

BEHAVIOURAL FACTORS ASSOCIATED WITH HPV VACCINE ACCEPTABILITY AMONGST MEN WHO HAVE SEX WITH MEN IN THE UNITED KINGDOM

TOM NADARZYNSKI

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ABSTRACT

Due to an increased risk of anal cancer and genital warts, the UK Joint Committee on Vaccination and Immunisation recommended targeted HPV vaccination programme for men who have sex with men (MSM). The research in this thesis aimed to examine the feasibility and acceptability of HPV vaccination for MSM in the United Kingdom. Accordingly, two systematic reviews and three empirical studies were conducted to address the thesis objective.

Two reviews synthesised evidence on factors associated with hepatitis A-B and HPV vaccine acceptability and uptake amongst MSM. The first study explored knowledge and beliefs about HPV and HPV-related diseases as well as attitudes towards the HPV vaccine amongst MSM in the UK, using qualitative methods. The second study examined psychological and behavioural factors associated with HPV vaccine acceptability amongst MSM, using quantitative methods. The third study investigated attitudes of sexual healthcare professionals (HCPs) towards a targeted HPV vaccination programme for MSM in the UK, using mixed methods.

The majority of MSM did not know about HPV and their risk of contracting genital warts and anal cancers. HPV infection was perceived as a female problem and HPV vaccination was thought to be against cervical cancer. While only 55% of MSM would be willing to ask for the HPV vaccine, 89% would accept it if offered by an HCP. Access to sexual health clinics, the disclosure of sexual orientation to an HCP and HIV-positive status were positively associated with HPV vaccine acceptability. Perceptions of HPV risk, HPV infection severity, HPV vaccination benefits, HPV vaccine effectiveness, and the lack of perceived barriers to HPV vaccination were also associated with acceptability. Around 14% of HCPs were already vaccinating men against HPV, 83% recommended gender-neutral HPV vaccination and 65% recommended targeting MSM.

Although nearly half of MSM would not actively pursue HPV vaccination, the vast majority would accept the vaccine if recommended by HCPs. MSM need to be informed about HPV to appraise the benefits of HPV vaccination for their health. In order to achieve optimal uptake, vaccine promotion campaigns need to focus on MSM that do not access sexual health clinics and those unwilling to disclose their sexual orientation. Clear advice and guidelines on HPV vaccine use for men at sexual health clinic are required to ensure equitable opportunities for vaccination.

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DEDICATION

With dedication to “*the Freedom of Expression*” and
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DECLARATION

I, Tomasz Nadarzynski, declare that the research contained in this thesis, unless otherwise formally indicated within the text, is the original work of the author. The thesis has not been previously submitted to these or any other university for a degree, and does not incorporate any material already submitted for a degree.

Signed

Dated

ABBREVIATIONS AND ACRONYMS

AIDS	Acquired Immune Deficiency Syndrome
AIN	anal intraepithelial neoplasia
ART	antiretroviral therapy
BASHH	British Association for Sexual Health and HIV
CI	confidence interval
CIN	cervical intraepithelial neoplasia
DNA	deoxyribonucleic acid
GUM	genitourinary medicine
High-risk HPV	human papillomavirus types with high oncogenic potential
HBM	Health Belief Model
HCP	healthcare professional
HIV	Human Immunodeficiency Virus
HPV	Human Papilloma Virus
HSIL	high-grade squamous intraepithelial lesion
JCVI	Joint Committee on Vaccination and Immunisation
Low-risk HPV	human papillomavirus types with low oncogenic potential
LSIL	low-grade squamous intraepithelial lesion
MSM	men who have sex with men
MVH	the Model of Vaccine Hesitancy
OIN	oral intraepithelial neoplasia
PIN	penile intraepithelial neoplasia
HCP	sexual healthcare professionals
SHC	sexual health clinic
STI	sexually transmitted infection
TPB	the Theory of Planned Behaviour
R ₀	basic reproductive rate
R ₁	effective reproductive number
UK	The United Kingdom
US	The United States of America
VPAAM	the Vaccine Perceptions, Accountability and Adherence Model

LIST OF PUBLICATIONS FROM THIS THESIS

Peer-reviewed articles:

- Nadarzynski**, T., Smith, H. E., Richardson, D., Ford, E., & Llewellyn, C. D. (2015). Sexual healthcare professionals' views on HPV vaccination for men in the UK. *British Journal of Cancer*, 113(11), 1599-1601. (Appendix A)
- Nadarzynski**, T., Smith, H., Richardson, D., Jones, C. J., & Llewellyn, C. D. (2014). Human papillomavirus and vaccine-related perceptions among men who have sex with men: a systematic review. *Sexually Transmitted Infections*, 90(7), 515-523. (Appendix B)
- Published conference abstracts:**
- Nadarzynski**, T., Smith, H., Richardson, D., Pollard, A., Hurst, S., Berglund, A., & Llewellyn, C. (2015). Delay in disclosure about sexual orientation to health-care professionals among men who have sex with men in Brighton, UK. *The Lancet*, 386, S57.
- Nadarzynski**, T., Smith, H., Richardson, D., Ford, E., & Llewellyn, C. (2015). Sexual healthcare professionals' Attitudes towards HPV vaccination for men in the United Kingdom. *Sexually Transmitted Infections*, 91(Suppl 1), 50-51.
- Nadarzynski**, T., Llewellyn, C., Richardson, D., Pollard, A., & Smith, H. (2015). A qualitative assessment of UK sexual healthcare professionals' views on targeted vaccination against human papillomavirus (HPV) for men who have sex with men (MSM). *Sexually Transmitted Infections*, 91(Suppl 1), 54.
- Bayley, J., Mesher, D., **Nadarzynski**, T., & Soldan, K. (2014, April). Age distribution in men who have sex with men attending genito-urinary medicine services in England: implications for targeted HPV vaccination. *HIV Medicine*, 15, 85.
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Chapter I – Introduction

1.1. The context of the thesis

The research described in this thesis was designed to inform the development of a targeted vaccination programme against Human Papillomavirus (HPV) for men who have sex with men (MSM) in the United Kingdom (UK). In 2012, the Joint Committee on Vaccination and Immunisation (JCVI), an expert advisory board on vaccination policies in the UK, began to examine the cost-effectiveness of MSM-targeted HPV vaccination due to their higher risk of HPV-related diseases. Starting in October 2012, my PhD research aimed to examine whether MSM-targeted HPV vaccination was feasible and acceptable and to identify potential barriers to its implementation. In November 2014, the JCVI issued an interim statement of a proposed MSM-targeted HPV vaccination inviting researchers and clinicians to comment on the proposed programme (Kirby, 2015). Their initial cost-effectiveness modelling assumed 100% vaccine uptake. In my response to the JCVI, I challenged their position (Appendix C) indicating that approximately 80% of MSM would be willing to accept the HPV vaccine, which was based on my data. I also outlined several barriers such as the lack of openness about same-sex experiences and insufficient motivation for vaccination due to significant obstacles. Thus, I recommended several changes to the proposed programme in order to increase HPV vaccination uptake in MSM. These included awareness campaigns and an extension of MSM-targeted HPV vaccination beyond sexual health clinics (SHCs) and HIV services to other settings such as pharmacies or general practice.

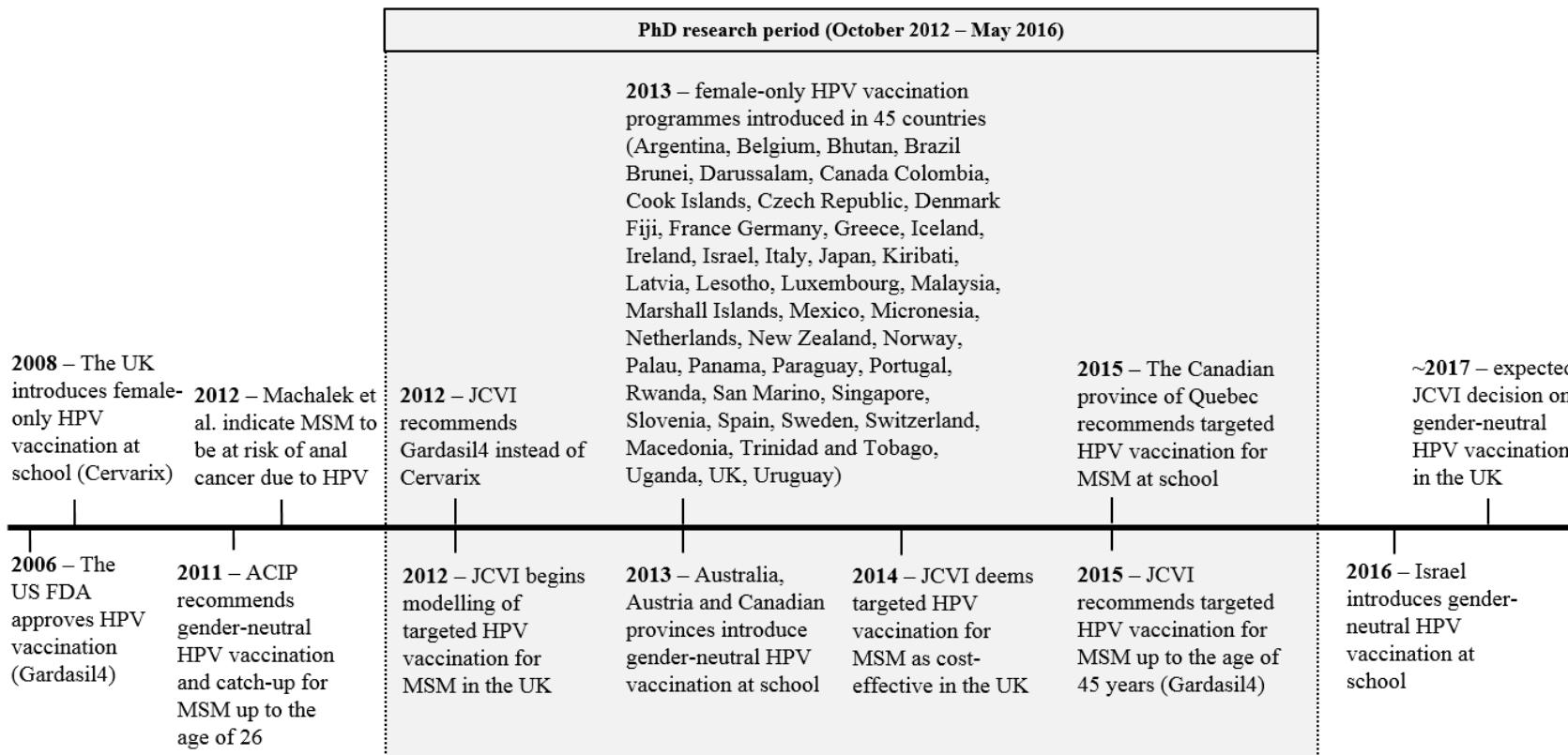
In 2015, the JCVI concluded that an MSM-targeted HPV vaccination programme was cost-effective if delivered at genitourinary medicine (GUM) and HIV services as well as extended settings such as general practices (The Joint Committee on Vaccination and Immunisation, 2015). Sexual health settings have been proposed as they are the most accessed healthcare services by self-identified MSM. The proposed programme is aimed at MSM and transgender women below the age of 45 years. Clinicians have also been able to recommend vaccinations outside of the national programme using individual clinical judgement enabling the HPV vaccine to be offered on a case-by-case basis. In addition, the JCVI has been in the process of reviewing the cost-effectiveness of gender-neutral HPV vaccination and the results of this assessment are expected in 2017.

1.2. The global context of HPV vaccination

Figure 1 outlines the timeline of the global developments of female-oriented, gender-neutral and MSM-targeted HPV vaccination programmes. It is important to understand the global context of HPV vaccination because the historical process of developing policies on HPV vaccination influences support and acceptability of MSM-targeted HPV vaccination. The rapidly changing context of HPV vaccination has certainly influenced the direction of my research throughout the entire course of my PhD. Below is a short overview of the history of HPV vaccination.

HPV is one of the most common sexually transmitted infections. It is mainly associated with genital warts and anogenital cancers (Muñoz, Castellsagué, de González, & Gissmann, 2006). The primary studies on HPV in the 1980s demonstrated that persistent HPV infection is an essential factor in the development of nearly all cervical cancers worldwide (Burchell, Winer, de Sanjosé, & Franco, 2006). The discovery of the causal relationship between HPV infection and cervical cancers have steered research to develop an effective HPV vaccine to substantially reduce the incidence of cervical cancers (Fife, 1998). The first two vaccines were approved in 2006 and 2007. Respectively, these were Cervarix (GlaxoSmithKline) protecting against the two most common HPV strains responsible for 70% of cervical cancers, and Gardasil (Sanofi Pasteur-MSD) protecting against these oncogenic strains and two further strains accounting for 90% of all genital warts (Einstein et al., 2009). Since then, most developed countries, such as the United States of America (USA), the United Kingdom (UK), Australia, Portugal and Canada, have implemented routine HPV vaccination programmes within their healthcare systems. The characteristics and delivery of HPV vaccination have varied by country.

An HPV vaccination strategy that focussed on adolescent girls was initially proposed because of the strong association between HPV and cervical cancer as well as satisfactory cost-effectiveness. In the UK, HPV vaccination has been offered to all girls aged 12-13 years old since 2008. The school-based, female-oriented HPV vaccination programme has consistently achieved 85% coverage in England, resulting in a significant decrease in two oncogenic HPV strains amongst vaccinated women (Mesher et al., 2013). Additional data from Australia, which has implemented a similar school-based HPV vaccination programme, have shown that the decrease in HPV was also observed amongst unvaccinated



MSM – men who have sex with men

HPV – Human Papillomavirus

FDA – the US Food and Drug Administration

ACIP – the US Advisory Committee in Immunisation Practices

JCVI – the UK Joint Committee on Vaccination and Immunisation

Cervarix – Bivalent HPV vaccine against two oncogenic HPV types

Gardasil4 – Quadrivalent HPV vaccine against four HPV types

Gardasil9 – Nine-valent HPV vaccine against nine HPV types

Figure 1. The timeline of the global developments of female-oriented, gender-neutral and MSM-targeted HPV vaccination programmes

women and men of the corresponding age, indicating a strong ‘herd protection’. It is predicted that the female-oriented HPV vaccination programme will substantially reduce the incidence of cervical cancer in the UK (Kulasingam et al., 2008).

Since the introduction of HPV vaccination in the UK, subsequent studies have indicated that men are also susceptible to HPV-related cancers, demonstrating the associations between HPV and anal, penile and oropharyngeal cancers (Parkin & Bray, 2006). In particular, individuals with compromised immune systems, notably HIV-positive men, are at substantially higher risk of anal cancer, even after the introduction of Highly Active Antiretroviral Therapy (HAART) (Machalek et al., 2012). Heterosexual men at all ages have a lower incidence of HPV compared with gay, bisexual and other men who have sex with men (MSM) are at significantly higher risk of HPV infection (Dunne, Nielson, Stone, Markowitz, & Giuliano, 2006). Heterosexual men are likely to receive indirect protection from the ongoing female-oriented HPV vaccination, but MSM receive very little health benefit from this vaccination strategy (Chow et al., 2014). MSM are more susceptible to anal cancer due to HPV infection during sexual intercourse and a disproportionately higher HIV co-infection (Machalek et al., 2012). Several studies have suggested that HPV vaccination could reduce the incidence of anal cancer in MSM (Kim, 2010; Giuliano et al., 2011). Based on these data, researchers have begun to explore whether a specific targeted HPV vaccination for MSM could further reduce the HPV-related morbidity and mortality.

Between 2011 and 2014, several health authorities updated their HPV vaccination guidelines to address the HPV-related burden in men. A gender-neutral vaccination strategy, which includes both women and men, has been deemed cost-effective in countries where uptake has been lower than 75%. As a result, Australia, the USA and several provinces in Canada have begun to offer the HPV vaccine regardless of gender (Elbasha and Dasbach, 2010). The HPV vaccination programme in the US also aims to target MSM below the age of 26 years (Markowitz et al. 2014) and in 2015 the Québec Immunisation Committee recommended an in-school targeted HPV vaccination programme for MSM (Sauvageau & Dufour-Turbis, 2015). As countries start adding men to their existing HPV vaccination programmes, it is important to explore the feasibility in the UK.

The global context of HPV vaccination affects HPV vaccine acceptability and uptake. Unlike the USA and Canada, the school-based, female-oriented HPV vaccination in the UK has

achieved excellent uptake (85%). The initial association of HPV with cervical cancers is likely to influence the understanding of HPV-related diseases amongst MSM. The differences in healthcare systems, HPV epidemiology and HPV vaccination strategies across various countries may have an impact on the perceived demand for either gender-neutral or targeted HPV vaccination programmes. It is also essential to acknowledge that MSM have already been targeted with hepatitis B vaccination through GUM clinics since 2002 and the proposed HPV vaccination is likely to use similar vaccination delivery infrastructure (Public Health England, 2012). Therefore, the feasibility and acceptability assessment of a potential targeted HPV vaccination programme in the UK could not be conducted without the recognition of the on-going, school-based, female-oriented HPV vaccination and the MSM-targeted hepatitis vaccination. In addition, the current consideration of gender-neutral HPV vaccination programme in the UK is also likely to affect the acceptability and support for the targeted programme.

1.3. Characteristics of HPV

1.3.1. Life cycle and duration

HPV is a circular, non-enveloped, double-stranded, icosahedral DNA virus, approximately 52-55nm in diameter, containing only eight gene expressions and a genome of approximately 8000 pairs (Guissman et al., 1977; Orth et al., 1978; Schwartz et al., 1983; Schiffman et al., 2002). The virus is capable of infecting human cells, exclusively keratinocyte of the skin or mucous membranes, causing instability in the natural maintenance of the host cell proteins. HPV is epitheliotropic, as it only infects basal and parabasal cells. The virus requires a break in the tissue surface, usually caused by a mild trauma, in order to infect epithelium and further replicate. The process of HPV genome transcription into host DNA takes between 12 and 24 hours. HPV may be inactive in the host cell at relatively low copy number for prolonged time. Such latent infection does not present clinically, but it has the potential to progress to productive viral infection, rapidly increasing the replication of viral particles. The specific causes of this transition are still poorly understood.

There is no single definition of the duration of HPV infection, as it can vary between several days to almost a few decades (Burchell, 2006). The infection can also return to the dormant stage and recur after time. It is now well documented that the vast majority of HPV infections clear within two years after acquisition. However, the rate of HPV clearance depends on several factors such as the type of HPV, the strength of host's immune system and the

specific site of HPV infection. Persistent HPV infection has been closely related to the development of malignancy (Zur Hausen, 2002; Munoz et al., 2006).

1.3.2. Carcinogenesis

The prolonged infection has a detrimental impact on natural replication of the host cell. Once the cell's genome is contaminated with HPV DNA, it promotes dysfunctional cellular proliferation (Castellsague, Bosch and Munoz, 2002). As a consequence of this sustained genetic instability, anomalous cells continue to replicate resulting in dysplasia or intraepithelial neoplasia (IN). The classification of IN is related to the site of infection and the thickness of the histological severity of HPV-induced lesions (Schiffman et al., 1993). In men, they are anal intraepithelial neoplasia (AIN), penile intraepithelial neoplasia (PIN) and oral intraepithelial neoplasia (OIN), corresponding to cervical intraepithelial neoplasia (CIN) and vulvar intraepithelial neoplasia (VIN) in females. In the example of AIN, based on histological analysis, low-grade AIN 1 (also called low-grade anal squamous intraepithelial lesion – LSIL) often does not require any treatment due to the relatively low probability of progressing into cancer. However, high-grade AIN 2 and AIN 3 (or high-grade anal squamous intraepithelial lesion - HSIL) as well as CIN might require treatment as can progress into invasive forms of cancer. However, it is still poorly understood what proportion of AIN 2 and AIN 3 progress into cancer and how long it takes for a malignancy to be established (Stanley et al., 2012).

1.3.3. HPV classification and possible manifestations

Papillomaviruses capable of infecting humans are categorised into five genera: Alphapapillomavirus, Betapapillomavirus, Gammapapillomavirus, Mupapillomavirus and Nupapillomavirus (Chouhy, Bolatti, Perez, & Giri, 2013). Over 170 HPV strains, generally referred as HPV types and numbered in order of discovery, have been analysed and classified based on their genetic expressions. However, over 202 new putative HPV types are awaiting full genome classification. There is strong evidence indicating that HPV genomes are static and any sequence changes through recombination or mutation are very uncommon.

HPVs are also grouped according to their pathological properties into “low-risk” and “high-risk” types (Jacobs et al., 1995). Low-risk HPV types are associated with non-malignant cellular changes such as cutaneous growth. The most common of these types involved in tissue tropism are HPV1, HPV2, HPV3, HPV4, HPV7, HPV8, HPV10, HPV22 and HPV63

associated with common non-genital warts. HPV6 and HPV11 are commonly linked to genital warts and respiratory papillomatosis. Over a dozen high-risk HPV types: HPV16, HPV18, HPV30, HPV31, HPV33, HPV35, HPV39, HPV45, HPV51, HPV52, HPV56, HPV58, HPV59, HPV66, HPV67, HPV68, HPV69, HPV70 and HPV82 have been associated with mucosal lesions able to progress into neoplasia and further into anal, cervical, oropharyngeal, penile, vaginal and vulvar cancers. Additionally, high-risk HPV types have been found in malignancies such as non-melanoma skin cancers or lung cancers (Feltkamp et al., 2003; Cheng et al. 2001). However, their causal role in the development of these diseases is yet to be fully investigated.

1.3.4. Acquisition and transmission

In terms of horizontal transmission, anogenital HPV is mostly acquired through sexual activity (Burchell et al., 2006). In nearly all cases, skin-to-skin contact between infected cervical, vaginal, vulvar, penile and anal epithelium is required for HPV to spread. Various epidemiological data have indicated that sexual intercourse is the primary cause of anogenital HPV infection (Moscicki et al., 2006). This has been largely documented in studies examining the occurrence of genital warts, HPV type-specific DNA concordance between partners and the very low HPV prevalence in men and women who have not had penetrative sexual intercourse, including either vaginal or anal intercourse.

There is growing evidence suggesting that intercourse involving penis entering vagina or anal canal is not strictly necessary for HPV transmission to occur. Other possible routes such as oral sex, digital-vaginal, digital-anal sex or the use of sex toys have also been associated with HPV transmission (Marrazzo et al., 1998; D'Sauza et al., 2009). For example, studies on homosexual couples have demonstrated that HPV acquisition, albeit rare, is possible without penetrative peno-vaginal or peno-anal intercourse (Marrazzo et al., 2000). This could be explained by the ability of some HPV strains to spread through hand-genital contact. Additionally, the infection that takes place at one site could also be transferred to another anogenital site by self-inoculation (Hernandez et al., 2008). Anogenital HPVs are the most common sexually transmitted infection however, the transmutability of HPV infections may differ across populations and amongst various HPV types.

1.3.5. Methods for the detection of HPV infection

Several methods such as visual inspection, anoscopy of the anal site (colposcopy for cervical), cytology and histology are used for the detection of HPV infection. These are indirect methods to detect the clinical sequelae of HPV infection and do not detect the actual presence of HPV. Visual inspection involves the application of acetic acid on epithelial cells (Belinson et al., 2001). The acid reacts with metaplastic cells which can then be observed with a naked eye or a magnifying device. Genital warts can be easily identified using a magnifying glass. Anoscopy and colposcopy involve high-resolution stereoscopic and magnified viewing of the internal genital areas to determine the tissue abnormalities (Fox et al., 2005). Although anoscopy and colposcopy methods are more accurate than visual inspection and provide satisfactory diagnostic sensitivity, there is inconsistent evidence supporting colposcopy and anoscopy as a sensitive screening tools for precancerous lesions.

Anal and cervical Papanicolaou smears (or Pap test) have been utilised as a standard screening tool for HPV-induced precancerous lesions (Bernstein et al., 2001). The test involves collecting cells from either cervix or anus using a specialist brush and looking for any epithelial abnormalities such as neoplasia, dysplasia or borderline changes, all of which could be a precursor to cancer. The cells are stained and observed under microscope to detect any possible koilocytosis. This method has been applied in various cervical screening programmes and it has been proposed as a potential anal screening tool in high-risk populations (Palefsky et al., 1997).

More sensitive methods for the detection of HPV infection that have been used in cancer screening involve immunological detection of HPV in human cells. The infection can be identified by detection of HPV proteins such as L1 or L2, and protein-specific antibodies using immunohistochemistry (Wright et al., 2000). Smears of anogenital areas are stained with corresponding proteins and antibodies to find expressions of HPV proteins as a marker of past infection. Another method examines the presence of p16 and pRb proteins associated with HPV E6 and E7 inhibitory actions (Cuzick et al., 2006). Staining of p16 antibody allows more precise identification of the intraepithelial neoplasia grading. The immunohistochemistry method may reduce false-negative and false-positive biopsies and improve cancer diagnosis.

The most sensitive methods for HPV identification are achieved via direct detection of HPV genome. These methods use hybridisation procedures such as dot blots, in situ hybridisation, Hybrid Capture and DNA sequencing (Gravitt et al., 1998; van den Brule et al., 2002). Also, polymerase chain reaction (PCR)-based methods allow for the identification of HPV viral load (Manos et al., 1989). Currently, the most sensitive procedure capable of recognising all HPV types is DNA sequencing in which HPV particles are cloned. However, this method is time and labour intensive and requires highly specialised expertise and the use of expensive equipment. Also, DNA sequencing is not suitable when detecting multiple HPV types in one specimen. Therefore, these methods are unlikely to be utilised in cancer screening programmes.

1.3.6. Immunity following natural HPV infection

HPV infection does not necessarily trigger the activation of natural defence mechanisms. In rare cases, the host's immune protection is not activated by the infection (Trottier et al., 2010). HPV infection does not destruct the host cell and it transcribes into a host's DNA, so the virus replicates alongside the natural cell reproduction without alerting natural defence mechanisms. Inflammation does not occur and there is little release of pro-inflammatory cytokines, important for antigen activation and migration. As a consequence, HPV is not recognised by the host as a pathogen. The antigen cells are not activated by the presence of HPV capsids and fail to initiate an immune response and develop antigens. For an extended period, the infection is ignored and discounted by the host immune systems.

HPV infections can resolve with time. The infected cells are cleared due to cell-mediated immune responses against early HPV proteins (Moscicki et al., 2006). Typically, such a response would be followed by seroconversion and antibody release. HPV antibody concentrations are usually low and in many infected individuals seroconversion might not occur. The virus shreds at the epithelium surface and it does not access lymphatic channels, so the overall immune responses are not activated. Up to 10% of individuals, depending on specific risk factors, do not seroconvert and may develop persistent HPV infection. This may further lead to the development of intraepithelial neoplasia, genetic instability of the host cell and progressive ability to resist innate and adaptive antiviral defence mechanisms (Nobbenhuis et al., 2001). Although the virus is eventually cleared, these neoplastic cells with assimilated HPV DNA are resistant to immunological effects such as the activation of T-cell or type 1 interferons that have antiviral, antiangiogenic, antiproliferative, and

immunostimulatory properties. Without a strong immunological response, HPV DNA synthesis continues inhibiting tumour suppressing proteins. Therefore, natural HPV infection does not guarantee seroconversion and the activation of immune defences against HPV.

1.4. HPV epidemiology in men

1.4.1. Global HPV infection in men

HPV is the most common STI in men, but in the majority of cases the infection is asymptomatic and clears naturally within two years (Giuliano et al., 2008). Three reviews of studies conducted before the introduction of HPV vaccination have concluded that approximately 16% (range 1-84%) of men have been actively infected with HPV (Dunne et al., 2006; Giuliano et al., 2008; Smith et al. 2011). Because HPV prevalence in men has generally been equivalent to the rate of HPV infection in women, any decrease in female HPV infections would most likely result in a decreased incidence of HPV in men. The high-risk HPV16 is the most predominant type, followed by HPV18, HPV6, HPV11, and HPV31. Nearly half of men have multiple type infections (Nielsen et al., 2013). The most common anatomic sites are corona and glans (6-50%), penile shaft (5-51%), prepuce (24-50%), scrotum (7-46%) and urethra (9-50%). Oral HPV is found in approximately around 5% of men in the general population. In different studies, despite not engaging in receptive anal intercourse, up to 33% of heterosexual men might have anal HPV through autoinoculation or digital contact (Nyitray et al., 2008; Kreimer et al., 2010). Thus, these epidemiological studies suggest that men, regardless of their sexual orientation, are susceptible to anal HPV infection.

There is little reliable data on HPV incidence in men, because HPV prevalence varies between countries and social groups, making it difficult to generalise. One multi-continental study of heterosexual men has indicated that 9 per 100 become HPV infected each year (Moreira et al., 2014). The infection peak is not generally concentrated on younger age groups, mainly 15-24 year olds as reported in females, and around 16% of men below the age of 30 years are HPV positive. In about 70% of cases, HPV infection is cleared within eight months and over 95% of men do not present with HPV infection beyond eighteen months from diagnosis (Giuliano, Lu, et al., 2008). Less than 1% of infected men present with any HPV-related clinical symptoms. Therefore, most men do not usually realise they are infected, as HPV does not result in any observable disease burden.

1.4.2. HPV infection amongst men in the United Kingdom

Only two population studies have estimated HPV prevalence in the UK. One study conducted between 1999 and 2001 as part of the National Survey of Sexual Attitudes and Lifestyles (NATSAL II), involving 3123 UK citizens aged 18-44 years, asked participants to provide urine samples in order to detect HPV (Johnson et al., 2012). The results showed that 17% of men were positive for any HPV type, and 9.6% for high-risk types. While vaccine preventable high-risk HPV16 and HPV18 were found in 3% of men, HPV6 and HPV11 associated with genital warts were detected in 2.2%. The peak HPV infection occurred approximately five years after the initial sexual debut. However, caution should be exercised as the sensitivity of urine sampling in men is only modest due to a low HPV DNA content detection rate when compared with other anogenital sites (Enerly, Olofsson, & Nygard, 2013). Additional studies examining anal and oral sites would offer better insight into HPV prevalence amongst men in the UK.

Another study conducted in England used HPV antibody markers to detect previous HPV infection. The study recruited males aged 10-49 years old as part of a seroepidemiological survey in 2002-2004 (Desai et al., 2011). The results showed that 7.6%, 2.2%, 5.0% and 2.0% of men were seropositive for HPV6, HPV11, HPV16 and HPV18, respectively. The findings support the evidence that only a proportion of men previously infected with HPV might seroconvert. Hence, initial HPV infection not resulting in antibody response could reoccur. Nevertheless, both studies were conducted before the introduction of female HPV vaccination and therefore more research is needed to identify whether HPV vaccination of females has had an impact on HPV rates in men in the UK.

1.4.3. Men at high risk of HPV infection

Several factors are associated with HPV infection in men, worldwide. While in healthy ‘low-risk’ individuals the prevalence ranges between 3.5% and 33.8%, in ‘high-risk’ men (e.g. STI clinic attendees, partners of HPV-positive women) it ranges between 8.3% and 62% (Wasserheir, 1992). Men that frequently change their sexual partners are at an increased risk of STIs. It is now well documented that earlier sexual debut, a higher number of lifetime sexual partners and more frequent sexual intercourse are associated with higher susceptibility to HPV infection (Dunne et al., 2006; Partridge et al., 2007). Due to the high prevalence, most sexually active men would acquire the virus at some point in their life.

Therefore, it is not infection per se but HPV persistence that usually determines whether men are at higher risk of HPV-related morbidity, because HPV persistence is associated with the development of pre-cancerous lesions (Nielson et al., 2007). Two factors have been independently associated with HPV persistence: immunosuppression and receptive anal intercourse.

1.4.3.1. Men with immunodeficiency

The deterioration of the immune system, through organ transplant or infection with HIV, has been associated with higher HPV infection and HPV-related cancer rates. Table 1 outlines HPV prevalence in penile, oral, and anal sites between HIV-positive and HIV-negative men. HIV-positive men are about four times more likely to present with HPV than HIV-negative men (Müller, Chirwa, & Lewis, 2010; Van Der Snoek et al., 2005; Pokomandy et al., 2009; Videla et al., 2013). The recurrence and reactivation of HPV16 are nearly three times higher in men with HIV. Those with severely compromised immune systems (CD4 count $<200/\mu\text{L}$) show higher rates of HPV persistence than individuals with higher CD4 count, suggesting that weaker immunological competence is associated with prolonged HPV infection (Adhieh et al., 2001). Due to the higher prevalence of HIV in MSM, this population is considered more susceptible to HPV infection and HPV-related cancers (Houlihan et al., 2012).

An increased prevalence of HPV infection and HPV-related cancers has also been observed in organ transplant recipients, suggesting that immune system competence plays a major role in control processes against HPV infections (Grulich et al., 2007). There is a high incidence of recurrent genital warts in this population, indicating that the virus is capable of remaining in the epithelium subclinically (Deneshpouy et al., 2001; Stockfleth et al., 2002) The studies suggest that an intermittent loss of immunological memory might reactivate the virus and manifest itself repeatedly. Immunological incompetence following HIV infection is strongly associated with HPV persistence and the development of malignancies. A systematic review of the incidence of cancers in people with HIV/AIDS and organ transplants demonstrated that there is a similar pattern of infection-related cancers in these two populations (Grulich et al., 2007). Therefore, immune deficiency per se is considered the strongest predictor of HPV persistence and progression to HPV-related diseases

Table 1. Estimated HPV prevalence and HPV-associated cancer incidence in penile, oral and anal sites in men in relation to sexual orientation and HIV status

	Penile	Oral	Anal
HPV prevalence			
HIV-negative heterosexual	6-51% ^D	1-5% ^A	0-33% ^D
HIV-negative MSM	18% ^G	7% ^R	64% ^M
HIV-positive heterosexual	27-32% ^{VS}	19-23% ^{VSE}	42% ^V
HIV-positive MSM	25-38% ^{SV}	15-33% ^{SRVEP}	93% ^{MP}
Worldwide cancer incidence per 100,000			
HIV-negative MSM	ND	ND	4.7 ^M
HIV-positive MSM	ND	ND	46 ^M
HIV-positive men	4.4 ^L	2.3 ^L	29 ^W
Percentage HPV DNA in cancer tumour	~48% ^B	~26% ^K	~77% ^H
Cancer in men in the UK			
Number of cases in 2011	558	4,510	414
Incidence per 100,000	1.5	12.8	1.1

ND - no data; **A** - (Kreimer et al., 2010); **B** - (Backes, Kurman, Pimenta, & Smith, 2009); **C** - Cancer Research UK; **D** - (Dunne et al., 2006); **E** - (Darwich et al., 2014) **G** - (Goldstone et al., 2011); **H** - (Hoots, Palefsky, Pimenta, & Smith, 2009); **K** - (Kreimer et al., 2005); **L** - (Grulich, van Leeuwen, Falster, & Vajdic, 2007); **M** - (Machalek et al., 2012); **P** - (Parisi et al., 2011); **R** - (Read et al., 2012); **S** - (Sirera et al., 2006); **V** - (Videla et al., 2013);

1.4.3.2. Men who have sex with men

Due to prevailing sexual behaviours, such as receptive anal intercourse, and a number of lifetime sexual partners, some MSM are at significantly higher risk of HPV infection. HPV is more common in MSM than heterosexual men, so there is a higher HPV reproductive rate in this population (Read et al., 2011). Anal tissue is comparably more receptive to HPV infection than penile or oral anatomical sites, so receptive anal intercourse has been strongly associated with HPV acquisition (van Rijn et al., 2014; Abramowitz et al., 2007). Table 1 outlines the differences in penile, oral and anal HPV prevalence between heterosexual men and MSM, showing that anal infections are significantly more prevalent in MSM. The rate of HPV clearance is slower in men that engage in frequent receptive anal intercourse with multiple sexual partners than those not engaging in such practices (Giuliano et al., 2011; Nyitray et al., 2011; Videla et al., 2013). Multiple HPV type infections that are more common in MSM have been associated with slower clearance and disease progression (Kjaer et al., 2005; Giuliano et al. 2011; Nyitray et al., 2011). Therefore, MSM are at an increased risk of HPV-related infections.

MSM with HIV are at the highest risk for HPV. The latest meta-analysis (Machalek et al., 2012), on HPV prevalence in MSM, has concluded that approximately 75% of HIV-positive

MSM and 37% of HIV-negative MSM are infected with high-risk HPV strains. There is no particular peak of incidence, as observed among young heterosexual women. High-risk HPV clearance occurs in approximately 15% of HIV-positive MSM and 27%-62% of HIV-negative MSM. In addition, men who have a larger number of sexual partners, use recreational drugs, smoke and do not consistently use condoms are more susceptible to HPV infection. Furthermore, the prevalence of anal cytological abnormalities is greater in HIV-positive MSM. It is estimated that 57% (95% CI: 51%-62%) of HIV-positive MSM and 18% (95% CI: 8%-29%) of HIV-negative MSM have anal dysplasia, because of persistent HPV infection. Approximately 7% (95% CI: 4%-9%) of HIV-positive MSM and 3% (95% CI: 0%-5%) of HIV-negative MSM have high-grade squamous intraepithelial lesion (HSIL), a precursor of anal cancer. Some caution is needed as the majority of these data come from North America and may not be generalizable to the MSM population in the UK.

Two studies estimating HPV prevalence in MSM are relevant to the UK population. Although the data from the first study comes from Ireland (Sadlier et al., 2014), there are similarities between Irish and UK populations of MSM that provide useful perspectives on the rate of HPV infection. The sample contained equal numbers of HIV-positive and HIV-negative MSM, aged 36 years old, recruited from a community-based sexual health clinic in Dublin in 2012. Anal smears were collected to detect HPV DNA. While 69% of MSM were positive for HPV, 42% were found with high-risk HPV type and 23% were positive for HPV31 (type not covered by the vaccine). In comparison with HIV-negative men, HPV-positive men were more likely to have anal HPV (77% vs 61%) and multiple type infection (31% vs 3%). Although the results confirmed that MSM are at substantial risk of HPV, they also showed that MSM from less urban areas or those with lower exposure to HPV present with lower rates of HPV infection.

The second study, conducted by King et al (2015), examined the HPV vaccine prevalence amongst 522 MSM attending an SHC in central London. The results showed that 72% were found with HPV at any oral, anal or penile site. About 47% of MSM were positive for high-risk HPV types, the most common HPV strains were HPV16 (13.5%), low-risk HPV11 (11.5%) and low-risk HPV6 (9.4%). While HPV prevalence amongst HIV-negative MSM was 71%, 92% of HIV-positive MSM were co-infected with HPV. The analysis showed that there was a 4.7% increase in odds of an HPV infection per year, but there were no significant associations between age and HPV infection. The number of lifetime oral or anal sex

partners, being infected with HIV and the drug use through the rectal passage were positively associated with HPV infection. Thus, these studies indicate very high HPV prevalence amongst MSM, with nearly half presenting with oncogenic strains associated with anogenital cancers.

1.5. HPV-associated diseases in men

HPV infection is mainly associated with the development of non-malignant genital warts, anogenital and oral cancers. In men, they are largely classified as anal, penile and oral cancers (Parkin and Bray, 2006). Oral cancers are further subdivided into oral cavity (tongue and mouth), pharyngeal (tonsil, oropharynx, piriform sinus, hypopharynx, pharynx unspecified) and laryngeal cancers. HPV DNA has been found in half of all penile cancers, a quarter of oral cancers and the majority of anal cancers (Table 1). Thus, prevention and treatment of HPV-induced cancers are also different from non-HPV-related cancers in these anatomical sites.

1.5.1 Genital warts

Less than 1% of infected men present with any HPV-related clinical symptoms such as genital warts (Stone, 1995; Koutsky, 1997). They usually occur on the penis, scrotum, urethra and anus, but in MSM genital warts are more typically found around the anus. Because infections with HPV6 and HPV11 are common, specific sexual practices and the number of sexual partners are closely related to the onset of genital warts. In England, there are around 40,000 cases of male genital warts each year, giving an incidence of 150 per 100,000 men (Public Health England, 2007). Around 3,000 (8%) of these cases are reported in MSM. One study from Australia has demonstrated that approximately 5 per 100 homosexual men present with genital warts each year (Poynten et al., 2013). Despite relatively low clinical manifestation, MSM and immunosuppressed individuals are more likely to present with genital warts than heterosexual men.

1.5.2. Anal cancer

In most European countries, less than 1 per 100,000 men are diagnosed with anal cancer each year (Hartwig et al., 2012). Although there were only 414 cases of anal cancer in all men in the UK in 2011, there has been a rise in anal cancers in the last few decades (Robinson, Coupland, & Moller, 2009). While age-standardised incidence in South-East England men was 0.79 per 100,000 in 1960-1964, the incidence increased to 1.06 per

100,000 in 2000-2004. A similar increase in anal cancer incidence between 1975-1979 and 1998-2002 has been observed in Scotland (Brewster & Bhatti, 2006), with an estimated rate of 0.37 per 100,000 men. An analysis of the English National Cancer Data Respiratory registry has also revealed a 69% increase in anal cancer between 1990 and 2010 (Wilkinson et al., 2014). Such a rise has been reported in a multinational review of 22 articles on the aetiology of anal cancers, demonstrating that the trends in specific risk groups are closely related to smoking, increased exposure to HPV via sexual practices and immunosuppression (van der Zee et al., 2013). Both men and women that engage in receptive anal intercourse have shown an elevated risk of anal malignancy.

MSM are at the greatest risk of anal cancer. Early epidemiological studies from 1987 and 1989 have demonstrated that MSM, especially those practising receptive anal intercourse were more likely to be diagnosed with anal cancer (Darling et al., 1987; Holly et al., 1989). In line with the HPV prevalence, MSM are at approximately 17.3 (95% CI: 8.8-36.1) times greater risk of anal cancer than heterosexual men, with 6.8 independent odds ratio for anal intercourse (Daling et al., 2004). In the same study, MSM that reported over 15 lifetime sexual partners were approximately six times more likely to suffer from anal cancer than men with lower numbers of sexual partners. Therefore, these findings demonstrate that MSM with a large number of sexual partners are a high-risk group for anal cancer.

MSM with HIV are the most susceptible to anal cancer. Estimates have shown that while 5 per 100 000 (95% CI: 0-11) of HIV-negative MSM develop anal cancer, about 46 per 100 000 (95% CI: 31-60) of HIV-positive MSM suffer from this malignancy (Machalek et al., 2012). Despite the introduction of antiretroviral therapy (ART) against HIV, there has been an increase in the incidence of both HIV and anal cancer in MSM and up to 78 per 100 000 (95% CI: 59-96) of MSM with HIV have developed anal cancer. This rate is comparable to the incidence of cervical cancer, before the introduction of cervical cancer screening programmes. A growing body of evidence suggests that ART has little protective effect against anal cancers and does not regress anal lesions despite the restoration of the immune system (Piketty et al., 2012; Piketty et al., 2013). One study from the US, involving 1409 HIV-negative men, found that certain types of HPV infection were independently associated with HIV acquisition, even after controlling for sexual behaviour (Chin-Hong et al., 2009). Thus, there is a higher risk of co-infection of HPV and HIV amongst MSM.

The majority of data on anal cancer come from North America and might not be generalizable to the UK populations. For example, one prospective study of 8640 London HIV patients examined the incidence and survival of anal cancers between pre-ART and post-ART era (Bower et al., 2004). The introduction of ART was not associated with a change in the anal cancer incidence in the HIV population. However, more recent epidemiological UK-based studies are needed to determine whether MSM in the UK are at significantly higher risk of anal cancer.

1.5.3. Penile cancer

Penile cancers are highly heterogeneous and HPV prevalence varies in penile malignancies,. There is a scarcity of data on specific risk factors associated with this malignancy, because of the very rare occurrence of penile cancers in the general population (Backes et al. 2009; Stratton et al. 2016). Findings of the penile cancer management audit in the UK indicated that a consultant urologist sees approximate one new case of penile cancer every two years. Smoking, lack of circumcision and poor penile hygiene, phimosis and inflammation have been associated with higher risk of penile cancer. Other risk factors include a number of sexual partners and a history of STIs, notably genital warts. Approximately 47% of penile cancer cases contain traces of HPV DNA, with HPV16 being the most common type (Backes et al., 2009). One study from the United States that examined the incidence of HPV-related cancer amongst patients with Autoimmune Deficiency Syndrome (AIDS) found a seven-fold increase in penile cancers amongst MSM (Frisch, Biggar, & Goedert, 2000). Therefore, HIV-positive men are at relatively higher risk of penile malignancy than HIV-negative men. However, there is no current data suggesting that HIV-negative MSM might be at increased risk of penile cancer when compared to heterosexual men.

1.5.4. Oral cancer

Oral cancers are highly variable and their association with HPV infection is still poorly understood. Due to changes in sexual behaviour in the last few decades, oral cancers in men have become more common (Mehanna et al., 2013). Although oral HPV infections are relatively rare compared to anogenital sites, about 25% of all oral cancers, nearly 90% in oropharyngeal regions (tonsils and base of tongue), have been found with HPV DNA (D'Souza & Dempsey, 2011). Several epidemiological analyses have shown that HPV-induced oropharyngeal cancers are increasing and are affecting younger men (Chaturvedi et al., 2011; Franceschi et al., 1996). Despite a decrease in tobacco use, universally associated

with oral cancers, there has been a rapid increase in oropharyngeal cancers in a sexually active population, especially in individuals that practice vagino-oral intercourse. One study from Sweden examining the prevalence of HPV in tonsillar cancers have shown an increase from 28% in the 1970's to almost 93% in 2007, suggesting that HPV infection associated with oral sexual practices are now largely responsible for the increases in oral cancers (Nasman et al., 2009). The mediating impact of smoking and excessive alcohol consumption in the aetiology of HPV-related oral cancers is still poorly understood.

UK data on oropharyngeal cancers demonstrated that at least 37% of oral tumours are associated with HPV infection (Louie et al. 2013; Louie et al., 2016). Oral cancers are more common in men than women and about 75% of these tumours contained HPV16 DNA. Additionally, individuals with HPV-induced oral cancers were younger than those who were not found with the p16 biomarker (Heath et al., 2012). There is also no existing evidence suggesting that MSM are at higher risk of oral cancers than heterosexual men, as rates of oral HPV infections are comparable in both groups. However, HIV-positive men are at 2-6 increased risk of HPV-induced cancers than HIV-negative men and further studies are needed to identify what factors are related to oral HPV persistence and the progression to malignancy in men with HIV.

1.6. HPV vaccination for men

HPV vaccination offers the best opportunity for HPV disease prevention. Vaccine immunogenicity, safety and clinical significance are the most relevant issues when recommending a large-scale immunisation. There are currently three prophylactic vaccines against HPV: Gardasil (produced by Merck & Co. and licenced in 2006), Cervarix (produced by GlaxoSmithKline and licenced in 2007) and Gardasil9 (produced by Merck & Co. and licenced in 2015). While Cervarix is a bivalent vaccine against two of the most common high-risk HPV16 and HPV18, Gardasil is a quadrivalent vaccine against HPV16, HPV18, HPV6 and HPV8, offering additional protection against genital warts. Gardasil9 protects against nine HPV strains (HPV6, HPV11, HPV16, HPV18, HPV31, HPV33, HPV45, HPV52 and HPV58). Gardasil9 was approved by the US Food and Drug Administration in 2015 and there are plans to implement the vaccine within the US healthcare from 2016. Gardasil4 is commonly used in over 45 countries, including the UK.

These vaccines offer high efficacy against HPV, however, the duration of protection is yet to be established (Malagon et al., 2012). The virus-like particles used in vaccines induce neutralising antibodies that further bind to viral particles in basal stem cells. Several randomised controlled trials have shown that Gardasil produces high immunogenicity in both females and males (Einstein et al., 2009). Gardasil induces effective antibody responses in more than 99% of vaccine recipients that had received three doses. The quadrivalent vaccine also provides cross-protection against non-included HPV types such as HPV31 and HPV45 (Ault, 2007). The analyses have shown that quadrivalent vaccine is capable of neutralising genetically related HPV types.

1.6.1. Potential herd protection following female HPV vaccination

Since the discovery of HPV DNA in patients with cervical cancer, nearly all HPV-related research interests and public health initiatives have focussed on cervical cancer prevention. Because cervical cancer incidence is substantially higher than other HPV-induced cancers, HPV vaccination has been prioritised to prevent this particular malignancy (Walboomers et al., 1999). HPV infection has been the cause of most cervical cancers and more sexually active women are at higher risk. Nevertheless, to avoid the association of HPV with sexual behaviour and increase public acceptability, the vaccine was branded to be “against cervical cancer” in the early public health campaigns. Still, the morbidity of HPV in men was commonly omitted. Before the introduction of HPV vaccination, 20%-60% of heterosexual women were most likely to acquire HPV soon after their first sexual intercourse (Smith et al., 2011). Thus, HPV vaccination in females is most effective when given before sexual debut, as subsequent sexual experience increases the likelihood of HPV infection. Early vaccination strategies against HPV focus on female vaccination, with the assumption that decline of HPV in women results in the reduction of HPV infection and disease burden in men.

This effect, known as “herd protection”, is a population-level acquired protection against a virus amongst both vaccinated and unvaccinated individuals. The herd, in this context, is understood as the homogeneous population at particular risk of infection, in which only a proportion receives the vaccination. Therefore, the population immunity is closely associated with the capability of the virus to reproduce and spread, known as ‘basic reproductive rate’ (R_0) (Garnett, 2006). In other words, it is the average number of new infections as a result of one infection within the susceptible population. The underlying

assumption is that the higher the proportion of the population being vaccinated, the lower the virus basic reproductive rate leading to a lesser likelihood of infection for those unvaccinated. The ‘effective reproductive number’ (R_1) is calculated to estimate the virus ability to spread after vaccination. For example, if a virus presents with $R_0=2$, meaning that a single infection results in additional two infections, then this number would proportionally decrease (R_1) with an increase in the ratio of vaccinated individuals in the population. However, the estimates of R_1 are complex and are based on various factors such as the virus characteristics (e.g. transmissibility, persistence, response to treatment, natural immunogenicity), the population characteristics (e.g. virus exposure, proportion of risky behaviours, natural susceptibility, co-infections) and the vaccine characteristics (e.g. immunogenicity via inoculation, coverage rate, duration of protection). As HPV is highly infectious and common, sufficient coverage of highly efficient HPV vaccine in females could offer valuable protection to unvaccinated men.

Nearly a decade after HPV vaccination has been introduced, the evidence demonstrates that female vaccination protects heterosexual men against genital warts. In countries with higher coverage of female HPV vaccination, there is an expected decrease in genital warts in both vaccinated and unvaccinated women and men. The latest surveillance data following 5-year HPV quadrivalent vaccination at schools in Australia have demonstrated that female vaccination reduced the incidence of genital warts by 93% in females below the age of 21 years and by 72% in those between the age of 21 and 30. Such a reduction in genital warts also corresponded to heterosexual males (82% in under 21), suggesting that female-oriented vaccination is likely to give protection to unvaccinated men (Donovan et al., 2011). Therefore, long-term, successful female HPV vaccination, capable of achieving at least 75% coverage, is likely to reduce HPV prevalence and HPV-related diseases in men.

1.6.2. Direct HPV vaccination in men

In the last few years, a growing body of evidence has highlighted that men are susceptible to HPV-related penile, anal and oropharyngeal cancers and female-oriented HPV vaccination programmes with suboptimal uptake are unlikely to eliminate these diseases. Universal, gender-neutral vaccination of both males and females would provide the opportunity to protect a greater proportion of women and reduce HPV-related cancers in men (Gillison, Chaturvedi, & Lowy, 2008). The HPV efficacy studies have shown that

vaccination is the most effective strategy against HPV in men. If affordable, this strategy is capable of achieving the largest decrease in HPV-related diseases in both sexes.

There are currently four countries worldwide that recommend HPV vaccination for men: Austria, Australia, Canada and the United States. Since 2006, the Austrian government has approved universal HPV vaccination for males and females aged 9-15 years, but fully financed by the patient. Although such a strategy may be relatively cheap for health authorities, its effectiveness may be reduced by low coverage rates, due to personal vaccine cost, resulting in higher incidence of HPV-related cancer in comparison to countries with greater coverage rates (Zechmeister, Blasio, Garnett, Neilson, & Siebert, 2009). Furthermore, due to low coverage rates of female HPV vaccination, health authorities in the US and Canada have recently changed eligibility criteria to include males in gender-neutral routine HPV immunisation (Kim & Goldie, 2008; Elbasha & Dasbach, 2010). However, due to the characteristic of the healthcare systems in these countries, although recommended, HPV vaccine is not publicly funded for men. Changing eligibility criteria to include men might increase the coverage of HPV vaccination, but the recent data shows that only 7% of men in the US are willing to be vaccinated against HPV. Therefore, further strategies would be needed to encourage a larger number of men to uptake the HPV vaccine. In order to achieve greater coverage against cervical cancer, Australia became the first country offering publicly funded gender-neutral HPV vaccination, delivered through school-based programmes. Such a strategy is likely to result in high coverage rates and give protection to MSM in the future. However, due to insufficient evidence for satisfactory cost-effectiveness in European countries, there is no equivalent recommendation for boys. Unless more inclusive HPV prevention programmes are developed, MSM will suffer substantial but largely preventable morbidity.

Adding men to on-going female vaccination programme requires further resources and incurs greater costs. In the current economic situation, taking into account the price of vaccination, the inclusion of males could be too costly to implement, especially in countries with high female vaccination coverage levels such as the United Kingdom. A recent review of HPV vaccination cost-effectiveness analyses for men has suggested that the increased costs of the direct vaccination strategy could only be justified if all HPV-related diseases are included in the model, the country fails to achieve high coverage of female vaccination and the price of the vaccine is low.

Female-oriented vaccination is therefore the most cost-effective strategy against HPV on a population basis. Additional male vaccination would accelerate the eradication of HPV in a shorter time frame and give protection to men that might not benefit from female vaccination such as MSM. As these men are at relatively greater risk of HIV and HPV-related diseases, direct school-based vaccination of adolescent males would potentially protect MSM and eradicate genital warts and anal cancers. The basic reproductive ratio of HPV is different in heterosexual men and MSM, due to the higher HPV prevalence and risk of transmission. As such, targeted HPV vaccination could offer a solution to anal cancers in high-risk MSM.

1.7. Targeted HPV vaccination for MSM

To date, only six countries, Australia, Austria, Canada, Israel, the UK and the USA, have developed guidelines on HPV vaccination in men. The gender-neutral strategy is recommended in Austria, Australia, Canada, Israel and the USA. The health authorities in the UK and the Canadian province of Quebec recommend MSM-targeted HPV vaccination and the health authorities in the USA recommend a catch-up programme for MSM below the age of 27 years. Thus, selective HPV vaccination for MSM is currently present in three countries.

1.7.1. Efficacy, immunogenicity and safety of HPV vaccination in MSM

HPV vaccination is efficacious in preventing HPV infection, reducing HPV persistence and decreasing rates of precancerous cells in young MSM. Quadrivalent HPV vaccine-induced HPV seroconversion in approximately 95% of men without prior serological evidence of infection (Kelsberg & Safranek, 2015). There was a 50% reduction of persistent anal HPV infection and AIN in young MSM aged 16-26 years old (Palefsky et al., 2011; Giuliano et al., 2011; Newman, Logie, Doukas, & Asakura, 2013). The vaccine was highly immunogenic, well tolerated with no serious vaccine-related adverse effects. MSM with no prior exposure to HPV and those who have already seroconverted are likely to benefit from HPV vaccination. Although HPV vaccination is most effective when administrated before sexual debut, the evidence shows that young MSM are likely to gain protection against persistent HPV infection after vaccination.

1.7.2. Cost-effectiveness of HPV vaccination in MSM

MSM-targeted HPV vaccination programmes are cost-effective. Vaccinating MSM up to the age of 26 years is cost-effective, even after sexual debut and exposure to HPV infections (Kim, 2009). The mathematical evaluations of targeted HPV vaccination of MSM estimate that the incidence of anal, penile and oropharyngeal cancer could be reduced by 90% in 50 years, given effective prophylaxis and lifelong immunity. The accepted cost of three-dose HPV vaccination is around US\$450. Kim (2009) demonstrated that vaccination of 12-year old MSM would result in US\$15,290 per quality-adjusted-life-year gained and this ratio increased with potential age, HPV exposure and coverage. Consequently, MSM-targeted HPV vaccination of MDM up to the age of 26 years in the USA would cost US\$37,830 per quality-adjusted life-year, considering that 50% of the MSM population could be potentially exposed to HPV. Estimates show that the price of the HPV vaccine would need to be reduced by 60-90% to around US\$36 per dose in order to achieve a similar cost-effectiveness ratio (Laprise et al., 2014).

In November 2015, UK Joint Committee on Vaccination and Immunisation recommended that MSM-targeted HPV vaccination would be cost effective (Joint Committee on Vaccination and Immunisation, 2015). The modelling considered a programme delivered mainly through sexual health clinics (SHCs) and targeting MSM and transgender women up the age of 45 years, with a three-dose quadrivalent HPV vaccine course over six months. The alternative setting, such as GP practices, also recommended for opportunistic vaccinations, due to restricted access to SHCs in more remote geographical areas.

1.7.3. Feasibility, access and acceptability of HPV vaccination in MSM

Although the JCVI recognised that not all MSM attending sexual health services would be willing to initiate and complete the three-dose course, there are currently no data illustrating factors associated with HPV vaccine acceptability amongst MSM in the UK (Joint Committee on Vaccination and Immunisation, 2015). It is important to determine HPV vaccine acceptability in order to predict future uptake and completion rates. One meta-analysis suggested that about half of men expressed willingness to receive HPV vaccine and there were no significant differences in vaccine acceptability between heterosexual men and MSM (Newman et al., 2013). Several psychological factors such as being aware of HPV, perceiving oneself as at risk of HPV infection and recognising the vaccine as an effective intervention against the virus were positively associated with HPV vaccine acceptability.

However, the analysis did not focus on knowledge and beliefs about HPV in the context of potential targeted HPV vaccination for MSM in the UK. Also, the majority of data came from North American men over the age of 26 years. In order to maximise the effectiveness of targeted HPV vaccination for MSM, it is important to investigate behavioural and psychological factors associated with the willingness to receive the HPV vaccine amongst MSM in the UK as this population might represent specific needs.

1.8. Men who have sex with men in the United Kingdom

In the UK, MSM experience stigma and discrimination. Before 1967, male same-sex sexual contacts (or homosexual acts) were criminalised and punishable by imprisonment. A large proportion of the public regarded these behaviours as a form of illness that required medical treatment (Ellis, 2007). Throughout the post-war period, sexual minority civil rights movements were set up to combat discrimination and social inequality. Increasing numbers of individuals were declaring their sexual orientation ('coming out') through various manifestations of gay identity, including the 'Gay Pride' demonstrations and events. At the beginning of the 1980's, the first cases of Acquired Immune Deficiency Syndrome (AIDS) were diagnosed as a result of infection with Human Immunodeficiency Virus (HIV). Throughout the 1980's and the 1990's, in the UK media and the popular imagination, HIV and AIDS were largely associated with the gay male identity, which further stigmatised and marginalised MSM populations. Hence, one of the first names of AIDS was Gay-related immune deficiency (GRID). Thus, since the beginning of the epidemic, MSM have been most affected by HIV and AIDS. In 1996, Highly Active Antiretroviral Therapy (HAART) was found to prevent AIDS onset and substantially reduce HIV-related morbidity and mortality. However, HIV-associated stigma and discrimination remain a significant issue for MSM communities. The social and political transformation has brought more recent significant changes resulting in several Equality Acts (e.g. the Equality Act 2006, the Equality Act (Sexual orientation) Regulations, The Equality Act 2010), and the Marriage (Same Sex Couples) Act (2013), which provide sexual minorities with equality and legal protection. The social and political context of MSM is likely to affect the implementation of vaccination programmes because the fear of discrimination or stigma amongst young MSM could reduce the willingness and/or ability of individuals to disclose same-sex experiences. Negative social attitudes towards MSM presented in the media, religious bodies or any institutions influencing public opinion have an impact on the disclosure of same-sex experiences amongst MSM. Therefore, it is challenging to examine the proportion of MSM

that do not declare their sexual orientation. As such, MSM are considered a heterogeneous and ‘hard-to-reach’ population.

There have been several attempts to estimate the size and characteristics of the MSM community in the UK. A number of population-based surveys such as the National Survey of Sexual Attitudes and Lifestyle (McManus et al., 2001), the Integrated Household Survey (Hayes et al., 2012), GP Patient Survey (Elliott et al., 2015) and the Health Survey for England (Aspinall et al., 2009) have suggested that between 1.1% and 2.4% of the population are self-declared MSM. The estimates from the Office for National Statistics (Office for National Statistics, 2014), which were based on sexual identity (i.e. ‘Heterosexual or Straight’, ‘Gay or Lesbian’, ‘Bisexual’ and ‘Other’) have demonstrated that 0.9% of men identified as gay and 0.5% as bisexual. While 0.5% of men declared ‘other’ sexual identity and 3.2% either were unsure or refused to respond, it is uncertain whether any of these men have ever had any sexual contact with another man. The Gay Men Sex Survey (Weatherburn et al., 2013), which is one of the largest studies of MSM in England, showed that 83% of the sample identified as gay, 11% as bisexual and 4% as neither gay nor bisexual. However, studies have shown that MSM are reluctant to disclosure their sexual orientation, indicating that up to 40% have no intention of revealing their sexual orientation to healthcare professionals (HCPs) (Keogh et al., 2004; Metcalfe et al., 2015). Therefore, the lack of robust and reliable data on the exact size of MSM population has implications for the implementation of targeted interventions that rely on overall uptake or coverage. The non-disclosure is likely to be a significant barrier to the implementation of targeted health interventions and services.

There are significant health inequalities due to sexual orientation. MSM are more likely to experience discrimination, physical and sexual abuse, as well as suffer from depression, anxiety and suicidal ideation compared to their heterosexual peers (Public Health England, 2015). They are more likely to report isolation, cyber-bullying and over-sexualised representations of same-sex relationships. There is a higher rate of smoking, drug abuse and excessive alcohol consumption in this population, which contribute to a greater likelihood of ill-health (Bourne et al., 2016). The rates of sexually transmitted infections (STIs), including HIV, are significantly higher in MSM than heterosexual men, with a quarter of MSM aged 16-24 years being diagnosed with at least one of the following infections: gonorrhoea, chlamydia, syphilis, herpes simplex virus or HPV (Public Health England,

2014). Therefore, the national public health strategy in the UK (Public Health England, 2015) aims to reduce these health inequalities through the introduction of targeted interventions for MSM delivered through dedicated sexual health clinics and specialised general practices. These services and programmes are available nationally and free at the point of access in the National Health Service (NHS).

1.9. Rationale

Immunisation programmes have been regarded as one of the greatest accomplishments of public health, contributing to the reduction in mortality and morbidity of numerous communicable diseases. Human behaviour plays a significant role in the transmission of infections and an understanding of factors that influence vaccination uptake is essential to improving disease control. Individual choices, attitudes, beliefs and behaviours may determine the success of vaccination programmes. Poor uptake, suboptimal coverage or partial commitment to vaccination results in the inability to contain preventable infections and avoid virus-specific diseases. Deficient vaccine uptake has been associated with outbreaks of measles (Hanratty et al., 2000), hepatitis A (Cotter et al., 2003), influenza (Munoz et al., 1999), varicella (Galil et al., 2002) and poliomyelitis (Fine & Clarkson, 1982). These studies all concluded that the outbreaks could have been prevented if sufficient vaccination coverage had been achieved. Therefore, it is crucial to understand the aspects of vaccination behaviours and their determinants on both individual and population levels to design effective vaccination programmes capable of achieving optimal uptake. Reliable theoretical frameworks could better facilitate the understanding of when, why and how vaccination does or does not occur, and outline possible mechanisms of action as well as factors that both moderate and mediate vaccination behaviour.

Feasibility studies provide evidence on potential vaccination uptake when estimating prospective effectiveness. Although there are no guidelines for the design and evaluation of feasibility studies, the findings of such studies are used to help determine whether a vaccination programme should be recommended (Bowen et al., 2009). They may inform the development of HPV vaccination programmes to address any potential barriers and suggest changes that could increase vaccination coverage. Acceptability studies have enabled researchers to understand the proportion of the population that have declined HPV vaccination within various vaccination contexts. Despite 98% efficacy in preventing HPV

infections, if sufficient uptake is not achieved, the HPV vaccination programme would only be considered partially effective.

There is an urgent need to assess acceptability, demand, implementation options and practicalities of a targeted HPV vaccination programme in MSM to estimate its potential value. In public health research, acceptability could be understood as an extent a targeted vaccination programme is suitable, satisfying or attractive to both programme deliverers and recipients, notably healthcare professionals and MSM. Acceptability may be expressed as satisfaction, intention to vaccinate, perceived appropriateness of HPV vaccination within the organisational and social culture, expressed interest or perceived demand. An assessment of the factors affecting the implementation of a targeted HPV vaccination, considering the amount and type of resources needed for vaccination to be delivered is also required. In addition, specific aspects of practicality such as positive or negative effects on targeted population and the ability of potential vaccination recipients to undergo the full vaccination course need to be considered when judging feasibility. In the absence of gender-neutral HPV vaccination, MSM-targeted HPV vaccination could provide valuable preventative opportunities against genital warts and HPV-related cancers. However, the success of this risk-based vaccination strategy will solely be dependent on achieving optimal uptake. The research in this thesis aims to inform the estimate of MSM who might not accept the HPV vaccine, in order to inform policy-makers about the potential barriers to the implementation of an MSM-targeted HPV vaccination programme in the UK.

1.10. Research question and aims

The following research question is posed: ***“Is a targeted HPV vaccination programme in men who have sex with men feasible and acceptable in the United Kingdom?”***. This thesis has four specific aims:

Aim 1: To assess from the existing literature the factors associated with vaccination behaviours in the context of hepatitis and HPV vaccinations.

Aim 2: To establish beliefs about HPV and attitudes towards HPV vaccination amongst MSM in the UK.

Aim 3: To examine behavioural and psychological factors associated with HPV vaccine acceptability amongst MSM in the UK.

Aim 4: To examine the level of support for a targeted HPV vaccination programme amongst healthcare professionals in the UK.

Chapter II – An overview of theoretical constructs associated with vaccination behaviours

2.1. Terminology

A variety of terms and expressions have been used to describe an individual's uptake immunisation. Although these terms have often been used interchangeably, there are significant differences between their paradigms. For example, '*vaccine compliance*' is understood as the extent to which patient's behaviour matches prescriber's advice and '*vaccine adherence*' is defined as the degree to which patient's behaviour matches an agreed plan of vaccination schedule (Hayness and Sackett, 1979; Lehmann and Benson, 2009). While '*compliance*' reflects specific '*passiveness*' about receiving a vaccine, '*adherence*' refers to the agreement when one is willing to complete the prescribed course of vaccination. Despite these subtle differences, many researchers do not define which vaccination behaviour they aim to measure, so '*vaccination adherence*' and '*vaccination uptake*' are commonly used to describe the behaviour or act of receiving the vaccine. Additionally, '*vaccine completion*' indicates the accession to the number of agreed vaccination doses in a prescribed timeframe. The degree to which people adhere to vaccinations is likely to vary between patient groups and within the same patient over time and across different vaccination types (Horne, Weinman, Barber, Elliot and Morgan; 2005). However, some individuals do not undergo vaccination as recommended by health authorities. The terms such as '*vaccination non-compliance*', '*suboptimal immunisation*', '*under-vaccination*', '*delayed vaccination*' or '*not being up-to-date with immunisation*' are often used to describe unvaccinated populations (Willis and Hill, 2013).

2.1.1. Vaccine acceptability

In behavioural sciences, '*vaccine acceptability*' (or '*acceptance*') is used to describe the degree to which a patient is willing to undergo the prescribed course of vaccination. In general, the concept of acceptability has been directed at understanding the demand that leads to vaccination adherence. It has been divided into '*active demand*' and '*passive acceptability*' (Streefland, Chowdhury and Ramon-Jimenez, 1999). While the active demand represents intentional seeking of vaccination programmes by an informed public that perceives benefits and need of a particular vaccination, passive acceptability entails

compliance by a public that follows recommendations and social pressure of healthcare professionals and community leaders.

At present, there is no single construct of vaccine acceptability. A systematic review of measurements used to ascertain HPV vaccine acceptability (Allen et al., 2010) showed that the construct has been expressed in various ways. For example, as an agreement (e.g. “Would you agree to vaccination...”), acceptance (e.g. “Would you accept the vaccine...”), willingness (e.g. “Would you be willing to receive the vaccine...”), intention (e.g. “I intend to be vaccinated...”) and also uptake (e.g. “Have you received an HPV vaccine?”). The lack of standardised metrics and the operationalisation of the construct are likely to impede the development of coherent theories of vaccination behaviour, because these various expressions are not comparable and could offer limited ability to predict vaccination uptake. While the willingness to receive vaccination may only signal positive attitudes towards a specific vaccine, intentions to vaccinate are likely to be an indicator of a psychological preparedness for the uptake.

The concept of vaccine acceptability has been poorly conceptualised and does not distinguish between individual and collective demand for vaccination. It does not differentiate between various dimensions such as the personal desire to be vaccinated, active vaccine-seeking behaviours, social demand, individual refusal or group resistance. The acceptability construct may be useful for identifying individuals who express some willingness to be vaccinated, but may be impractical when recognising individuals requiring encouragement and support to uptake vaccinations. Therefore, in the context of targeted HPV vaccination for MSM, the construct of vaccine acceptability refers to the individual degree of motivation of one wanting to receive HPV vaccine. It is likely to represent personal enthusiasm, desire and interest while any vaccination programme is under consideration. It is important to investigate to what extent observed vaccine acceptability translates into actual vaccine adherence and uptake.

2.1.2. Vaccine hesitancy

‘*Vaccine hesitancy*’ refers to delay, deferral or refusal of vaccination and can be observed as a continuum between vaccination receipt and rejection. Hesitancy is closely related to decision-making processes and aims to identify individuals that differ in their attitudes towards immunisations leading to the lack of prompt vaccination adherence when offered

with opportunities to vaccinate. The concept suggests that the absence of public demand and individual vaccine desirability often corresponds with vaccination non-adherence. Both public demand and desirability are associated with various attitudes, beliefs and views on vaccinations. For example, Keane et al. (2005) reported various hesitancy traits amongst parents considering vaccinating their child. While ‘vaccine believers’ perceived vaccinations as highly beneficial for their children, ‘cautious’ parents had doubts about vaccination effectiveness or safety. ‘Relaxed’ parents were highly sceptical about vaccinations and ‘unconvinced’ parents reported distrust in vaccines and were not willing to follow any recommendations. The study showed a gradient of attitudes reflecting different levels of support for the vaccination of their children. Hesitancy is often conceptualised as a continuum rather than binary of acceptability and non-acceptability (Figure 2). For example, MacDonald and Dube (2015) argued that hesitant individuals might have positive views on immunisation programmes in general but be unsure of a particular vaccine being offered to them. The concept of vaccine hesitancy attempts to capture the characteristics of particular mindsets, motivations and decision-making processes receptive to shifts in acceptability and doubt about vaccinations. The concept of vaccine hesitancy, similarly to acceptability, lacks clear conceptualisation and reliable metrics. For example, there have been various expressions of vaccine hesitancy referring to knowledge gaps or reflections on benefits of specific vaccines and it is impossible to compare characteristics of hesitant individuals (Rees & Madhi, 2011).

The vaccination hesitancy concept is poorly operationalised and there is no reliable measurement of hesitancy. The vaccine hesitancy tool proposed by Opel et al. (2011) reflected the four relevant domains of vaccination behaviour, beliefs about vaccine safety and efficacy, attitudes about vaccine mandates and trust. The measurement was also combined with the Health Belief Model (Rosenstock, Strecher, & Becker, 1988), a theoretical framework originally developed to incorporate psychological factors associated with various health behaviours such as screening for tuberculosis. Opel’s (2011) framework showed that vaccine hesitancy constructs were capable of predicting parental decision to either delay or refuse their child vaccination. Nevertheless, the concept of vaccine hesitancy has not yet been studied in MSM and it is yet unknown whether this construct could predict vaccination non-adherence in this population.

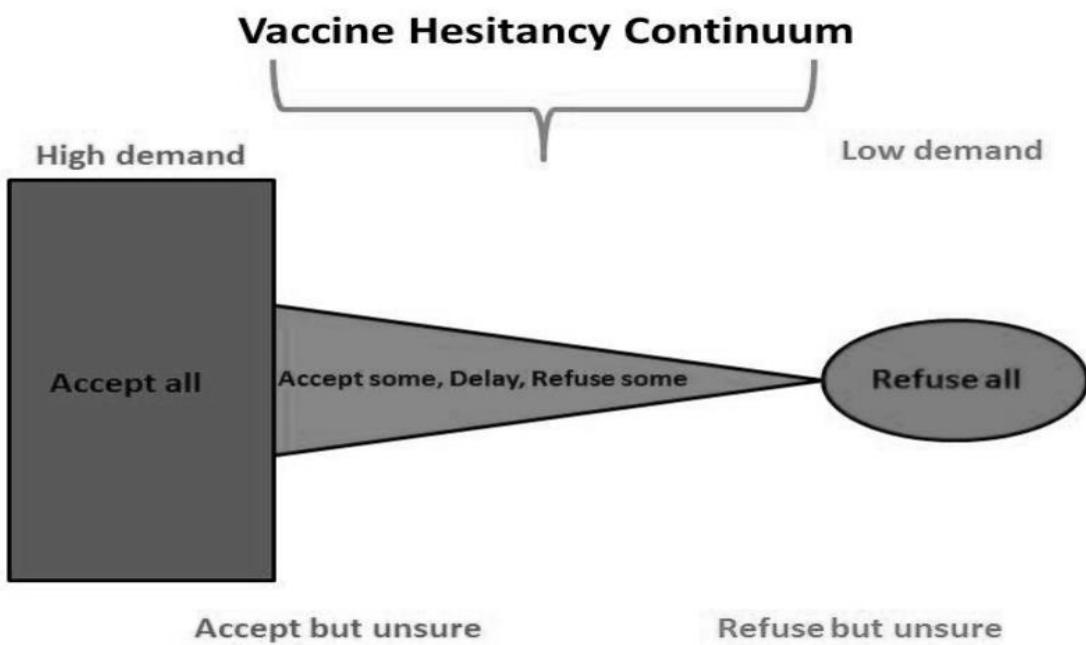


Figure 2. Vaccine hesitancy continuum (modified from MacDonald 2015)

Both vaccine acceptability and hesitancy could reflect individual lack of preparedness to receive vaccination. While the acceptability has been operationalised as a binary accept or refuse construct, the hesitancy aims to identify individuals with predispositions to decline vaccination. The synthesis of these two constructs by extending the acceptability to reflect behavioural barriers and vaccination context for MSM population could offer more sensitive measurement capable of predicting vaccination uptake.

2.2. Theoretical models

Theories of behaviour change and social cognition models are a group of conceptual frameworks that focus on understanding the distribution and frequency of psychological, social and/or cultural determinants of specific behaviours that influence health, fitness and well-being. The models, commonly used in sociobehavioural epidemiology, preventive medicine and public health explain, predict and alter relevant health behaviours (Michie et al. 2008). Over 80 theoretical frameworks of behaviour change have been proposed, differing in complexity, the ease of application and explanatory power (Michie et al. 2014). While some models focus predominantly on individual decision-making processes inducing beliefs, attitudes and various perceptions, others recognise more individual and contextual factors such as personality, habits or environmental/cultural influences. The diversity of theoretical frameworks highlights the difficulty in characterising health behaviours and their underlying mechanisms.

Currently, there is no framework, which describes vaccination uptake amongst MSM. There have been various theories used in sexual health interventions for MSM such as the AIDS Risk Reduction Model (Catania et al., 1990), which aims to outline factors associated with HIV-protective behaviours. The model specifies that the adaptation of protective behaviours is categorised in three stages: labelling, commitment and enactment. Labelling is a cognitive process associated with the self-identification of risky behaviours. Commitment is a readiness to change behaviours from high-risk to low-risk. Enactment is the implementation of various behavioural changes, which facilitate the transition to low-risk behaviours. Various psychosocial factors have been associated with each stage of the model, including knowledge about HIV and AIDS, the influence of external motivators, social norms and various help-seeking or information-seeking behaviours (Catania et al. 1994). There is also moderate evidence demonstrating that the components of the model can predict consistent condom use and HIV testing (Fisher and Fisher, 2000). However, the model was developed specifically in the context of HIV prevention and is unlikely to be useful in vaccination studies, which focus mainly on ‘one-off’ vaccination uptake rather than a series of committed behaviours. A valid and sensitive vaccination model needs to explain various predictors of HPV vaccine acceptability, uptake and series completion. In the absence of a vaccination model specifically for MSM, other framework may facilitate the understanding of the variety of factors that need to be considered in vaccination studies.

Several models can illustrate the complexity of health behaviours and their potential use in studies on HPV vaccine acceptability in MSM. The two most commonly cited theoretical frameworks are the Health Belief Model (Rosenstock et al., 1988; Figure 3) and the Theory of Planned Behaviour (Ajzen, 1991; Figure 4). Although these two models were not primarily developed to describe vaccination behaviours, they were previously used in studies on HPV vaccine acceptability in MSM (Reiter et al. 2009; Wheldon et al. 2011; Gutierrez et al. 2013). Hence, it is necessary to understand the constructs to distinguish what factors are associated with HPV vaccine acceptability and uptake in MSM. In addition, two models that were developed to predict vaccination adherence can illustrate various determinants of vaccination uptake. The Model of Vaccine Hesitancy (Dubé et al., 2013; Figure 5) specifies the impact of environmental influences on individual decision-making processes in regards to vaccination uptake. Although, the model offers an insight into the range of various factors that may be related to any vaccination behaviour, it is not specific to vaccination for

Figure 3. Health Belief Model (Rosenstock et al., 1988)

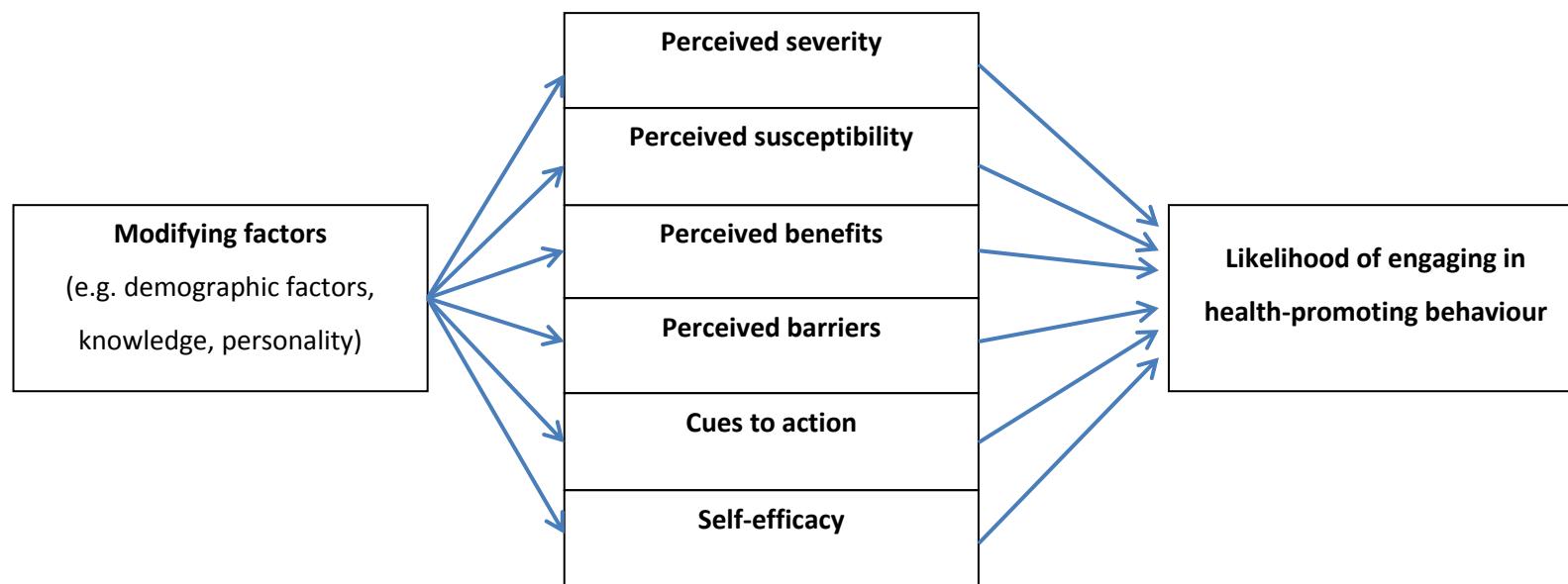


Figure 4. Theory of Planned Behaviour (Ajzen, 1991)

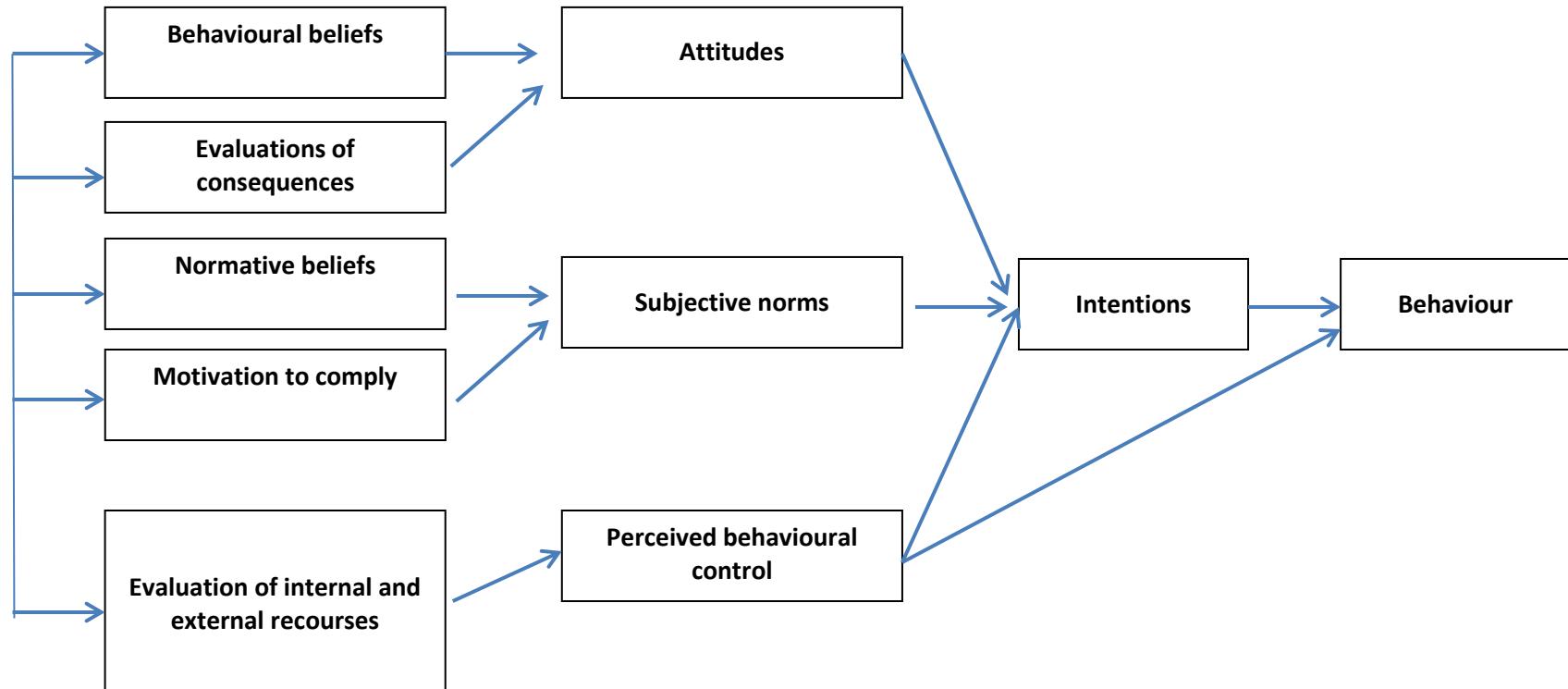


Figure 5. Model of Vaccine Hesitancy (modified from Dube et al., 2013)

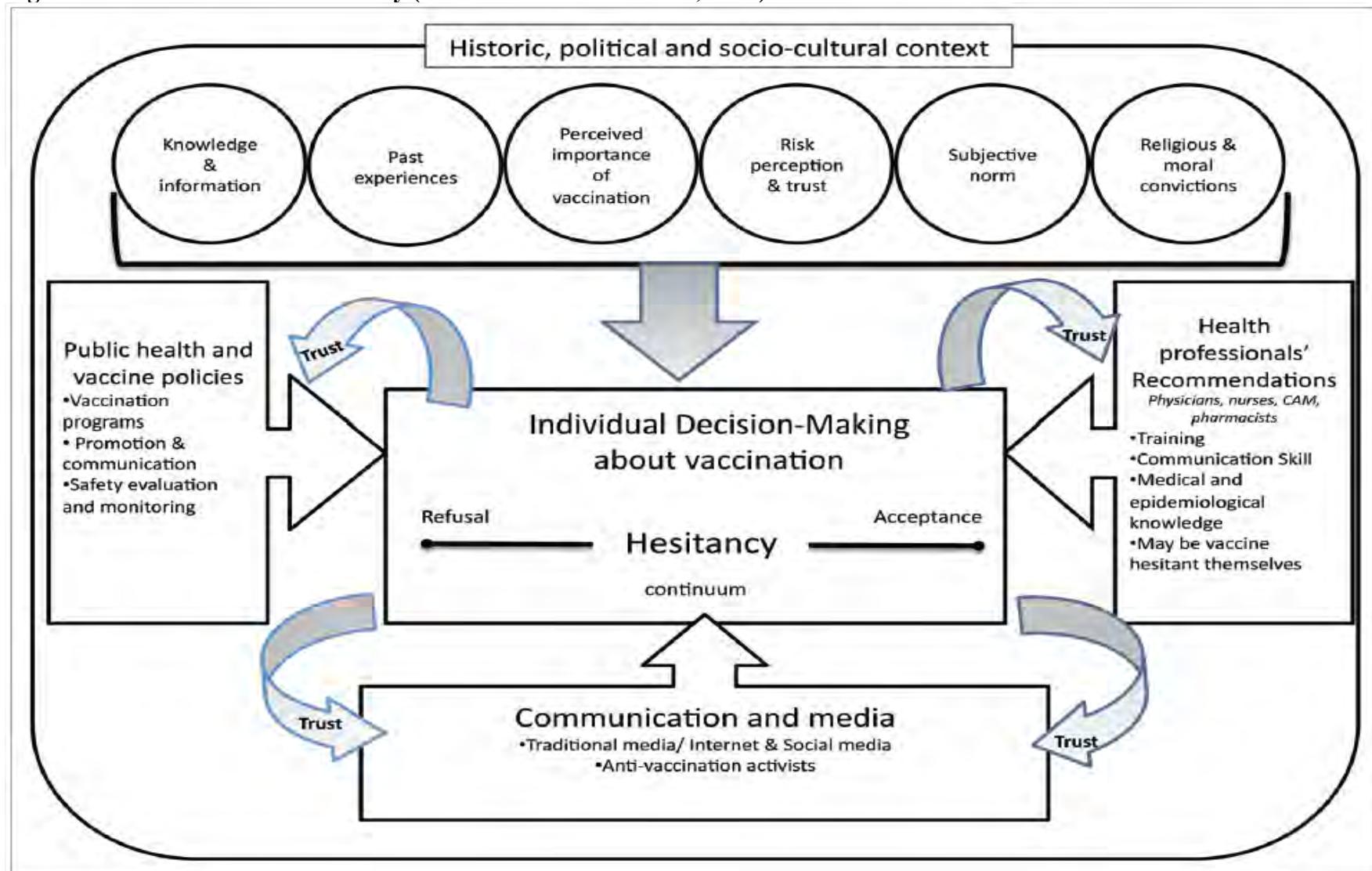
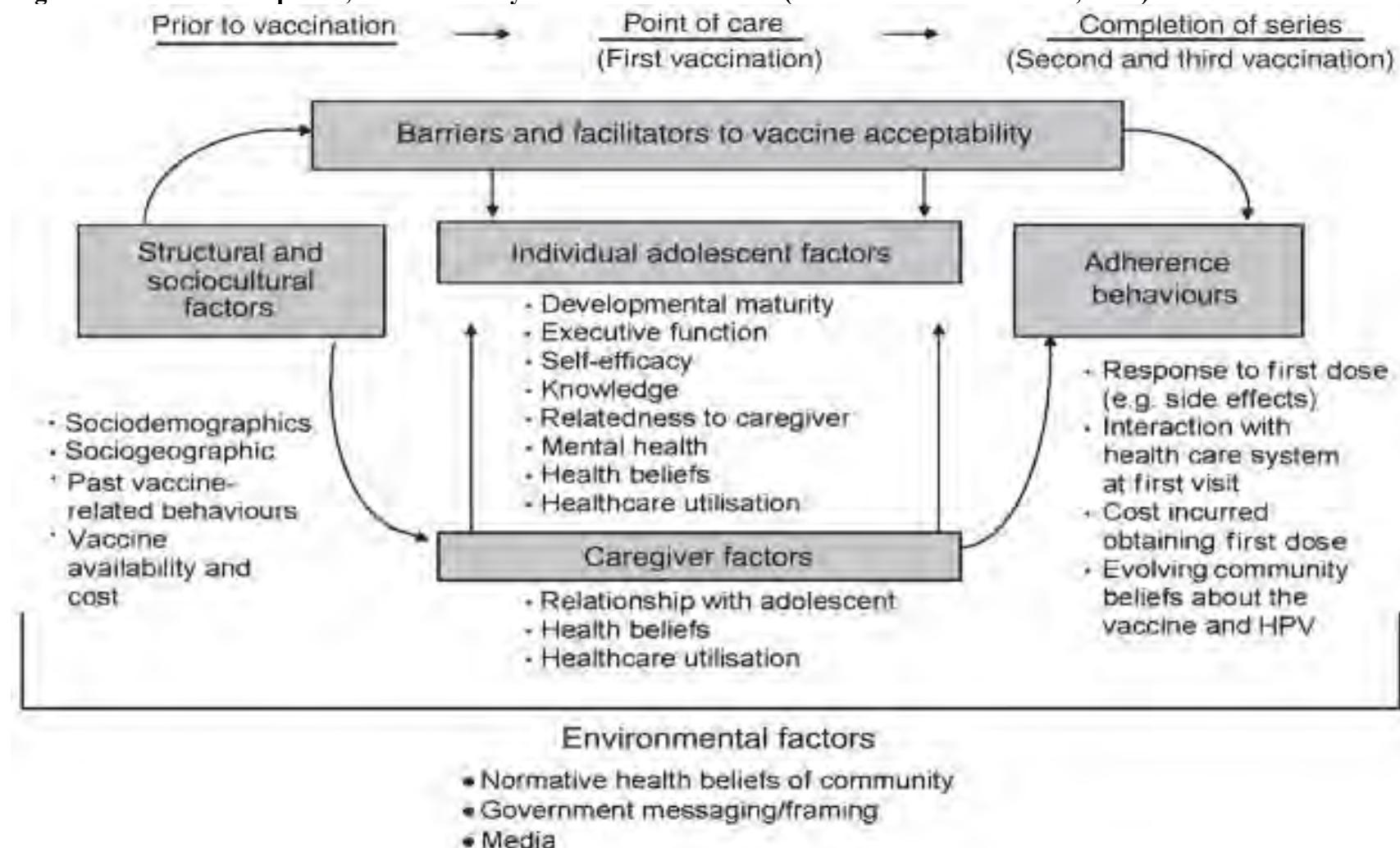


Figure 6. Vaccine Perceptions, Accountability and Adherence Model (modified from Katz et al., 2014)



MSM. The Vaccine Perceptions, Accountability and Adherence Model (Katz et al., 2010; Figure 6) outlines key theoretical constructs related to the uptake of adolescent HPV vaccination. Although the model might be sensitive to HPV vaccination in particular, it was not developed to serve any programme for MSM.

2.2.1. Health Belief Model

The extended version of the Health Belief Model (HBM, Figure 3) consists of seven constructs: perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, self-efficacy and modifying variables (Rosenstock et al., 1988). The theory proposes that individuals who perceive themselves at risk of a disease and perceive the disease to be serious are more likely to adopt health behaviours. Also, individuals evaluate the potential pros and cons of performing health behaviours anticipating possible advantages such as reducing the risk of the disease or improving health. Specific barriers such as an effort or investment needed to perform health behaviours are also acknowledged. The model specifies that personal perception of the competence to successfully perform any health behaviours is likely to increase their likelihood to occur. However, modifying variables such as age, sex, knowledge, personality or sexuality are likely to influence perceived susceptibility, severity, benefits and barriers and, therefore, affect the probability of one adopting health behaviours.

The HBM's constructs are capable of predicting vaccination. A systematic review of 28 studies on HPV vaccine acceptability has demonstrated that perceived risk, perceived effectiveness of the vaccines, conceptualised as perceived benefit and a cue to action in the form of doctor's recommendation, are amongst the most important predictors of HPV vaccination (Brewer et al., 2007). Vaccination price and a belief that HPV vaccine would promote sexual behaviours were associated with vaccine refusal and were understood to be barriers to vaccination. A meta-analysis of 44 studies that used the HBM has showed that perceived susceptibility and perceived severity significantly predict vaccination behaviours (Brewer et al., 2007).

However, empirical findings on the validity of the model have been inconsistent. The sensitivity of the model in predicting behaviours is dependent of the operationalisation of its constructs. Because the HBM's components are broad in their definition, there is a chance of a theoretical overlap between constructs (Mikhail et al., 1981; Maiman et al., 1977). For

example, while poor knowledge could be conceptualised as a modifying variable affecting perceived risk or perceived benefits of vaccination, it could also be understood as a single barrier to vaccination. Operationalisation of the model is not well defined. The examination of cues to action is challenging because individuals might not be aware which cues prompted them towards health behaviours. The HBM does not recognise the impact of emotions on individual behaviours and postulates that all health-related actions are based purely on rational evaluations of risks as well as pros and cons of the actions it does consider. The impact of fear and automated behavioural factors, which are not part of rational decision making such as habits, are not considered. Therefore, it is important to recognise that the HBM's components are useful when studying vaccination, but the current version of the model might have limited sensitivity to capture the fluctuations in complex vaccination behaviours such as hesitancy, reluctance or degree of vaccine acceptability.

2.2.2. Theory of Planned Behaviour

The Theory of Planned Behaviour (TPB, Figure 4) is a motivational model concentrated on the prediction of intention as a proximal precursor of behaviour. It was developed on the basis of the Theory of Reasoned Action (TRA; Ajzen and Fishbein, 1980) which attempted to estimate the relationship between attitudes and behaviour. Both models imply a specific cognitive process of reasoning and planning that contribute to the formation of behavioural intentions. While behaviour is an observable enactment, intentions indicate readiness to respond. Attitudes, subjective norms and perceived behavioural control determine intentions. Subjective norms consist of normative beliefs and motivation to comply. Normative beliefs indicate personal perception of an encouragement or even pressure from relevant others (e.g. friends or family members) that one should or should not perform behaviour (e.g. ‘My boyfriend wants me to get vaccinated’). ‘Motivation to comply’ specifies the degree an individual conform to the perceived social or cultural norm. Perceived behavioural control is a function of beliefs about internal and external resources necessary for behaviour to occur, for example, necessary skills or opportunities.

The TPB constructs have also predicted vaccination behaviours. Across several studies on HPV vaccination, mothers who had positive attitudes towards the HPV vaccine and that reported stronger intentions were more likely to vaccinate their daughters (Juraskova et al., 2012; Ogilvie et al., 2007). Also, physician’s attitudes and intentions to recommend HPV vaccination to adolescent patients have been associated with vaccination coverage (Riedesel

et al., 2005). However, the only analysis that compared the hepatitis vaccine uptake amongst MSM, using both the HBM and the TPB, concluded that none of the TPB variables were significantly related to vaccination. A small, however, non-significant effect of attitudes was found, suggesting that men who had more positive views on vaccination could be more likely to obtain it (Vet et al., 2015). Interestingly, only the perceived susceptibility, perceived severity and perceived barriers from the HBM (i.e. side effects, limited period of protection and lifestyle becomes known) were significantly related to vaccination. Therefore, there is limited evidence suggesting that the TPB could be utilised in vaccination studies amongst MSM and more research is needed to draw adequate conclusions based on the satisfactory amount of evidence.

The TPB has several limitations. While other components, such as demographic determinants of behaviour, were added to the extended versions of the model, the theory does not consider constructs such as past behaviour, habit, identity, anticipated regret, moral norms or affect, notably fear, worry and concern (Conner and Armitage, 1998). As in the HBM, the omission of these constructs might reduce the ability of the model to predict or explain vaccination behaviours. Also, the theory does not include risk perceptions that are amongst the strongest determinants of health behaviours. Finally, the model, as its name indicates, was developed to explain planned, deliberate or intentional behaviours. This could be a major limitation because MSM are often given the opportunity to vaccinate on the spot, during sexual health consultations. Therefore, men might have little knowledge or attitudes towards vaccination. Instead of having certain attitudes, men might only construct them prior to receiving the vaccination.

2.2.3. Model of Vaccine Hesitancy

The Model of Vaccine Hesitancy (MVH, Figure 5) proposes that individual motivation for vaccination can be presented on a continuum between vaccine refusal and acceptance (Dube et al., 2013). The theory proposes that individual decision-making processes about vaccination are influenced by several factors. Receiving doctor's recommendation to uptake the vaccine, trusting public health policies on vaccinations and being exposed to media reports on vaccination predicts the extent of vaccine hesitancy. To specify further, health professional recommendations are influenced by their training about vaccinations, professional communication skills presented during consultations, medical and epidemiological knowledge about the disease and the vaccine, as well as personal hesitancy

towards the vaccine. The form and delivery of vaccination programmes, its promotion and communication of safety and benefits also influence individual decision-making processes. The exposure to vaccination campaigns through various health promotion campaigns and the impact of anti-vaccination activism or lobby are likely to affect personal motivation for vaccination. Also, the MVH postulates that knowledge and received information about the disease and vaccination, past experiences with vaccination services, perceived importance of vaccination, the perceived importance of vaccination in maintaining health, subjective norms, social pressures and social responsibility as well as religious and moral convictions, all influence decision-making about vaccination. These factors are also moderated by historic, political and sociocultural context that differs amongst various subcultures and geographical locations.

The model was developed based on the work of the Strategic Advisory Group of Experts in Immunisation by the World Health Organisation, a systematic review of studies on vaccine hesitancy (Larson et al., 2014) and expert interviews (Dube et al., 2014). The theory has been developed specifically for vaccination behaviours and unlike the HBM and the TPB, it outlines the importance of specific constructs such as health professionals' recommendations or anti-vaccination activism. Currently, there is no standardised measurement of the MVH constructs and the operationalisation of contextual components such as historical or sociocultural background might be too broad and difficult to assess.

Nevertheless, a meta-review of 15 literature reviews and meta-analysis on the effectiveness of interventions to reduce vaccine hesitancy or increase vaccine acceptance has concluded that there is no evidence to promote or recommend any particular intervention to address vaccine hesitancy (Dube & MacDonald, 2015). Because of the heterogeneity of hesitant individuals, the diversity of targeted populations and dynamic vaccination contexts, the development of "one size fits all" theories is challenging. Therefore, theoretical frameworks and interventions ought to be tailored to specific populations and particular vaccination demands within defined social and geopolitical contexts. Ideally, a model of HPV vaccination aimed at MSM living in the UK would be constructed to understand factors associated with vaccine hesitancy and to increase the impact of any potential intervention.

2.2.4. The Vaccine Perceptions, Accountability and Adherence Model

The Vaccine Perceptions, Accountability and Adherence Model (VPAAM, Figure 6) is a conceptual framework developed to improve understanding of HPV vaccine adherence behaviours and to guide socio-behavioural research on vaccinations for adolescents (Katz, et al. 2010). The theory, which is a vaccination-specific extension of the HBM, proposes that vaccination adherence is determined by multiple factors before vaccination, at the time of first vaccination and during the completion period. The authors postulate that vaccine acceptability is influenced by structural and sociodemographic factors such as sociogeographics, experiences of past vaccinations and vaccine availability or cost. The model was specifically developed to increase coverage of adolescent female HPV vaccination, so it identifies specific individual factors such as developmental maturity, executive functioning, self-efficacy, knowledge, mental health, health beliefs, healthcare utilisation and relatedness to caregiver. Caregiver-specific factors such as the relationship with an adolescent, health beliefs and healthcare utilisation are also understood to affect vaccine acceptability. Adherence behaviours following the first vaccine dose might determine vaccination completion (e.g. side-effects after the first dose, interaction with healthcare system at first vaccination visit, cost incurred obtaining the first dose or evolving community beliefs about the vaccine). Finally, environmental factors such as normative health beliefs of the community, government messaging/framing and media coverage are likely to affect vaccine acceptability and uptake.

Although the model defines constructs closely associated with HPV vaccination adherence, its usefulness for HPV vaccination for MSM is limited. To date, only one study has adopted the VPAAM and recommended the implementation of additional constructs, such as the context of school-based HPV immunisation programmes that remove healthcare-related barriers and increase acceptability by creating vaccination norms, amongst all adolescents attending school (Whelan et al., 2014). This study suggested that the theory would benefit from the acknowledgement of the relationship between teachers and parents, HPV Health Education to teachers and reminder calls for vaccination return. Although the model highlights constructs relevant to HPV vaccination such as adherence behaviours following the first vaccine dose, there is a need for examination and possible extension of constructs relevant to MSM such as sexual identity, duration of homosexual activity and openness about sexual orientation with a healthcare professional. Therefore, the extension of the

model to accommodate constructs relevant to MSM might increase its predictive power and guide the development of targeted HPV vaccination programmes for MSM.

2.3. Conclusion

This overview describes theoretical frameworks and outlines constructs associated with vaccination behaviours. It attempts to systematise the terminology used in this doctoral thesis and define the key concept of vaccine acceptability. It considers the differences in operationalising motivation for vaccinations, notably vaccine acceptability and hesitancy. While acceptability has been considered in binary terms, hesitancy reflects a range of attitudes and perspectives that can be receptive to change. However, both concepts have been poorly conceptualised and there is limited evidence on the relationship between acceptability and hesitancy as well as how they relate to actual vaccine uptake. For the purpose of this thesis, vaccine acceptability is therefore considered as the motivation, drive and desire to receive vaccinations.

In the absence of a coherent, transparent and sensitive model that could predict vaccination behaviours in the MSM population in particular, this chapter outlines four theoretical frameworks, which could be potentially utilised when studying HPV vaccine acceptability. Although two of these models, the Health Belief Model and the Theory of Planned Behaviour, were previously used in studies on HPV vaccine acceptability in MSM, their constructs were not specifically developed to represent vaccination behaviours. Hence, two additional frameworks, the Model of Vaccine Hesitancy and the Vaccine Perceptions, Accountability and Adherence Model, were reviewed because of their specific focus on vaccination behaviours, decision-making and associated factors. However, these two vaccination models have been poorly conceptualised and there is a substantial overlap between constructs, such as risk perceptions or doctor's recommendation. These models were not specifically developed for MSM vaccination, and there is a chance that important factors, solely related to sexual identity or sexual behaviours, might not be recognised. As such, developing HPV vaccine acceptability studies based on pre-existing models could lead to substantial bias, if key variables are not identified. Therefore, a systematic review of studies on vaccination behaviours (i.e. attitudes, acceptability, intentions and uptake) amongst MSM will enable the exploration of theoretical constructs and correlates associated with vaccine acceptability and uptake as well as the identification of knowledge gaps while studying HPV vaccine acceptability in MSM.

Chapter III – A scoping review of studies on theoretical constructs associated with hepatitis vaccination amongst men who have sex with men

3.1. Background

At present, no theoretical framework adequately describes various the key associated with vaccination behaviours amongst MSM. The overview of social cognition models in Chapter II illustrated that individual decision-making processes, interaction with HCPs and previous opportunities to access relevant health services are likely to be associated with vaccination acceptability and uptake. While these models are conceptually diverse and differ in complexity, they do provide knowledge that may guide the exploration of the determinant of vaccination behaviours amongst MSM. Socio-cognitive models offer mainly individualistic perspectives on health behaviour and with a particular focus on cognitive aspects such as attitudes, beliefs and perceptions. The models are reductive in nature and unclear on the conceptualisation of dynamic psychological and social processes that are embedded in vaccination behaviours. As an example, social structures, in which vaccinations may operate, including the organisation of a healthcare service, delivery of immunisation programmes or access to relevant healthcare, were difficult to discern. These models may also underestimate the value of environmental contexts, such as the impact of doctor's recommendations, which can influence vaccine acceptability and uptake. Kahan et al. (2010) argued that views on HPV vaccination could be affected by 'cultural cognition', which is a collective belief about the potential harms and benefits of vaccination. Interestingly, most theoretical frameworks are not unique to particular health behaviours and populations at risk. They are limited to operating within individual cognitions and fail to conceptualise specific social contexts and characteristics of these populations. It is likely that the political, economic and social aspects, although difficult to conceptualise and measure, would also influence HPV vaccine acceptability amongst MSM. Hence, there is a need to broaden the perspective on vaccination in MSM to understand which factors may be associated with vaccination acceptability and uptake.

Studies on hepatitis vaccination in MSM can perhaps be used to inform factors associated with vaccination behaviours in this population. The justification for this approach includes the following facts: 1) there have been several outbreaks of hepatitis A and B amongst MSM,

who reported multiple sexual partners (Bell et al., 2001; Reintjes et al., 1999; Cotter et al., 2003, Urbanus et al., 2009); 2) there is strong evidence that hepatitis can be transmitted through sexual intercourse, mainly due to the faecal-oral route associated with sexual practices (MacKellar et al., 2001); and 3) for over 20 years, there have been efficient and safe vaccines against two types of hepatitis A and B (Szuness et al., 1980; Andre et al., 1992). Furthermore, despite a call for universal hepatitis vaccination of children from the World Health Organisation several countries, including the UK and the Netherlands, initiated targeted programmes for high-risk groups such as adult MSM (Lavanchy, 2005; Van Houdt et al., 2007). These targeted programmes were preferred because of their cost-effectiveness profiles (Williams et al., 1996; Edmunds, 1998).

From 2001, MSM in the UK have been selected to receive the hepatitis B vaccine due to the higher risk of transmission through sexual contact (Public Health England, 2014). Following several outbreaks of hepatitis A amongst MSM, several sexual health services have incorporated routine hepatitis A vaccination for their MSM service users (Public Health England, 2009). Both vaccines have been offered at SHCs to all MSM at their first attendance. The HepB3 survey, which measured the uptake of the hepatitis B vaccine in the UK in 2006, showed 85% uptake and 46% completion rate for eligible MSM (Brown et al., 2006). Thus, although the study indicated that hepatitis vaccination was highly acceptable, a large proportion of men were unwilling or unable to complete the three-dose course.

In an attempt to move away from model-dependant examination of HPV vaccine acceptability, studies on hepatitis A and B vaccine acceptability and uptake may facilitate the knowledge of theoretical constructs and factors related to vaccination behaviours amongst MSM. They could enable the understanding of demographic, psychological, behavioural and social determinants of vaccination acceptability. That knowledge could be utilised when assessing barriers to vaccination or promoting health promotion campaigns aimed at increasing the vaccine coverage amongst MSM. Therefore, a review of studies on hepatitis A and B vaccination in MSM will attempt to map a theoretical framework of vaccination behaviours that could provide a base for the exploration of factors associated with HPV vaccine acceptability. The results of this review will not only attempt to explain the differences in vaccination behaviours amongst MSM but also enable a better understanding of similarities between the acceptability of hepatitis and HPV vaccinations.

3.1.1. The aim of the review:

The review has two aims:

Aim 1: To identify theoretical constructs used in studies on hepatitis vaccination in MSM

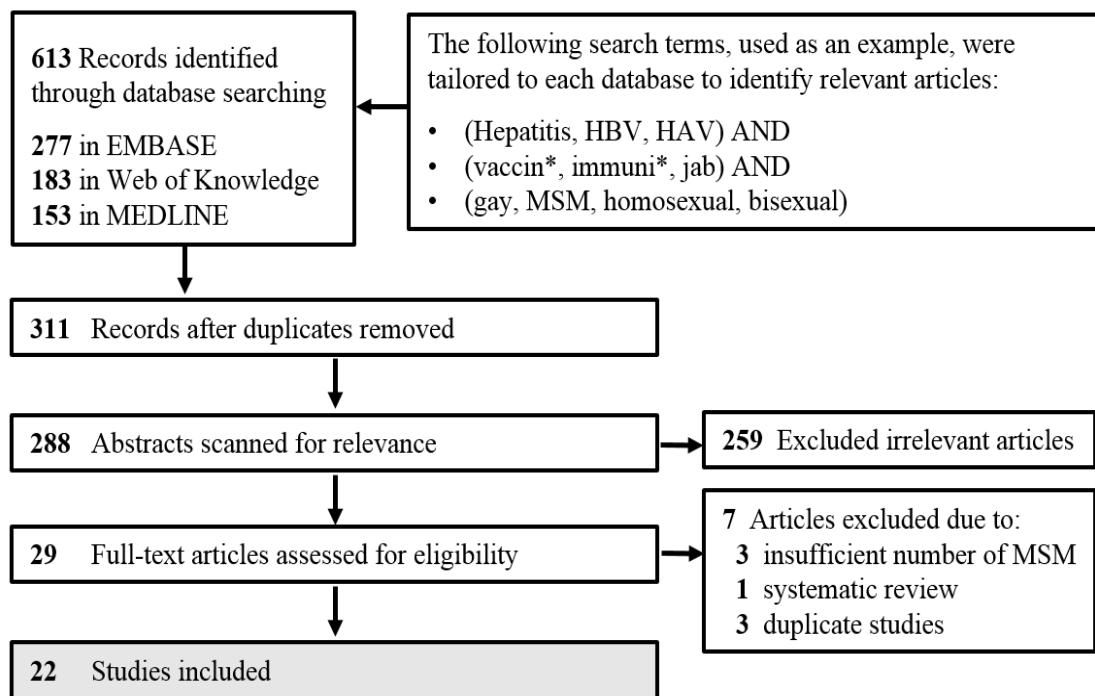
Aim 2: To determine factors associated with hepatitis vaccination acceptability and uptake amongst MSM

3.2. Methods

A scoping review is a type of literature review that aims to map relevant literature with a specific field. Unlike systematic reviews that focus on a well-defined research question, scoping reviews promote the identification of parameters for future systematic reviews and allow the recognition of gaps in the literature within the specific population, intervention or health outcome (Pham et al., 2014). Although quality assessment, detailed data extraction and synthesis are not core features of a scoping review, it still requires a thorough literature search, careful study selection, data charting and narrative data analysis. The advantage of a scoping review over an unstructured literature review is that it allows a broad research question to be addressed and it utilises a systematic search of the literature to ensure that all relevant concepts are captured and described. It utilises the same strategies to identify relevant papers as a systematic review format. However, it does not have clear endpoints and specific research questions. Similar to systematic reviews, scoping reviews may include unpublished articles, various methodologies and studies with dissimilar dependent variables. This method has been used when the topic has not been exclusively reviewed or is of a heterogeneous nature (Armstrong et al.; 2011).

In September 2014, three electronic bibliography databases (PubMed, the Web of Knowledge and Scopus) were searched to identify studies on correlates of hepatitis vaccination amongst MSM. The following Medical Subject Headings (MeSH) search terms were used [(Hepatitis OR HAV OR HBV) AND (vaccin* OR immuni* OR jab) AND (MSM OR homosexual* OR gay OR bisexual)]. All studies, written in the English language and reporting factors associated with hepatitis vaccination in MSM were included. These were both qualitative and quantitative studies with no restriction on geographical location, publication type and a year of publication. The references of reviewed articles were also

Figure 7. PRISMA chart of articles for inclusion in the scoping review of studies on hepatitis vaccination



hand-searched. Studies that described high-risk populations, such as sex workers whose sexual orientation was not defined, were excluded to maintain the focus on MSM population.

3.3. Results

3.3.1. Study characteristics

Two hundred and thirty-eight abstracts identified through database searching, were reviewed. Twenty-two studies published between 1990 and 2014 on hepatitis vaccinations amongst MSM were identified (one qualitative, sixteen cross-sectional, one scale validation and three intervention-based studies). Fourteen studies were conducted in various cities in the United States of America (USA), one in Canada and seven in the Netherlands. There were no peer-reviewed articles describing hepatitis vaccine acceptability and uptake conducted in the UK. Various settings were used to recruit participants, such as health centres, gay bars, clubs, saunas, gyms, gay Pride events, mobile sexual health clinics, cruising areas, university campus, online platforms for gay and bisexual men, gay religious services, HIV testing centres and outreach services, HIV prevention, support and counselling services, and various community social and educational programmes. In total 10,725 MSM participants took part, with an age range from 15 to 78 years. Table 2 outlines methodologies and main findings from the identified studies on hepatitis vaccination amongst MSM.

Table 2. List of studies included in the scoping review on hepatitis vaccination in MSM

Author	Study methodology	Main findings
Rhodes et al. (2002) ¹	<ul style="list-style-type: none"> • Focus groups with MSM in Birmingham, US (2001) • Thematic analysis • N = 62 • mean age = 25 	<ul style="list-style-type: none"> • Perceived severity: while half of the participants perceived hepatitis B as a non-severe condition, other half saw it as a serious condition • Perceived susceptibility: Men perceived themselves susceptible to hepatitis B infection, but felt it was unlikely to occur; the sense of susceptibility was reduced by the lack of knowledge about hepatitis B • Perceived benefits: hepatitis B vaccination promotes health, but also showed fatigue when describing their desire to be vaccinated • Perceived barriers: low levels of knowledge about hepatitis B, no information about hepatitis B vaccination process (location of vaccination sites and cost), limited access to healthcare, limited provider communication about stigmatised behaviours, distrust the government, 'AIDS fatigue' (overexposure to health promotion)
McCusker et al. (1990) ²	<ul style="list-style-type: none"> • Questionnaire at health centres, US (1985) • N = 150 • mean age = 30 	<ul style="list-style-type: none"> • Vaccinated men were more likely to: i) be older, ii) have higher educational attainment, iii) engage in same-sex behaviours for more than 5 years, iv) have health insurance, v) regularly utilise healthcare services, vi) be aware of their susceptibility to hepatitis B, vii) previously receive the vaccine recommendation from a healthcare workers, viii) have read informational brochures about the hepatitis vaccine, and ix) report having a family member who have been infected with hepatitis B in the past • Men that refused to be vaccinated were more likely to: i) perceive themselves at low risk of hepatitis B (reporting to be in a monogamous relationship or practising 'safe sex' only), ii) perceive the vaccine as expensive, and be concerned about vaccine-related side-effects and associated health problems
Dufour et al. (1999) ³	<ul style="list-style-type: none"> • Questionnaire at gay venues in Montreal, Canada (1994-1998) • N = 653 • mean age = 34 	<ul style="list-style-type: none"> • Men that refused to be vaccinated were more likely to: i) come from rural settings, ii) have a higher number of sexual partners, iii) inject drugs, and iv) avoid or not participate in public sex venues such as bathhouses • Men that did not complete vaccination were more likely to: i) be younger, ii) have lower educational attainment, iii) be unemployed, and iv) have lower income • Men that completed vaccination were more likely to: i) have a sexually transmitted infection in the past, ii) use alcohol before sexual encounter, iii) have sex with women in the last 5 years, iv) receive goods or services for sex, and v) have unprotected anal sex with a regular partner

Table 2. Continuation

Author	Study methodology	Main findings
MacKellar et al. (2001) ⁴	<ul style="list-style-type: none"> • Questionnaire at gay venues in seven US cities (1994-1998) • N = 3432 	<ul style="list-style-type: none"> • Vaccinated men were more likely to: i) be younger, ii) be in education, iii) be open about sexual orientation, iv) have a regular source of healthcare, and v) be regularly screened for sexually transmitted infections
Rhodes et al. (2000) ⁵	<ul style="list-style-type: none"> • Questionnaire at bars in the US • N = 111 	<ul style="list-style-type: none"> • Vaccinated men were more likely to: i) be younger, ii) use condoms, iii) know about hepatitis B, hepatitis C, iv) be aware of the hepatitis B vaccine, v) be exposed to information about hepatitis B infection and hepatitis B vaccine, vi) and receive hepatitis B vaccine recommendation from a physician
Rhodes et al. (2001) ⁶	<ul style="list-style-type: none"> • Online survey in the US • N = 336 Mean age = 38 	<ul style="list-style-type: none"> • Vaccinated men were more likely to: i) be younger, ii) have higher level of knowledge about hepatitis B vaccine, iii) discuss hepatitis B vaccine with their healthcare providers, and iv) receive training about Hepatitis B
Schutten et al. (2002) ⁷	<ul style="list-style-type: none"> • Questionnaire at gay venues in Netherlands (1998) • N = 433 • Mean age = 30 	<ul style="list-style-type: none"> • Attitudes towards vaccination, perceived norms and perceived susceptibility predicted intentions to be vaccinated against hepatitis B • Knowledge, behavioural control and perceived severity were not associated with intentions to be vaccinated
Rhodes et al. (2002) ⁸	<ul style="list-style-type: none"> • Questionnaire at a gay bar in Birmingham, US (2001) • N = 143 • mean age = 25 	<ul style="list-style-type: none"> • Vaccinated men were more likely to: i) perceive hepatitis B as severe and ii) to perceive themselves capable of completing a 3-dose vaccination course • Perceived susceptibility and perceived barriers were negatively associated with the hepatitis B vaccination status • Healthcare provider-patient communication was a strong predictor of hepatitis A vaccination, but not hepatitis B
Rudy et al. (2003) ⁹	<ul style="list-style-type: none"> • Questionnaire at sexual health clinics in Los Angeles, US (1999-2000) • N = 495 	<ul style="list-style-type: none"> • Vaccinated men were more likely to: i) be younger, ii) have higher educational attainment, iii) perceive themselves to be at risk of hepatitis B, iv) perceive hepatitis B infection as severe, v) report lower levels of concern about vaccine safety, vi) visit the clinic for screening, as opposed to reporting symptoms, vii) worry about hepatitis B-related diseases, viii) participate in gay community events • Men that refused vaccination were more likely to: i) report not having enough time to be vaccinated, ii) have concerns about vaccine side effects, iii) report being troubled about 'current health problems' iv) prefer to test for disease, v) prefer to talk to their own doctor, and vi) request more information about the hepatitis B vaccine

Table 2. Continuation

Author	Study methodology	Main findings
Rhodes et al. (2003) ¹⁰	<ul style="list-style-type: none"> • Questionnaire at 2 gay bars in Birmingham, US (2001) • N = 358 • mean age = 27 	<ul style="list-style-type: none"> • Men that perceived barriers to hepatitis B vaccination were more likely to be in the pre-contemplation and contemplation stages rather than preparation and action stages • Men that perceived benefits of hepatitis B vaccination, perceived hepatitis B to be severe, perceived themselves to be self-efficacious in being vaccinated were more likely to be in preparation and action stages
Diamond et al. (2003) ¹¹	<ul style="list-style-type: none"> • Two phase questionnaire at gay venues in the US (1997-2000) • N = 833 	<ul style="list-style-type: none"> • Unvaccinated men were more likely to: i) be unaware of the hepatitis B vaccine, ii) have not been offered the vaccine, and iii) perceive themselves to be at low risk of hepatitis B
De Wit et al. (2005) ¹²	<ul style="list-style-type: none"> • Questionnaire at health centres and cruising areas in Netherlands (1998-2000) • N = 432 mean age = 30 	<ul style="list-style-type: none"> • Vaccinated men were more likely to: i) be younger, ii) report being exclusively homosexual, iii) be in a stable relationship, iv) have a lower number of sex partners in the last 6 months, v) perceive greater threat from hepatitis B, vi) perceived fewer potential side effects from hepatitis B vaccination, vii) perceive the vaccine to offer unlimited period of protection, and viii) report a lack of concern that homosexual lifestyle becomes known to others • Health Belief Model was poor at predicting vaccination • Theory of Planned Behaviour did not predict vaccination
Das et al. (2008) ¹³	<ul style="list-style-type: none"> • Questionnaire at gay venues in Netherlands • N = 86 • Mean age = 33 	<ul style="list-style-type: none"> • Negative affect (tension and anxiety) predicted intentions • Perception of susceptibility to hepatitis B and outcome expectancies (vaccine is effective and prevents from hepatitis B) were predicting hepatitis B vaccination intentions
Siconolfi et al. (2009) ¹⁴	<ul style="list-style-type: none"> • Questionnaire at gyms and fitness centres in New York City, US (2004-2005) • N = 311 • mean age = 40 	<ul style="list-style-type: none"> • Vaccinated men were more likely to: i) be younger; ii) be infected with HIV, and iii) report having a clinic doctor

Table 2. Continuation

Author	Study methodology	Main findings
Neighbors et al. (1999) ¹⁵	<ul style="list-style-type: none"> • Questionnaire at gay venues in Michigan, US (1997) • N = 118 • Mean age = 25 	<ul style="list-style-type: none"> • Vaccinated men were more likely to be previously tested for hepatitis B • Men reported four reasons for not receiving vaccination: i) not being aware of hepatitis B, ii) not being at risk, iii) not knowing where to receive hepatitis B vaccine, and iv) perceiving vaccination as expensive • Participant received information about vaccination from newspapers friends, newspapers, television, posters, parents, university health services and health departments
Baars et al. (2010) ¹⁶	<ul style="list-style-type: none"> • Questionnaire at gay venues in Netherlands (2004-2006) • N = 320 • Mean age = 35 	<ul style="list-style-type: none"> • Vaccinated men were more likely to: i) have a casual sex partner in the last 6 months, ii) engage in receptive anal intercourse, and iii) be informed about the vaccine by a healthcare worker, • Men that did not receive vaccination reported that i) they did not see themselves at risk of hepatitis B, ii) did not have time to obtain vaccination, iii) were lazy or experienced “vaccine fatigue”, iv) were not considering hepatitis B vaccination, and v) knew little about vaccination procedure
Matthews et al. (2012) ¹⁷	<ul style="list-style-type: none"> • Online survey in the US (2010) • 1,052 Median age = 26 	<ul style="list-style-type: none"> • Vaccinated men were more likely to: i) be in the 20-30 years age group, ii) be white, iii) have higher educational attainment, iv) have private health insurance, v) come from the Southern states of the US, vi) be tested for hepatitis B and HIV, vii) have unprotected anal intercourse, viii) visit their healthcare provider in the last 12 months, ix) tell doctors about sexual orientation, and x) received vaccine recommendation from healthcare provider
De Wit et al. (2008) ¹⁸	<ul style="list-style-type: none"> • Online questionnaire in Netherlands • N = 118 • mean age = 38 	<ul style="list-style-type: none"> • Narrative message increased risk perceptions and intentions to be vaccinated • Risk perceptions mediated intentions
Vet et al. (2011) ¹⁹	<ul style="list-style-type: none"> • Online questionnaire in Netherlands (1995) • N = 168 • mean age = 33 	<ul style="list-style-type: none"> • Both risk communication and social norm communication were equally effective in improving intentions to vaccinate • Both communications increased risk perceptions and social norms
Vet et al. (2014) ²⁰	<ul style="list-style-type: none"> • Questionnaire in Netherlands • N = 616 	<ul style="list-style-type: none"> • Men who had stronger intentions to be vaccinated and who formed implementation intentions were more likely to obtain the vaccine

Table 2. Continuation

Author	Study methodology	Main findings
Rhodes et al (2004) ²¹	<ul style="list-style-type: none">• Questionnaire at gay bars in Birmingham, US (2001)• N = 358• mean age = 25	<ul style="list-style-type: none">• A scale measuring constructs of the Health Belief Model and self-efficacy shows satisfactory reliability• No associations were presented
Friedman et al. (2000) ²²	<ul style="list-style-type: none">• Questionnaire at various gay venues in Atlanta, US• N = 210• median age = 34	<ul style="list-style-type: none">• Vaccinated men were more likely to: i) express fears about hepatitis B-related disease, ii) perceive themselves at risk of hepatitis B infection, iii) report peer pressure about being vaccinated, iv) be exposed to information about hepatitis B vaccination, and v) access and read gay-oriented newspapers• Men provided reasons for not receiving hepatitis B vaccination: never offered, did not believe to be at risk, never heard of hepatitis vaccine, not convenient vaccination times and sites

3.3.2. Theoretical constructs

Table 3 provides an overview of identified theoretical constructs. In total 72 constructs associated with vaccination behaviours were identified. These were classified into ten groups: demographics, sexuality, behavioural/clinical risk indicators, access to healthcare, awareness and knowledge, health-related perceptions, vaccine-related perceptions, affect, social/environmental influences and perceived barriers. A total of 38 factors were significantly associated with hepatitis vaccination behaviours amongst MSM.

Vaccination behaviours

Ten contrast that attempted to examine vaccination behaviours were identified. Although the most commonly used constructs of vaccination behaviours were self-reported ‘vaccination completion’ and behavioural ‘intentions’ to receive the vaccine, other constructs were used to identify vaccine acceptability. For example, McCusker et al. (1990) reported ‘vaccine refusal’ as an indicator of acceptability. Three studies used a binary measure of ‘vaccine acceptability’ and ‘vaccine refusal’ when describing the motivation to be vaccinated. De Wit (2008) used a three-item scale to assess personal motivation and preparation to obtain the vaccine in the next six months (e.g. “Are you planning to get vaccinated against hepatitis B in the future?”). Other studies assessed vaccine acceptability using constructs such as ‘vaccination status’ or ‘past vaccination’ without an actual measure of vaccine completion, so it was impossible to determine how many doses of the vaccine were received. Also, ‘willingness to be vaccinated’ and ‘perceived likelihood of being vaccinated’ were used to assess vaccine acceptability. One study incorporated the Stages of Change framework (Prochaska & Diclemente, 1986) to examine the readiness for vaccination. The Stages of Change model categorises individuals into discrete motivational phases to represent their eagerness, preparedness and attentiveness with respect to vaccination. These stages are pre-contemplation (when one does not consider to be vaccinated), contemplation (when one only considers being vaccinated), preparation (when one takes meaningful actions to obtain the vaccine) and action (when one obtains vaccination). Two studies incorporated an objective measure of vaccination uptake, using serological biomarkers indicating an immunity to hepatitis B.

Table 3. Theoretical constructs and classification of variables and significant factors associated with hepatitis vaccination behaviours amongst MSM

Theoretical constructs	Source
Vaccination behaviours	
Vaccine initiation (started series)	8, 11, 20
Fully vaccinated (completed series)	1, 3, 8, 11, 14, 15, 21, 22
Willingness to be vaccinated	15
Behavioural intention to vaccinate	2, 6, 12, 13, 18, 19, 20
Perceived likelihood of being vaccinated	6,
Past vaccination	9, 14, 22
Vaccine hesitancy/fatigue	1, 11
Vaccine acceptance/refusal	2, 9, 17
Immunity (serological markers)	3, 11,
Readiness for vaccination (stage of change)	10
Demographics	
Age	1, 2, 3*, 4, 5*, 6*, 8, 9*, 10, 11, 12*, 13, 14*, 17, 21, 22*
Education	1, 2*, 3*, 4, 6, 8, 9, 10, 14, 16, 17, 21
Income	1, 3, 8, 9, 10, 14, 21
Employment	3, 16,
Socio-geographic (e.g. rural vs urban)	2, 3*, 4*, 16, 17
Ethnicity (race)	1, 2*, 4, 8, 9, 10, 11, 14*, 13, 16, 17, 21, 22*
Have children	3,
Religiosity	16
Sexuality	
Sexual identity (self-identified as homosexual)	6, 14, 16
Sexual orientation (exclusively homosexual)	1, 3, 12, 16, 17
Openness to healthcare professionals about sexuality	3*, 4*, 8, 10*, 12*, 17
Duration of homosexual activity	2, 22*
Behavioural/ clinical risk indicators	
Engaged in anal intercourse	3*, 4, 8, 11, 16, 17
Engaged in anal fisting	4,
History of an STI	2, 3*, 4, 8, 9, 11, 14, 16, 22
Use alcohol before sexual encounter	3
Receive of goods or services for sex	3*, 4, 9
Monogamous relationship status (steady partner)	2, 6, 9, 12, 13, 16
Number of sexual partners	1, 3*, 4, 6, 8, 9*, 10, 11, 12*, 13, 22*
Ever injected drugs	3*, 4, 8, 9, 11, 17
Ever injected steroids	8
Received blood or blood products	8
HIV status	4*, 8, 9, 10, 14*, 21, 22
Have an HIV positive casual partner	3*
Practice safe sex (condom use)	2, 5*, 6, 8, 16
International travel	8
Access to healthcare	
Health insurance	2*, 4, 8, 9, 10, 11, 14, 17, 21
Vaccine cost/affordability	2, 11, 15, 17, 22
Consistent source of healthcare	1, 14,
Healthcare utilisation (previous screening for STIs)	2*, 4, 9, 14, 17, 21
Doctor recommending the vaccine	2, 5*, 9, 17
Doctor-patient communication	1, 5*, 6*, 8, 10
Receiving treatment for HIV	21
Reasons for visiting the clinic	9*
Awareness and knowledge	
Awareness/knowledge about the disease	2, 5*, 6*, 7, 8, 22*
Awareness about the vaccine	2, 8, 15*, 22*
Knowledge of the vaccination (and procedure)	1, 5*, 6*

*statistically significant predictor of vaccination behaviour

Table 3. Continuation

Theoretical constructs	Source
Health-related perceptions	
Perceived susceptibility (vulnerability) to disease	1, 2, 6*, 8*, 9, 10*, 11, 12*, 13*, 15, 17, 18, 19*, 21, 22
Perceived severity of disease	1, 6, 8*, 9*, 10*, 12*, 18, 21
Perceived threat of disease	12*,
Vaccine-related perceptions	
Perceived benefits	1, 8, 10, 12, 21
Perceived self-efficacy	8*, 10*, 12, 13*, 21
Attitudes towards vaccination	6*, 12
Perceived vaccine effectiveness	9, 11, 17
Perceived side effects	9*, 10*, 12*
Perceived vaccine harm	2, 9
Perceived behavioural control	6, 12
Affect	
Worry about getting sick	9*
Concern about the disease	9*
Fear about the diseases	10, 22
Tension/anxiety about the diseases	13*
Social/environmental influences	
Perceived social norms	6*, 12, 19*
Normative beliefs	6*
Peers got vaccinated	9
Peer pressure to vaccinate	22
Knowing someone who is infected	2, 9
Partner/family recommending the vaccine	9
Attendance (participation) at gay community events	9*, 16
Exposure to health promotion advertisement	1, 2, 22*
Source of information about the disease and vaccine	2, 5*, 6, 15, 22*
Perceived barriers	
Testing for immunity before vaccination	9*
Discussing the vaccine with doctor	9*
Insufficient information about the vaccine	1, 2, 9*, 11, 15, 17, 22
Not having time to be vaccinated	8*, 9*, 10*, 22
Not able to keep appointments	9, 12
Being too busy	9
Living far away from the clinic	9, 17
Needle aversion	9
Being more concerned about other health problems	9
Unknown substance in blood	12
Limited period of protection from the vaccine	12
Never offered vaccination	11, 17, 22
Perceived illegibility to receive the vaccine	17

*statistically significant predictor of vaccination behaviour

Demographic factors

All studies reported demographic factors associated with hepatitis vaccination amongst MSM. The most frequently assessed demographics were age, education and ethnicity. The less frequently used constructs were: the amount of personal income, employment status, religiosity, sociogeographic location (conceptualised as a divide between the rural and urban place of residence) and whether any men had a child.

Age, education, sociogeography and ethnicity were significantly associated with vaccination behaviours. Two studies, conducted shortly after the introduction of hepatitis B vaccination, showed that older MSM were more likely to receive the vaccination compared to younger MSM (McCusker et al., 1990; Dufour et al., 1999). However, five studies indicated that younger men, especially in the age group between 20 and 30 years old tended to be most receptive to hepatitis vaccination (MacKellar et al., 2001; Rhodes et al., 2000; Rhodes et al., 2001; Rudy et al., 2003; De Wit et al., 2005). One study from Canada showed that men who were younger and at the lower spectrum of their educational attainment were less likely to complete hepatitis B vaccination (Dufour et al., 1999). In the same study, men who were living in less urban settings were more likely to refuse vaccination. Three studies indicated that men from the non-White ethnic background were less likely to initiate or complete vaccination in the US (McCusker et al., 1990, Sinconolfi et al., 2009; Friedman et al., 2000). Therefore, demographic factors such as age, ethnicity and education should be monitored to identify what subpopulations of MSM are likely to benefit from targeted immunisation.

Sexuality

Four constructs related to sexuality were identified across twelve studies. These were: sexual identity, sexual orientation, openness about sexuality to HCPs and duration of homosexual activity. Six studies measured whether MSM were openly discussing their sexuality with HCPs and four studies demonstrated that it was associated with vaccine acceptability and uptake (Dufour et al., 1999; MacKellar et al., 2001; Rhodes et al., 2003; De Wit et al., 2005). MacKellar et al. (2001) showed that men who were open about having sex with men to peers and/or HCPs were more likely to receive the hepatitis B vaccine. However, the odds ratio was only 1.1 [CI: 1.0-1.2] indicating only a weak relationship between vaccination initiation and sexual orientation disclosure. The study was conducted in gay venues and it may be that men who attend gay-oriented settings are more likely to be open about their sexuality. De Wit et al. (2005) also showed that men who identified as exclusively homosexual were

approximately 3 times more likely to be vaccinated than those identified as bisexual. Dufour et al. (1999) reported physicians' awareness of sexual orientation was associated with vaccine uptake. Similarly, Rhodes et al. (2003) indicated that men, who were able to discuss their sexual behaviours with doctors, were more likely to obtain the vaccination. In addition, Friedman et al. (2000) showed that men who reported having sex with other men for over 20 years were four times more likely to be vaccinated than men who only had these relations for a few years, suggesting that the duration of homosexual activity was also associated with vaccination uptake.

Behavioural/clinical risk indicators

Eighteen studies examined various behavioural/clinical risk indicators. The most common indicators were: the number of sexual partners, previous history of an STI, HIV status and engagement in anal intercourse. Other indicators were being in a monogamous relationship, condom use, illegal drugs consumption and receiving goods or services for sex. Engaging in anal fisting, consuming alcohol before sexual encounters, injecting steroids, receiving blood or blood products, having an HIV-positive sexual partner, and being an international traveller were also considered. These variables were constructed to identify individuals at higher risk of hepatitis and to measure their associations with vaccine acceptability and uptake.

There are mixed findings on the relationship between behavioural indicators and hepatitis vaccination amongst MSM. Dufour et al., (1999) demonstrated that men, who engaged in receptive anal intercourse, had previously been diagnosed with an STI, had a higher number of sexual partners and who injected drugs were more likely to refuse hepatitis B vaccination. McCusker et al. (1990) showed that men who reported being in a monogamous relationship or practising 'safe sex' were less likely to be vaccinated. In the same study, men that completed the vaccination course had a previous experience of an STI, used alcohol before sexual encounters, had sex with a woman in the last five years and received goods or services for sex. They also had unprotected anal intercourse with a regular partner, which contrasts with previous findings on the relationship between personal risk and vaccination adherence. MacKellar et al. (2001), in a study of 3432 MSM, demonstrated that lifetime number of sexual partners and injecting drugs were not associated with vaccine uptake. This lack of association between behavioural risk indicators and vaccination status was also highlighted by Neighbor et al. (2010). While some studies indicated that individuals, whose behaviours

were considered at risk for hepatitis, were more likely to respond to the vaccination offer, other studies demonstrated that men who engage in self-protective behaviours (e.g. consistent condom use) were as likely to be vaccinated. Therefore, there might be a weak relationship between behavioural indicators and vaccination adherence.

Access to healthcare

Thirteen studies examined factors associated with access to healthcare for MSM eligible for hepatitis B vaccination. The most commonly used constructs were: having health insurance or coverage, being able to afford the vaccination, consistent source of healthcare (having a primary care doctor), and healthcare utilisation (previous screening for STIs or receiving treatment for HIV). The less commonly used constructs were: doctor's or a HCP's recommendation of the vaccination, patient-doctor communication and reasons for visiting sexual health services (e.g. screening, symptoms or partner notification).

Having a health insurance, history of healthcare utilisation and doctor's recommendation were positively related to vaccination behaviours. For example, McCusker et al. (1990) showed that men who did not have health insurance were unable to access hepatitis B vaccination. In the same study, men who had a regular primary care doctor or a consistent source of healthcare were more likely to be vaccinated. Healthcare utilisation in the context of previous screening for STIs was also strongly correlated with vaccination uptake. Men that visited clinics for screening, as opposed to reporting symptoms of an STI, were more likely to accept hepatitis B vaccine (Rudy et al., 2003). Hence, men who did not test for STIs had inconsistent contact with HCPs and who did not have an opportunity to use various sexual health services were unlikely to receive the vaccine. Also, men who received vaccine recommendation from their doctor or other healthcare worker were more likely to accept the vaccine (Rhodes et al., 2000). Discussions about hepatitis B vaccine with HCPs and positive healthcare-patient communication styles were predictive of vaccine uptake amongst MSM (Rhodes et al., 2000; Rhodes et al., 2001). However, because none of the studies was conducted in the UK, the relevance of the access to healthcare constructs is unclear in the context of MSM-targeted vaccination programmes, because of the differences in the structure of healthcare systems across various countries.

Health education

Eight studies attempted to measure awareness and knowledge of hepatitis and the hepatitis vaccine. In four studies, three constructs related to awareness and knowledge significantly related to vaccination behaviours. These were awareness about the disease, knowledge about the disease, awareness about the vaccine and knowledge about vaccination procedures (Rhodes et al. 2000; Rhodes et al., 2001; Neighbor et al., 2010, Friedman et al., 2000). In general, there was moderate evidence that knowledge about hepatitis and awareness of hepatitis vaccination was associated with vaccine acceptability and uptake amongst MSM. Three studies showed that men who knew about hepatitis B and the hepatitis B vaccine were more likely to be vaccinated. The lack of knowledge about the vaccination procedure was associated with poor vaccination initiation. One study from the Netherlands showed that knowledge per se was not a necessary factor for vaccine intentions if the vaccine was recommended by a HCP during the consultation (Schutten et al., 2002). In one retrospective study, vaccinated men were shown to have better knowledge about HPV (Friedman et al., 2000). However, this could be a result of a direct experience with the vaccination rather a pre-existent determinant.

Health-related perceptions

Across fifteen studies, three constructs related to health-related perceptions were identified and all were associated with vaccination behaviours. While fifteen studies measured perceived susceptibility, eight measured perceived severity and one assessed perceived threat as a combination of risk perceptions. A qualitative study by Rhodes et al. (2002) showed that while men perceived themselves susceptible to acquire hepatitis B, they also thought that infection was unlikely. Also, men that knew about hepatitis B were more likely to feel susceptible to the infection. While half of the sample thought that hepatitis B infection was a ‘minor inconvenience’, the other half perceived hepatitis B as a potentially life-threatening condition. Six surveys showed that men who perceived themselves to be vulnerable to hepatitis B infection were more likely to accept the vaccine or form intentions to be vaccinated in the future (Rhodes et al., 2001; Rhodes et al., 2002; Rhodes et al., 2003; De Wit et al., 2005; Das et al., 2008; Vet et al. 2011). Men that refused vaccination reported not feeling at risk of the infection or hepatitis B-induced diseases (McCusker et al., 1999). Rhodes et al. (2002) also found that vaccinated men were five times more likely to see hepatitis B as a severe condition. Men that refused vaccination did not believe that they were at risk of the infection or that hepatitis B can be harmful (Diamond et al. (2003). De Wit et

al. (2005) reported that vaccinated men were about 20 times more likely to perceive themselves susceptible to hepatitis B than those who refused the vaccine. Also, they were twice as likely to see hepatitis B infection as severe. Hence, perceptions of risk are associated with vaccine acceptability and uptake amongst MSM.

Vaccine-related perceptions

Across eleven studies, seven constructs related to vaccine-related perceptions were identified. The most frequently assessed constructs were: perceived benefits, side effects and effectiveness of the vaccine, and perceived self-efficacy to obtain the vaccination. The less commonly assessed constructs were: attitudes towards vaccination, perceived behavioural control in obtaining the vaccine and perceived harm of vaccination.

Perceived self-efficacy, attitudes and perceived side effects were significantly associated with hepatitis vaccine acceptability and uptake. For example, Rhodes' et al. (2002) demonstrated that while men had positive attitudes towards hepatitis B vaccination, they also showed fatigue when describing their motivation for obtaining the vaccine. Men reported several benefits, such as vaccination would reduce their worries about contracting hepatitis B. They also compared the benefits of hepatitis B vaccination to other changes in their lifestyle such as having a better diet, quitting smoking or getting regular screening by their doctor. Rhodes et al. (2003) showed that men who perceived hepatitis B vaccine as beneficial and reported higher levels of self-efficacy were more likely to be vaccinated. In contrast, the study conducted at gay venues in the Netherland showed that self-efficacy was not associated with hepatitis B vaccination intentions (Das et al., 2008). Also, Schutten et al. (2002) indicated that men that perceived hepatitis B vaccination as important, good, positive, wise, pleasant and nice were more likely to form strong intentions to be vaccinated in the next six months.

Affect

Four constructs related to negative emotions or affect indicated were identified across four studies. In one of the Los Angeles sexual health clinics, men who reported being worried about hepatitis were more likely to accept the vaccine and men who showed low levels of concern were more likely to refuse vaccination (Rudy et al., 2003). Similarly, results of a survey at gay venues in the Netherlands showed that men who reported negative affect (e.g. tension or anxiety) about hepatitis were more likely to form intentions to be vaccinated in

the next six months (Das et al., 2008). These studies suggest that negative emotions about a potential STI amongst MSM are associated with motivation for hepatitis vaccination.

Social/environmental influences

Across nine studies, nine constructs related to social and environmental influences were associated with vaccination behaviours. These were: perceived social norms and normative beliefs, vaccination of peers, knowing someone who is infected, family or friends recommending vaccination, attendance at gay community events, exposure to health promotion advertisement, and various sources of information about the disease and vaccination. Perceived social norms, normative beliefs, participation at gay community events and exposure to health promotion advertisements and different sources of information about hepatitis B and its vaccine were significantly associated with vaccine acceptability and uptake. For example, a survey assessing reasons for vaccination refusal amongst MSM attending sexual health services in Los Angeles in 2000 examined five positive social influences on vaccination behaviour: i) friends/peers receiving the vaccination, ii) knowing someone that was infected with hepatitis B, iii) a partner recommending vaccination, iv) a doctor recommending vaccination, and v) social participation in gay-oriented community events. The study found that men who did not attend gay community events were less likely to refuse vaccination. Another survey from 1998 on the University of Michigan campus examined the sources of information about hepatitis B vaccine for young MSM. It found that 25% learned about hepatitis B from friends, 19% from newspapers or magazines, 14% from university health services, 13% from health departments and 6% from local gay advocacy groups and LGBT organisations. A survey in the Netherlands randomised participants to conditions where they received communication about their risk or communication about social norms regarding vaccinations. These communications used social role models to inform participants about vaccinations. The study found that perceived social norms were associated with intentions to vaccinate and participants, who perceived vaccination as a norm, were more likely to form intentions. These studies indicated that the opinions of peers about vaccination, participation in LGBT events and the perception that vaccination is part of a social norm within the community, influence vaccine acceptability and uptake.

Perceived barriers

Across nine studies, thirteen constructs were used to measure perceived barriers to vaccination. The most frequently measured barriers were insufficiency of information about

the vaccine, the lack of time to be vaccinated and not being offered the vaccine. The lack of time, insufficient knowledge about the vaccine, a preference to test for immunity before receiving the vaccine and having difficulty discussing the vaccine with an HCP were negatively associated with vaccine acceptability and uptake. Rhodes et al. (2002) argued that low levels of knowledge about hepatitis B, no information about the hepatitis B vaccination process (location, vaccination site or cost), limited access to healthcare, limited provider communication, distrust of the government recommending vaccination and over exposure to health promotion targeted at MSM were related to vaccination behaviours. Men, who reported not having enough time to be vaccinated, who had concerns about vaccine safety and had existing health problems, were more likely to refuse vaccination (Rude et al., 2003). De Wit et al. (2005) added that the perception of potential side effects, perceived limited period of protection and concern that one's lifestyle becomes known to others were significant barriers negatively associated with hepatitis B vaccine uptake. The lack of awareness of hepatitis B, poor perception of personal susceptibility to hepatitis B infection, the lack of knowledge about potential settings offering vaccination, the perception of high vaccine price and self-reported 'laziness' or the lack of motivation to obtain vaccination were identified as barriers (Neighbor et al, 2010; Baars et al, 2010). Although the construct of perceived barriers was heterogeneous and operationalised in various ways, there is a considerable overlap between perceived barriers and other theoretical concepts reported in previous sections. For example, while Rhodes et al. (2003) identified insufficient knowledge about hepatitis B as a discrete 'knowledge' construct, Rudy et al. (2003) showed that men who refused vaccination reported their lack of knowledge about the hepatitis B vaccine as a barrier.

3.4. Discussion

This review enhances the understanding of theoretical constructs associated with vaccination behaviours amongst MSM. It enables the identification of factors related to vaccine acceptability and uptake in the context of a targeted vaccination programme. The review shows that vaccine acceptability has been expressed in various ways such as the willingness to receive the vaccine, intentions to obtain vaccinations within a particular time or actual vaccine completion. The variations in acceptability have been related to various demographic, behavioural, psychological and environmental factors. A range of emotions, perceptions and behaviours have been identified as predictors of vaccine acceptability and uptake and these are likely to guide the development of a theoretical framework on

vaccination behaviours amongst MSM. The findings of the results can be utilised when studying HPV vaccine acceptability in MSM.

3.4.1. Constructs associated with vaccination behaviours

Overall, 72 constructs have been identified and were further grouped into eleven categories based on their theoretical resemblances. Vaccine acceptability was conceptualised using ten discrete constructs. There is no standardised measure of vaccine acceptability and the results illustrate a methodological weakness when assessing MSM preparedness to be vaccinated. A systematic review of measures used in studies of HPV vaccine acceptability concluded that there was significant heterogeneity in assessments of acceptability (Allen et al., 2010). It found that the absence of a standardised tool to measure acceptability, which is based on a theoretical framework and can be validated, produced a variety of outputs that were impossible to compare. The review stated the need to develop acceptability measures, which are capable of predicting future uptake rates. Hence, more studies are required to explore the relationship between various acceptability constructs, such as the willingness to vaccinate and the perceived likelihood of receiving the vaccine. The association between past vaccination behaviours, intentions, vaccine initiation and vaccine completion should be examined to understand whether the identified correlates can be related to all stages of vaccination behaviours. Also, future studies need to identify a reliable and sensitive measurement tool of vaccine acceptability for MSM to determine the potential uptake rates.

A number of variables have been associated with vaccination behaviours in MSM. Amongst the demographic factors age, education, ethnicity and participants' settings (e.g. urban, rural) were significantly related to vaccination behaviours. Five reviews have also demonstrated inequalities in the acceptability and uptake of HPV vaccination indicating that non-white ethnicity, older age, lower educational attainment and living in rural areas of residence were negatively associated with HPV vaccination completion (Yee et al., 2002, Kessels et al., 2012, Black et al. 2009, Newman et al., 2013, Fisher et al., 2013). There is also strong evidence that demographic factors such as income, education and ethnicity are associated with access to sexual health services (Millett et al., 2012). Monitoring of demographic factors is essential to ensure that MSM have equal opportunities for vaccination.

Sexuality variables, such as exclusive homosexual identity and openness about same-sex sexual behaviour, have also been associated with HIV testing and access to sexual health

services amongst MSM. For example, concerns that same-sex practices become known, worries about confidentiality breaches and anxiety about potential discrimination from HCPs and peers have been identified as possible barriers amongst MSM that have never tested for HIV (Deblonde et al., 2010). Ng et al. (2014) argued that MSM, who did not wish to be identified as gay or bisexual and were not willing to discuss sexual experiences with HCPs were less likely to utilise sexual health services. A survey on the relationship between sexual orientation identity and the initiation of HPV vaccination amongst US women found that while 28% of heterosexual women aged 15-25 years started a course of HPV vaccination, only 8% of self-identified lesbians initiated vaccination, suggesting that sexuality is associated with vaccine uptake (Agenor et al., 2015). Hence, the relationship between sexuality and vaccination behaviours need to be examined in the context of MSM-targeted HPV vaccination as sexuality is likely to be related to vaccine acceptability and uptake in MSM.

This review shows that engagement in anal intercourse, history of an STI, receiving goods and services for sex, a higher number of sexual partners, history of injecting drugs, being HIV positive or having an HIV-positive partner are positively associated with vaccination behaviours. It is possible that the access to sexual networks, which is then associated with the amount of same-sex experience, knowledge of health related issues and access to sexual health services would be related to vaccination behaviours amongst MSM. As such, men with restricted access to sexual networks might be less likely to utilise sexual health services and be offered vaccinations. For example, a survey of around 10,000 MSM in the USA showed that men with fewer sexual partners believed that their sexual practices were not sufficient to acquire HIV and were less likely to utilise HIV screening (Le et al., 2006). Therefore, the amount of sexual activity or experience is likely to be related to risk perceptions and the willingness to utilise STI screening and vaccination services. Future studies need to explore if MSM at the beginning of their sexual activity are less likely to consider vaccination, based on their belief that their sexual experience would not put them at risk of HPV.

Access to healthcare, notably the utilisation of STI screening services and the doctor's recommendation of the vaccine, has been positively associated with vaccination behaviours amongst MSM. Sexual health services provide opportunities to discuss health risks and consider preventative methods such as condoms and vaccinations. Thus, restricted access to

sexual healthcare removes these possibilities and could affect personal views on their relevance. In the US, the lack of health insurance, as a marker of the lack of access to healthcare, is related to suboptimal vaccination (Fisher et al. 2013). Deblonde et al. (2010) argued that in the UK structural barriers to vaccination services, such as the uncertainty regarding the location of vaccination services rather than the personal cost per se may predict the lack of access. A systematic review of factors associated with HPV vaccine uptake amongst teenage girls showed that regular visits to HCPs were one of the strongest predictors of HPV vaccination completion (Kessels et al., 2012). Women that were unable to utilise healthcare services were less likely to initiate vaccination. Access to healthcare needs to be examined while assessing HPV vaccine acceptability in MSM to identify whether men who do not have opportunities to utilise sexual health services would be as less likely receive the vaccine.

This scoping review shows that men who knew about the disease and the vaccination were more likely to complete it. Although awareness is not essential for vaccination in MSM, because men could be offered the vaccine while attending their sexual health screening, the review demonstrates that knowledge about hepatitis and the hepatitis vaccine were associated with vaccine acceptability and uptake. A systematic review of HPV vaccination predictors showed that HPV knowledge was weakly associated with vaccine acceptability (Brewer et al., 2007). However, women who were more knowledgeable about HPV showed positive attitudes towards the vaccine, suggesting that knowledge may be indirectly associated with vaccine acceptability and uptake. Another review reported that women, who were not aware of HPV were more likely to refuse vaccination (Black et al., 2009). Increased exposure to media coverage on HPV vaccination topics is likely to increase acceptability, as the lack of familiarity with the vaccine may be associated with the uncertainty of the need to vaccinate. Therefore, MSM who are more aware of STIs, notably hepatitis and HPV, could form positive attitudes and be willing to receive vaccinations. Future studies need to explore the level of knowledge about HPV amongst MSM and to identify if men who are not aware of the HPV vaccine are less likely to be vaccinated.

Hepatitis and vaccine-related perceptions were significantly associated with vaccine behaviours. There is strong evidence that perceptions of vulnerability to the infection are one of the strongest predictors of vaccine acceptability and uptake. A meta-analysis of 34 studies that assessed the relationship between risk perceptions and vaccination behaviours

demonstrated that the perception of disease likelihood, perceived susceptibility and perceived severity significantly predicted vaccination uptake (Brewer et al., 2007). Deblonde et al. (2010) showed that even amongst men who reported potentially risky sexual behaviours, the lack of belief that they could have been exposed to HIV, was positively associated with the refusal of HIV testing, suggesting that perceptions of risk influence the uptake of sexual health services and perhaps vaccinations. Correspondingly, this review shows that perceived self-efficacy, attitudes towards vaccination and perceived side-effects were significantly related to vaccination behaviours amongst MSM. Four systematic reviews reported the relationship between attitudes and HPV vaccination uptake, suggesting that individuals with negative attitudes are less likely to accept the vaccine (Kessels et al., 2012; Newman et al., 2013; Chan et al., 2012, and Hopkins & Wood, 2013). Therefore, beliefs about HPV and HPV vaccination need to be explored systematically to identify if risk perception or vaccine-related perceptions could be negatively associated with HPV vaccine acceptability. These perceptions need to be explored through qualitative methods to identify the most relevant beliefs and perceptions for MSM living in the UK.

Men who had strong negative emotions about hepatitis, such as worry or anxiety, were more likely to accept vaccination. The relationship between negative affect and vaccine uptake has not been extensively explored. Yaqub et al. (2014) demonstrated that fear of adverse side effects and the fear of needles were associated with vaccine refusal. Also, Mimiaga et al. (2007) reported the fear of needles predicted the avoidance of blood tests and HIV screening amongst MSM. Thus, emotional reactions about disease or potential negative aspects of vaccination, such as the fear about the vaccination process, may influence vaccine acceptability.

Perceived social norms, participation at gay community events and exposure to health promotion advertisements have been associated with positive vaccination behaviours amongst MSM. Brewer et al. (2007) reported that parental and peer recommendations for vaccination predicted vaccination acceptability amongst young adults in the US. The normalisation of vaccination programmes may influence the perception of a vaccination norm, which in turn is associated vaccine acceptability (Davis et al., 2004). Parents who were exposed to various educational materials about HPV vaccination were more willing to initiate vaccination for their daughters. Therefore, cues to action, such as messages and personal recommendations may also encourage MSM to obtain the vaccination. Future

studies should explore whether information about HPV and the HPV vaccine could change individual perceptions and increase HPV vaccine acceptability amongst MSM.

While there is an overlap of the constructs of perceived barriers with other constructs, these factors might directly inform vaccine acceptability and suboptimal uptake. Men who refused vaccination reported having insufficient knowledge about the vaccine and the lack of time to undergo the vaccination as the main barrier. A systematic review of 55 studies on barriers to HPV vaccination amongst US adolescents showed that the lack of awareness about the vaccine, its cost and not receiving recommendations from HCPs were amongst the strongest predictors of vaccine refusal (Holman et al., 2014). Deblonde et al. (2010) discussed how perceived barriers were negatively associated with HIV testing, indicating that perceptions play important roles in informing the development of sexual health services. Thus, future qualitative studies need to explore perceived barriers to HPV vaccination amongst MSM to design tools which enable the identification of the relationship between perceived barriers and HPV vaccine acceptability.

3.4.2. Limitations

The review has several limitations imposed by the quality of the included studies. There is no standardised definition of the vaccination behaviour and vaccine acceptability. Previous studies used various constructs and measurement tools, such as vaccine hesitancy, vaccine initiation and vaccine completion, and the findings lack comparability. For example, while some studies reported vaccine initiation as a marker of vaccine acceptability, others were referring to vaccine completion of three-doses. Although vaccine initiation and completion are inter-related, the findings of studies for men who reported being vaccinated, when only initiating vaccination and not completing it, overestimate compliance. Thus, there is a need for an in-depth investigation of various components of vaccination behaviour to understand the relationship between its different representations. There are a limited amount of studies examining the correlation between vaccine acceptability, uptake and completion. There is a possibility that reported high acceptability rates using some measurement tools do not translate into vaccine completion rates. A hierarchy of various vaccination behaviours, including vaccination refusal, hesitancy, acceptability, intentions to uptake and completion, needs to be determined when studying acceptability. Such a systematic classification would enable the identification of variables associated with stages of vaccination behaviour and facilitate the potential prediction of uptake and completion.

The operationalisation and validity of constructs and measurement factors associated with vaccination behaviours differed across studies. In two studies, de Wit et al. (2004) and Rudy et al. (2003) both measured if perceived susceptibility was associated with self-reported vaccination uptake amongst MSM. While Rudy et al. used five-item scale of self-ranked perceived risk, de Wit et al. used one item asking about the probability of being infected in the next six months, with seven possible options ranging from ‘very low’ to ‘very high’. Perceived susceptibility was not significantly associated with self-reported uptake in Rudy’s study, but it was correlated in de Wit’s assessment. There is considerable difference in how perceived susceptibility was measured and so there is a chance that these two measurement tools reflected two discrete perceptions related to personal risk. Therefore, the comparability of these two variables within the same construct is limited. There is no harmonised set of psychological measurements that would allow for a thorough examination of factors associated with vaccination behaviours. Future studies on vaccination behaviours need to consider the most reliable and validated measures to increase the comparability of findings. The quality of each study was not assessed and a systematic exclusion of articles with poor methodological quality may facilitate better understanding of vaccination behaviours.

This review was conducted to guide the development of a theoretical framework on vaccination behaviours amongst MSM that could have implication for policy-makers that consider any MSM-targeted vaccination programme. It reports constructs that were previously used in research, but a number of other variables, which have not been conceptualised in any theoretical framework, could also be associated with vaccine acceptability and uptake. For example, personality traits, anticipated regret, altruism or religious beliefs have not been identified in this review. Ziarnowski et al. (2009) demonstrated that parents, who reported higher anticipated inaction regret, were more likely to construct intentions to vaccinate their daughters. A systematic review of HPV and HPV-related perceptions amongst MSM will be needed to identify factors associated with vaccination behaviours in this population.

3.5. Conclusion

The scoping review enables modelling of constructs associated with vaccination behaviours amongst MSM. It illustrates various attempts to identify hepatitis vaccine acceptability using

constructs such as vaccine initiation, vaccine completion, intention to vaccinate or perceived likelihood of being vaccinated. There is no standardised measurement of vaccine acceptability, so the results, based on various measurement tools, lack homogeneity and are difficult to compare. The review also identifies demographic, sexuality-related, behavioural, psychological and environmental factors significantly related with vaccination behaviours amongst MSM. It demonstrates that openness about sexuality to HCPs, duration of homosexual activity, the number of sexual partners, HIV status and engagement in anal intercourse are associated with hepatitis vaccination acceptability and uptake. These factors are likely to play a major role in any targeted vaccination programmes for MSM, notably HPV vaccination. The review identifies a number of psychological factors, such as perceived risks, attitudes towards vaccination and perceived side effects of the hepatitis vaccine, which are likely to explain the differences in vaccination acceptability and uptake amongst MSM. In total, although differently operationalised in various studies, 38 factors significantly associated with hepatitis vaccination behaviours were identified. A systematic review of studies on HPV vaccine acceptability is needed to explore if any of these factors could be relevant in the context of MSM-targeted HPV vaccination. It will also present constructs and factors that have been measured to date and enable validation of the findings from this scoping review.

Chapter IV – A systematic review of studies on HPV and vaccine-related perceptions amongst men who have sex with men

A part of this chapter has been published: Nadarzynski, T., Smith, H., Richardson, D., Jones, C. J., & Llewellyn, C. D. (2014). Human papillomavirus and vaccine-related perceptions among men who have sex with men: a systematic review. *Sexually Transmitted Infections*, 90(7), 515-523.

4.1. Background

The theoretical overview of socio-cognitive models and the scoping review on the hepatitis vaccine acceptability (please see Chapters II and III) outlined a number of constructs which may explain vaccine uptake amongst MSM. The scoping review provided an insight into the complexity of vaccination behaviour in MSM population taking into account sociodemographic, behavioural and psychological factors. It identified variables, such as sexual identity, openness about same-sex behaviours to HCPs and access to sexual health services that are likely to be relevant to MSM-targeted HPV vaccination. However, knowledge, perceptions and beliefs of hepatitis and HPV are likely to differ. To date there has been no study that compared perceptions of hepatitis and HPV amongst MSM. Hence, it is essential to synthesise information about the perceptions of HPV and the HPV vaccine in order to understand whether MSM would be willing to accept this vaccine in particular.

4.1.1. HPV vaccine acceptability in men and women

Several studies in women reported various characteristics associated with HPV vaccine acceptability. A systematic review of 28 studies indicated six behavioural and psychological factors related to HPV vaccine acceptability (Brewer et al., 2007). It demonstrated that women who were aware of HPV were more likely to express their willingness to receive HPV vaccination. It showed a weak relationship between HPV knowledge and acceptability, indicating that limited knowledge about the virus is likely to be a barrier. However, during a consultation with a HCP, the lack of previous HPV knowledge was not associated with vaccine refusal. The review also showed that women, who believed they were not susceptible to HPV infection and it did not cause any serious health problems, were less likely to accept the vaccine. Perceptions that the vaccine was both effective and beneficial were associated with the willingness to obtain it.

Several other reviews demonstrated other factors associated with HPV vaccine uptake. For example, a review of 29 studies from Fisher et al. (2013) indicated that ethnicity and access to healthcare services were predictive of HPV vaccine initiation. Black women and those without health insurance were less likely to obtain the vaccine. The review showed no association between religion, frequency of religious attendance, income, primary caregiver education and HPV vaccine uptake. A review of 25 studies on HPV vaccination uptake from Kessels et al. (2012) confirmed that ethnicity and a lack of insurance were negatively associated with HPV vaccine uptake. It also showed a higher uptake in women who knew about the HPV vaccine and received relevant vaccinations in their childhood. Women who had discussed HPV with their doctors and reported positive attitudes towards the vaccine were more likely to initiate vaccination. Another review of 55 studies on barriers to HPV vaccination in the US, conducted by Holman et al (2014), showed that the implementation of HPV vaccination have been challenging due to various HCPs and parental beliefs about the vaccine. The review indicated that limited knowledge about HPV vaccination, lack of insurance coverage, distrust of the healthcare system and negative cultural views on vaccinations were negatively correlated with HPV vaccination uptake. These findings are comparable to HPV vaccine acceptability in men.

A systematic review of 29 studies demonstrated that socio-demographic, behavioural and psychological factors were associated with HPV vaccine acceptability in men (Newman et al., 2013). Those who were unemployed, reported lower education and non-White ethnicity were less willing to accept the HPV vaccine. HPV awareness and knowledge, attitudes towards vaccination and risk perceptions of HPV infection were positively associated with HPV vaccine acceptability. Men who received recommendations from their doctors and who received HPV vaccine endorsements from their partners, peers or family were more likely to accept the vaccine. Perceived barriers such as personal cost, the lack of time, hassle and the need for multiple doses were negatively correlated with HPV vaccine acceptability. Although the authors differentiated between MSM and non-MSM, the review did not focus on MSM populations in particular when describing factors within the context of MSM-targeted HPV vaccination. Thus, the review findings of Newman et al. (2013) are not generalisable to MSM population and there is a need for a systematic assessment of behavioural and psychological factors associated with HPV vaccination acceptability amongst MSM. The findings of this review will identify factors relevant to MSM-targeted

HPV vaccination and inform the development of measurement assessing HPV vaccination acceptability in the UK.

4.1.2. The aims of the current review

The review has three specific aims:

Aim 1: To identify HPV and HPV vaccine-related perceptions amongst MSM

Aim 2: To examine HPV vaccine acceptability amongst MSM

Aim 3: To identify correlates of HPV vaccine acceptability amongst MSM

4.2. Methods

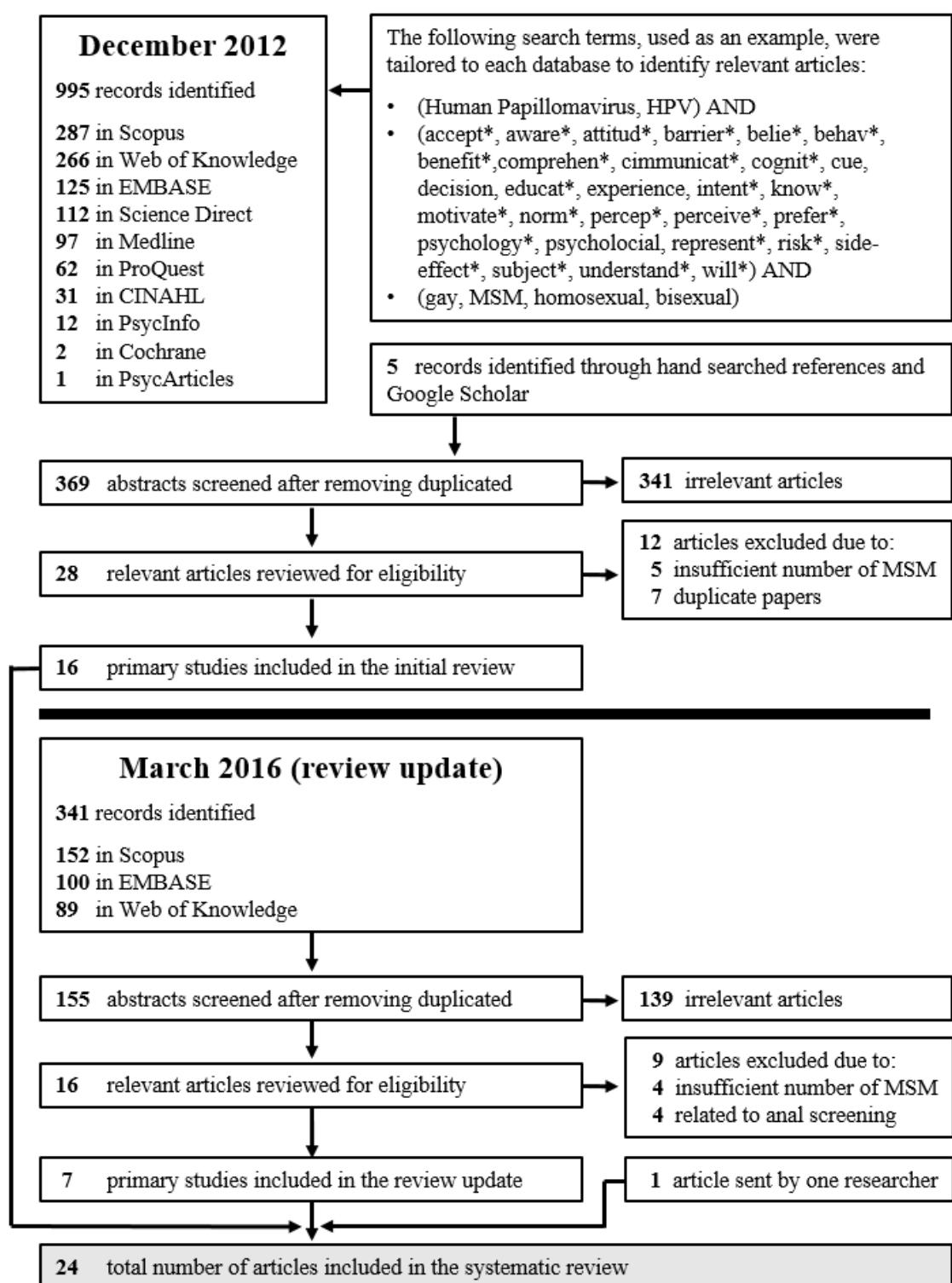
This systematic review, which followed the Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines (Moher et al., 2009) was conducted in two stages.

Figure 8 outlines the database search process and the inclusion of articles for the systematic review. In December 2012, ten electronic databases were systematically searched for studies examining HPV knowledge, beliefs about HPV infection and attitudes towards HPV vaccine among MSM. The search identified 16 articles that met the inclusion criteria. The systematic review of these articles was published in 2014 (Nadarzynski et al., 2014). In March 2016, the review was updated using comparable search strategy, which yielded seven additional articles.

4.2.1. Article selection process

There were specific inclusion and exclusion criteria for this review. When conducting the initial database searches, no geographical, time or publication-type restrictions were applied, but only papers published in English were eligible. Multiple combinations of various search terms were used to capture psychological and behavioural factors associated with HPV vaccine acceptability amongst MSM. Three health psychologists from Brighton and Sussex Medical School were consulted to identify the the most adequate and sensitive search terms. As an example, the following terms were used: [(Human Papillomavirus, HPV) AND (accept*, aware*, attitud*, barrier*, belie*, behav*, benefit*, comprehen*, cimcommunicat*, cognit*, cue, decision, educat*, experience, intent*, know*, motivate*, norm*, percep*, perceive*, prefer*, psychology*, psycholocial, represent*, risk*, side-effect*, subject*, understand*, will*) AND (gay, MSM, homosexual, bisexual)].

Figure 8. PRISMA chart of articles for inclusion in the systematic review of studies on HPV vaccination



These terms were then incorporated in individual search engines of 10 scientific databases: Scopus, the Web of Knowledge, EMBASE, Science Direct, Medline, ProQuest, CINAHL, PsycInfo, Cochrane and PsycArticles. Next, records from each database search were transferred to EndNote, a tool for managing bibliographies. All duplicated records were then removed and the title of each article was reviewed for relevance. In addition, a search through Google Scholar database was carried out to identify grey literature such as conference abstracts and unpublished theses and manuscripts. The references of reviewed articles were also hand-searched. Three international HPV experts (one from University College London, one from the University of North Carolina and one from the University of South Florida) were consulted to identify unpublished papers, reports and conference abstracts.

Only articles reporting original quantitative primary data were included. These studies focused on MSM in relation to their sexual practices as well as self-identified homosexual/gay and bisexual men. Studies that explored HPV-related perceptions in men but reported low proportions of MSM participants (i.e. less than 30 or 5% of the sample) were excluded. Data of heterosexual men from studies with large proportions of MSM participants were excluded. No comparisons with heterosexual populations were made as it was outside the scope of this review. Studies that examined HPV knowledge and HPV-related perceptions in the context of anal cancer screening, but not HPV vaccination were also excluded. These criteria were established to ensure that the data included in the review were sufficient to draw valuable conclusions in the context of MSM-targeted HPV vaccination. The identified articles were then verified by an independent researcher from Brighton and Sussex Medical School, Dr Christina Jones, who acted as a secondary data extractor. Specific data about MSM were requested directly from four authors to supplement the findings.

The review update from March 2016 used identical inclusion and exclusion criteria as the initial review from December 2012. Similar search terms were used in the three most relevant databases: Scopus, EMBASE and the Web of Knowledge. The search focussed only on papers published between 2013 and 2016. Five key authors specialising in research on HPV vaccination, identified from the initial review, were asked about any new publications that could meet the inclusion criteria. All retrieved citations were entered into the EndNote to exclude duplicates.

The STROBE checklist for observational studies (Von Elm et al., 2007) and the guidance for assessing risk of bias in randomised control trials (Higgins et al. 2007) were used to examine scientific quality. Each study was initially assessed (by TN and CJ) for its methodological strengths and weaknesses, generalisability of findings, use of theoretical frameworks and reliability of measures to establish scientific quality of reporting. There were no significant discrepancies between extracted data from two assessors. Additionally, the usefulness of data in the context of hypothetical MSM-targeted HPV vaccination was examined, taking into account the number and age of MSM participants and generalisability of the sample to the wider population of MSM below the age of 26 years. This criterion was in line with HPV vaccine licence regulations, which only allow men between the ages of 9 and 26 years to be vaccinated. Based on these evaluations, each article was characterised as having lower, medium or higher comparative quality.

4.3. Results

4.3.1. Study characteristics

Twenty-four studies were included in the review (Table 4). Twenty studies measured HPV vaccine acceptability prior to official HPV vaccine guidelines for men and four studies, all from the USA, examined the actual uptake in MSM. The studies were conducted between 2005 and March 2015 in the following countries: the USA (12), Australia (3), China (2), Italy (2), Canada (1), Sweden (1), Puerto Rico (1), Malaysia (1) and the UK (1). Fourteen studies were designed specifically to target MSM and ten explored HPV-related perception across men in general. This review is based on the behaviours and perceptions of 18,408 MSM. As the majority of studies did not report separate data for homosexual and bisexual men, the review reflects the general MSM population. Across all studies, most MSM were white, from large urban areas and in education or already holding a higher degree. While the majority of studied MSM were above the age of 26 years, eight surveys specifically recruited younger MSM. Convenience sampling through LGBT-relevant community settings (7) and sexual health clinics (7) were the most common recruitment methods. Other strategies used study advertisements through universities (3), LGBT-related digital media (2) and population-based panels (4). Seven studies applied psychological models within their design using constructs from the Health Belief Model and/or the Theory of Planned Behaviour.

The quality assessment classified two articles as having higher quality, five as medium and nine as lower. Two studies were selected as having higher comparative quality because their methodological approach and findings could be generalised to a larger MSM population, likely to be eligible for HPV vaccination. The STROBE checklist revealed that descriptions of the measurements' sources/reliability, potential sources of bias in design, anticipated sample size and possible generalisability were frequently omitted from the text. The earlier studies present lower quality and the applicability of findings when estimating the feasibility of MSM-targeted HPV vaccination. While nine studies recruited MSM, seven were aimed at males in general, restricting generalisability of findings. Two studies attempted to recruit MSM via population-representative sampling, whereas most studies were conducted in predominantly urban places likely to be visited by MSM (e.g. gay pride, sexual health clinic). These sampling methods are likely to attract MSM with substantial sexual experience. Three studies focused on perceptions and preferences of MSM below the age of 26 who would most benefit from vaccination against HPV. Studies used various measurements of HPV knowledge, and it was not always clearly stated whether respondents were presented with health information about HPV prior to the assessment of HPV vaccine acceptability.

4.3.2. Data synthesis

4.3.2.1. Knowledge about HPV

In total, 17 studies assessed knowledge about HPV and eight examined the awareness of the HPV vaccine. On average, 63% (range 20–93%) heard of HPV and 39% heard about the HPV vaccine (range: 0–86%). MSM had a poor understanding of HPV and its causal role in the development of cancer. Most MSM were more aware of 'a warts virus' rather than HPV per se. One study demonstrated that 63% of HPV-infected MSM reported having genital warts, but not HPV (Tider et al., 2005). In a Swedish study, 20% reported hearing about HPV and 93% about condylomata (Sundstrom et al., 2010). Thirteen studies used scales to assess HPV knowledge, showing that 36–75% of MSM associated HPV with sexual activity. While half knew HPV caused genital warts, fewer associated HPV with anal (32–53%), oral (25–47%) and penile (28–31%) cancers. Between 22% and 55% recognised smoking, receptive anal intercourse, multiple sexual partners and unprotected sexual intercourse as the main risk factors for anal cancer. Half of MSM knew HPV affects both sexes, and that infection may be asymptomatic (Reiter et al., 2010). The most cited sources of HPV information were primary care doctors and nurses, other HCPs, magazines, television adverts, family members and friends. The studies from USA published after 2014 reported

higher HPV vaccine knowledge and the awareness about the HPV vaccine amongst MSM than studies published before the national policy change recommending gender-neutral HPV vaccination in 2011 (Reiter et al., 2010; Thomas and Goldstone, 2011).

4.3.2.2. Perceptions of HPV

The majority of participants did not perceive themselves to be at risk of HPV or related diseases. Most MSM believed they were at average or below average risk of acquiring HPV, when compared to other MSM. There were greater perceptions of vulnerability to genital warts than anal cancer. MSM expressed modest levels of worry about HPV and related diseases. For example, most MSM in the US population-based study reported low levels of concern about developing HPV-related disease (Reiter et al., 2010). Despite the lack of concerns, the majority perceived HPV-related diseases as severe and having a potentially damaging impact on health. Around 60% of MSM attending a sexual health clinic in New York, USA considered themselves susceptible to HPV and 30% thought they could develop anal cancer (Sanchez et al., 2012). Half of MSM in the Hong Kong sample had misconceptions about HPV, such as it being of low infectivity or controlled by antibiotics (Lau et al., 2013). Three studies indicated that the majority of MSM thought HPV-related diseases, such as anal cancer, were severe and had a potentially damaging impact on health (Reiter et al., 2010; Wheldon et al., 2011; Lau et al., 2013).

4.3.2.3. Perceptions of HPV vaccine

MSM reported positive attitudes towards HPV vaccination. MSM perceived the HPV vaccine as good, safe, smart, easy, important, harmless and beneficial (Wheldon et al., 2011; Gutierrez et al., 2012). The vaccine was considered to be effective against HPV-related diseases, with one study demonstrating reduced perceived effectiveness against genital warts as compared to cancers (Lau et al., 2013). MSM were concerned about the personal costs of the vaccine and possible side effects. Some MSM were unsure if the HPV vaccine was safe, available and how many doses were needed for the vaccine to be effective. The perception that doctors were not recommending the vaccine to MSM, fear of needles and difficulties accessing clinics that offered HPV vaccination were amongst the main perceived barriers.

Table 4. Characteristics of studies included in the systematic review

Author (Year of publication)	Country	Number of MSM	Study design	Selected sample characteristics	Key variables measures	HPV vaccine acceptability	Quality
Tider et al (2005) ¹	USA	1065	Questionnaire at two gay community events in New York	Mean age = 36 (SD = 10) 65% White/European	HPV knowledge Sexual history	NR	Lower
Pitts et al (2007) ²	Australia	384	Questionnaire at gay community event in Melbourne	Mean age = 37 (range: 16-67) 58% high education degree 67% in full-time employment	HPV knowledge HPV information source HPV risk factors beliefs Healthcare access	NR	Medium
Simatherai et al (2009) ³	Australia	200	Questionnaire for gay/bisexual men at sexual health clinic in Melbourne	Median age = 27 (range: 19-71)	Willing to pay \$450 for HPV vaccine* HPV awareness Sexual history Sexual orientation disclosure	47%	Lower
Reiter et al (2009) ⁴	USA	312 [#]	Internet-based questionnaire for males via pre-existing panel of US households	Age range: 18-59 (4.5% 18-26) 81% non-Hispanic white 56% had high education qualification 94% living in urban area	HPV vaccine acceptability* HPV knowledge Concern Perceived susceptibility Perceived severity Perceived vaccine effectiveness Perceived barriers Anticipated regret Cue to action Sexual history	74%	Medium

*reference variable for HPV vaccine acceptability/intention;

NR – not reported; SD – Standard Deviation; HPV – Human Papilloma Virus; STI – sexually transmitted infection; IQR – interquartile range

† - additional data retrieved from the authors;

- selected number of MSM subjects taken from a larger study sample;

Table 4. Continuation

Author (Year of publication)	Country	Number of MSM	Study design	Selected sample characteristics	Key variables measures	HPV vaccine acceptability	Quality
Sundstrom et al (2010)^{†5}	Sweden	75 [#]	Multimodal nationwide survey of 14,000 adults recruited from the Swedish Population Register	Mean age = 24 (SD = 3) 86% born in Sweden 75% had high education qualification 55% living in rural area	Willingness to get vaccinated* Willingness to get vaccinated at any cost* Willingness to pay some cost of the vaccination* HPV awareness Perceived risk Belief about vaccine Sexual history Willingness to pay for vaccine HPV vaccine information request Reasons to abstain from HPV vaccine Beliefs about compensating risk	79% 7% 31%	Lower
Hernandez et al (2010)^{†6}	USA	88 [#]	Questionnaire for males at university campus and general public in Hawaii	23% were under 26 years old	HPV vaccine acceptability*	75%	Lower
Thomas & Goldstone (2011)⁷	USA	191	Telephone and face-to-face survey at practice for HPV treatment offering “off-label” HPV vaccine for gay/bisexual men	Mean age = 37 (range: 22-56) 80% White 86% previously diagnosed with HPV 50% diagnosed with non-HPV STI	Paid for HPV vaccine when offered (uptake)* HPV knowledge HPV vaccine information source Perceived barriers Perceived benefits Cue to action Risk compensation	6%	Lower
Blackwell & Eden 2011)⁸	USA	89	Questionnaire at various gay pride and gay community events	Mean age = 32 (SD = 13) 75% White 31% married/living with partner 67% had high education qualification	HPV knowledge HPV information source	NR	Medium

*reference variable for HPV vaccine acceptability/intention;

NR – not reported; SD – Standard Deviation; HPV – Human Papilloma Virus; STI – sexually transmitted infection; IQR – interquartile range

† - additional data retrieved from the authors; # - selected number of MSM subjects taken from a larger study sample;

Table 4. Continuation

Author (Year of publication)	Country	Number of MSM	Study design	Selected sample characteristics	Key variables measures	HPV vaccine acceptability	Quality
Wheldon (2011)⁹	USA	179	Internet-based questionnaire for gay/bisexual men through snowball sampling method via student organisations at 23 colleges and universities in Southeast US	Mean age = 21.6 (SD = 3) 68% White 78% were in education 39% knows someone who received HPV vaccine 10% had no sexual experience	Likely to get vaccinated* HPV vaccine intentions* HPV knowledge Perceived susceptibility Perceived severity Perceived benefits Perceived barriers Self-efficacy Attitudes towards HPV vaccine Subjective norms Perceived behavioural control	36% Mean = 4.5 (SD = 1.3, range: 1-7)	High
Pelullo et al (2012)¹⁰	Italy	630 [#]	Face-to-face interview at gay community venues in Naples	Mean age = 26 (SD = 7) 90% married 89% employed 14% had high education qualification	HPV vaccine acceptability* HPV knowledge	NR	Medium
Colon-Lopez et al (2012)^{†11}	Puerto Rico	58 [#]	Questionnaire for males and females at sexual health clinic in San Juan	Mean age = 38 (SD = 13) 68% HIV positive	HPV vaccine willingness* HPV awareness HPV vaccine awareness Perceived susceptibility	21%	Lower

*reference variable for HPV vaccine acceptability/intention;

NR – not reported; SD – Standard Deviation; HPV – Human Papilloma Virus; STI – sexually transmitted infection; IQR – interquartile range

† - additional data retrieved from the authors;

- selected number of MSM subjects taken from a larger study sample;

Table 4. Continuation

Author (Year of publication)	Country	Number of MSM	Study design	Selected sample characteristics	Key variables measures	HPV vaccine acceptability	Quality
Al-Naggar (2012)^{†12}	Malaysia	46 [#]	Questionnaire for males on university campus in Shah Alam	Mean age = 21 (SD = 2) 100% had not heard of HPV vaccine	Likelihood of getting HPV vaccine* HPV vaccine awareness Sexual history	0%	Lower
Rank et al (2012)¹³	Canada	1169	Questionnaire at various gay community events in Vancouver	Median age = 33 77% White 79% had high education qualification 18% HIV positive 56% have more than 5 sexual partners 26% use recreational drugs 18% diagnosed with genital warts	HPV vaccine acceptability* HPV knowledge Sexual orientation disclosure	67%	Higher
Sanchez et al (2012)¹⁴	USA	116	Questionnaire at sexual health clinic in New York City	Median age = 25 (range: 17-62) 46% Non-Hispanic white 10% diagnosed with genital warts	HPV vaccine acceptability* HPV knowledge Perceived risk	86%	Lower
Gutteriez et al (2013)¹⁵	USA	41 [#]	Questionnaire of a community based convenience sample in Philadelphia	Median age= 18 (range: 13-21) 77% African American	HPV vaccine intentions* HPV knowledge Attitudes Subjective norms Perceived behavioural control	Mean = 2.6 (SD = 1.2, range: 1-5)	Lower

*reference variable for HPV vaccine acceptability/intention;

NR – not reported; SD – Standard Deviation; HPV – Human Papilloma Virus; STI – sexually transmitted infection; IQR – interquartile range

† - additional data retrieved from the authors;

- selected number of MSM subjects taken from a larger study sample;

Table 4. Continuation

Author (Year of publication)	Country	Number of MSM	Study design	Selected sample characteristics	Key variables measures	HPV vaccine acceptability	Quality
Lau et al (2013) ^{16a} Lau et al (2014) ^{16b}	Hong Kong	542	Face-to-face questionnaire at various gay venues in Hong Kong	25% were 18-25 years old	Intention to uptake HPV vaccine* Intention to pay for the vaccine* Intention to uptake free HPV vaccine* HPV knowledge Perceived susceptibility Perceived severity Perceived benefits Perceived barriers Perceived self-efficacy Cues to action Sexual history	20% 29% 79%	Medium
Meites et al (2014) ¹⁷	USA	9819	National HIV Behavioural Surveillance System in 20 US cities	32% were 18-25 years old 32% Black, 25% White 19% Bisexual 7% HIV positive	HPV vaccine uptake* Behavioural risk indicators Access to healthcare	2.7%	Medium
Zou et al (2014) ¹⁸	Australia	200	Questionnaire for MSM recruited via social media, sexual health clinics and community settings	Median age = 19 (range: 16-20)	Perceived likelihood to have the HPV vaccine if had to pay \$450* Perceived likelihood to ask for the HPV vaccine if it was free for MSM* HPV knowledge Attitudes	30% 86%	Higher
Cummings et al (2015) ¹⁹	USA	1457	Questionnaire for MSM advertised online	Mean age =22.5 (SD=2.4) 75% White 19% Bisexual	HPV vaccine acceptability* HPV vaccine uptake* HPV knowledge Access to healthcare Disclosure of sexual orientation	88% 7%	Higher

*reference variable for HPV vaccine acceptability/intention;

NR – not reported; SD – Standard Deviation; HPV – Human Papilloma Virus; STI – sexually transmitted infection; IQR – interquartile range

† - additional data retrieved from the authors;

- selected number of MSM subjects taken from a larger study sample;

Table 4. Continuation

Author (Year of publication)	Country	Number of MSM	Study design	Selected sample characteristics	Key variables measures	HPV vaccine acceptability	Quality
Reiter et al (2015)²⁰	USA	428	Questionnaire for MSM recruited through population-based LGBT Panel	71% were 22-26 years old 64% White	HPV vaccine uptake* Willingness to accept the vaccine* HPV knowledge HPV vaccine recommendation Access to healthcare Sexual orientation disclosure Worry about HPV-related disease Perceived severity of HPV-related disease Perceived likelihood of getting HPV Perceived effectiveness of HPV vaccine Perceived harms of HPV vaccine Perceived barriers to getting HPV vaccine Perceived social norms of the HPV vaccine in the LGBT community Anticipated regret	13%* 74%	Higher
Zou et al (2015)²¹	China	196	Questionnaire distributed at sexual health clinic in Wuxi	12% were below the age of 20 35% were married	Willingness to take free HPV vaccine* HPV awareness Access to healthcare Disclosure of sexual orientation Behavioural risk indicators	35%	Medium
King et al (2015)²²	UK	522	Questionnaire for MSM recruited through a sexual health clinic in London	27% were below the age of 26 76% White 47% born in the UK 5% HIV-positive	Perceived likelihood of accepting 3-dose HPV vaccine* Behavioural risk indicators Access to healthcare Disclosure of sexual orientation HPV knowledge Comparative risk perceptions Past hepatitis B vaccination	83%	Medium

*reference variable for HPV vaccine acceptability/intention;

NR – not reported; SD – Standard Deviation; HPV – Human Papilloma Virus; STI – sexually transmitted infection; IQR – interquartile range

† - additional data retrieved from the authors;

- selected number of MSM subjects taken from a larger study sample;

Table 4. Continuation

Author (Year of publication)	Country	Number of MSM	Study design	Selected sample characteristics	Key variables measures	HPV vaccine acceptability	Quality
Gerend et al (2016)²³	USA	305	Questionnaire for MSM advertised through mobile applications	Mean age = 22.5 (SD=2.5) 19% Bisexual 33% Black, 25% White	HPV vaccine uptake* Completion of the vaccination course* Doctor's recommendation HPV knowledge HPV vaccine attitudes Perceived norms	21% 41%	Higher
Giuliani et al (2016)²⁴	Italy	296	Questionnaire administered to men at a sexual health clinic in Rome	Median age=32 (IQR:26-40) 35% HIV-positive	Willingness to be vaccinated* Willingness if prevent wars* Willingness if prevent cancer* Willingness if prevent cancer only* Willingness to receive 3 doses* Willingness to pay for the vaccine* HPV Knowledge Perceived benefits Perceived severity Perceived benefits Attitudes	72% 86% 89% 83% 89% 73%	Higher

*reference variable for HPV vaccine acceptability/intention;

NR – not reported; SD – Standard Deviation; HPV – Human Papilloma Virus; STI – sexually transmitted infection; IQR – interquartile range

† - additional data retrieved from the authors;

- selected number of MSM subjects taken from a larger study sample;

The lack of openness about same-sex experiences to HCPs was perceived as a potential barrier for some people considering the HPV vaccination, with the majority of MSM indicating willingness to disclose sexual orientation to HCPs in order to receive the vaccine (Simatherai et al., 2010; Rank et al., 2012). Three studies reported anticipated regret amongst MSM who refused HPV vaccination and who may later develop cancers (Reiter et al., 2010). Although MSM did not perceive HPV vaccination as a social norm, in one study most MSM believed they would be encouraged by their family and friends to be vaccinated (Reiter et al. 2015). Around 85% of MSM in a study from a sexual health clinic in Italy reported that they would be willing to advise their partners and friends to be vaccinated against HPV (Giuliani et al., 2016).

4.3.2.4. HPV vaccine acceptability

Over half of MSM would be willing to accept HPV vaccination. HPV vaccine acceptability was measured using various constructs such as ‘willingness to be vaccinated’, ‘perceived likelihood of accepting the vaccine’, ‘intentions to be vaccinated’ and ‘actual uptake/initiation of the HPV vaccine’. Twelve studies that measured HPV vaccine acceptability showed that on average 71% (median=77%, range: 0-89%) of MSM would accept it. HIV-positive MSM in Puerto Rico (21%) and older MSM from a sexual health clinic in China (35%) were less likely to accept the vaccine (Colon-Lopez et al., 2012; Zou et al., 2015). In contrast, MSM from sexual health clinic in Italy (89%) and young MSM recruited online in the USA (88%) showed the highest acceptability (Giuliani et al., 2016; Sanchez et al., 2012). None of the students (0%) from Malaysia perceived themselves likely to receive the HPV vaccine due to their lack of awareness of HPV (Al-Naggar, 2012). MSM attending sexual health clinics consistently showed higher HPV vaccine acceptability than MSM recruited from other settings. One study that assessed intentions to receive the HPV vaccine found that men had formed weak intentions to obtain the vaccine, despite it being highly acceptable (Wheldon et al., 2011). Four studies reported that only a third of MSM (one study reported 73%) were prepared to pay for the HPV vaccine. In the Italian study from 2016, 89% of MSM were willing to receive the HPV vaccine if it could protect against both genital warts and cancer, and 83% showed willingness if the vaccine was only protective against cancers, but not warts (Giuliani et al., 2016).

Five studies from the USA measured the actual uptake of the HPV vaccine in MSM. A study of MSM visiting a specialist HPV treatment clinic, before the vaccine was officially

recommended to MSM, found that only 6% of men agreed to pay for the ‘off-label’ vaccination. In 2011, the year when HPV vaccine was recommended to MSM in the USA, Meites et al. (2014) measured the baseline HPV vaccine uptake in MSM through the National HIV Behavioural Surveillance System. While 2.7% (262/9819) reported receiving at least one dose of the HPV vaccine, this proportion was higher in men aged 18-29 years (4.9%). In December 2011, a survey of young MSM (Cummings et al., 2015) showed that 6.8% reported initiating the HPV vaccine. Around 88% of the studied men were willing to accept the HPV vaccine. Next, a survey conducted in October 2013 by Reiter et al (2015) aimed to assess the HPV vaccine uptake and acceptability amongst young MSM. The results showed that 13% had initiated the HPV vaccine and 74% of unvaccinated men were willing to receive it. The most recent study by Gerend et al (2016), which also examined a group of young MSM, reported that 21% initiated HPV vaccination and of those 41% completed the 3-dose vaccination course.

4.3.2.5. Correlates of HPV vaccine acceptability

Table 5 summarises statistically significant correlates of HPV vaccine acceptability among MSM. In total, there were 36 (28 positive and 8 negative) correlates of HPV vaccine acceptability in MSM. Amongst demographic factors, men that achieved higher educational attainment, reported higher earnings and longer period of residency in their place of living, were more likely to accept the vaccine. One study amongst MSM aged 18-26 years in the USA, showed that acceptability varied by age, with the youngest men (18-20 years) being more likely to initiate vaccination (Meites et al., 2014). However, six other studies did not show this association, indicating that age was not a consistent predictor of HPV vaccine acceptability. Six studies showed that men who heard of HPV and knew about HPV and the HPV vaccine were significantly more likely to accept the vaccine. MSM living in the USA showed higher rates of HPV awareness than MSM in countries where HPV vaccination was not available to men. For example, 85% of MSM from a New York sexual health clinic had heard of HPV and 86% reported willingness to receive the vaccine (Sanchez et al., 2012). In contrast, none of the Malaysian MSM participants had previously heard of HPV vaccine and none considered themselves likely to receive it (Al-Neggar, 2012).

Table 5. Correlates of HPV vaccine acceptability among MSM

Acceptability correlates	Reference
Positive correlates	
Demographic variables	
Educational attainment – having a degree	9
>\$20,000 Income	13
Length of local residency	21
Access to healthcare	
Vaccinated for Hepatitis A or B	4, 17
Health insurance	17, 20
Healthcare utilisation	16, 17, 19, 20, 21
Openness about sexual orientation	13, 17, 19, 20
Perceived/received doctor's recommendation to vaccinate	4, 16, 19, 20, 23
Behavioural risk indicators	
Number of lifetime sexual partners	13
Ever diagnosed with genital warts	13, 17
Ever diagnosed with an STI	21
HIV-positive status	17
Receptive role in anal sex	21
Inconsistent condom use	21
Knowledge about HPV and HPV vaccine	7, 16, 19, 20
Heard of HPV	13, 21
Watching media reports promoting HPV vaccine	16
Psychological correlates	
Concern about getting HPV related disease	4
Perceived severity of HPV related disease	4, 9, 16
Perceived likelihood of getting HPV related disease	4, 9, 19
Anticipated regret	4, 20
Perceived effectiveness of HPV vaccine	4, 20
Perceived benefits of HPV vaccination	9, 16
Attitudes towards HPV vaccine	9, 23
Belief that peers would recommend HPV vaccine (social norms)	16, 20
Worry about HPV	19, 20
Shame associated with infection	19
Self-efficacy	23
Negative correlates	
Demographic variable	
Age	23
Behavioural risk indicators	
Not using recreational drugs before or during sex	13
Age of first oral sex with a man	7
Unprotected anal intercourse in the last 6 months	16
Psychological correlates	
Perceived barriers to HPV vaccination (cost, safety)	9, 20
Belief that HPV vaccine is a sign of promiscuity	16
Not self-identified as gay	13
Perceived harms of the HPV vaccine	20

Access to healthcare was positively associated with HPV vaccine acceptability. Five studies showed that past STI testing, regular sexual healthcare, access to HIV/AIDS services and receiving routine medical check-ups were strongly associated with the willingness to receive the vaccine. Four studies indicated that openness about sexual orientation or same-sex attractions were positively correlated with HPV vaccine acceptability (Rank et al., 2012; Meites et al., 2014; Cummings et al., 2015; Reiter et al., 2015). MSM that had health insurance and received hepatitis vaccination in the past were more likely to accept vaccination (Meites et al., 2014; Reiter et al., 2015). Across five studies, men that perceived their doctors to recommend HPV vaccination to them or those who had already received recommendation were more likely to accept HPV vaccination. Two studies showed that doctor's recommendation was the strongest predictor of vaccine uptake, demonstrating that men who were encouraged by their doctors to be vaccinated were 42 and 104 times more likely to initiate vaccination.

Nine behavioural risk indicators predicted HPV vaccine acceptability. Men that were diagnosed with an STI, notably genital warts or HIV were more willing to receive the vaccine. Number of lifetime sexual partners and reporting frequent receptive anal intercourse were positively associated with HPV vaccine acceptability. While in one study (Thomas and Goldstone, 2011), unprotected anal intercourse was associated with refusal of HPV vaccination, another study showed that men who reported inconsistent condoms use were more likely to accept the vaccine (Zou et al., 2015). MSM that reported to experience their first oral sex with a man later in their lives (Thomas and Goldstone, 2011) and those that declared to refrain from alcohol or recreational drugs during sex were less likely to accept the vaccine (Rank et al., 2012).

Fifteen psychological factors were associated with HPV vaccine acceptability. MSM that reported being concerned about HPV-related diseases, worry about being infected with HPV and anticipated shame associated with HPV infection were more likely to accept the vaccine. Perceived likelihood of acquiring HPV and developing HPV-related disease as well as stronger perceptions that HPV infection could lead to severe health consequences were positively associated with willingness to accept the vaccine. MSM that had positive attitudes towards HPV vaccination and thought it was beneficial for their health were more likely to accept it. One study showed that self-efficacy predicted acceptability and two studies indicated that MSM who reported anticipated regret about the vaccine were more likely to

accept it (Gerend et al., 2016). Perceptions that HPV vaccine is very effective against HPV were positively correlated with acceptability. Beliefs that most MSM receive the HPV vaccine or that they would recommend it was associated with greater willingness to receive it. Interestingly, beliefs that HPV vaccination can be harmful and that it is a sign of promiscuity were negatively associated with acceptability. MSM that perceived greater barriers to HPV vaccination such as cost or safety were less likely to accept it.

4.4. Discussion

Regardless of poor awareness of HPV and HPV vaccination, the majority of MSM would be willing to accept the HPV vaccine. Studies conducted on SHC attendees showed the highest HPV vaccine acceptability. The findings show an increasing trend in HPV vaccine uptake amongst MSM since the introduction of HPV gender-neutral HPV vaccination in the USA. Various demographic behavioural and psychological variables have been associated with HPV vaccine acceptability. Knowledge about HPV and HPV vaccine, healthcare utilisation, openness about sexual orientation and receiving doctor's recommendations were the most frequently reported positive predictors of HPV vaccine acceptability. Men that perceived barriers to HPV vaccination in relation to its cost, possible side-effects or the lack of availability were less likely to accept the vaccine.

4.4.1. HPV and HPV vaccine-related perceptions amongst MSM

The knowledge about HPV infection amongst MSM is poor, the majority of MSM are not aware of the HPV vaccine and most do not know that HPV is associated with genital warts and cancers. There are also major misconceptions about HPV symptoms and treatment such as the belief that it could be treated with antibiotics, indicating that MSM are likely to confuse HPV with bacterial STIs such as gonorrhea or chlamydia. A systematic review of studies assessing the knowledge about HPV infection (Klug et al., 2008) showed that the general public was largely unaware about HPV before HPV vaccination was introduced. It showed a large variability (13-93%) in HPV awareness across 39 studies and a poor understanding of the link between HPV and anogenital cancers. Their review demonstrated that men had significantly lower knowledge about HPV than women. Therefore, poor HPV knowledge amongst MSM is likely to reflect the general public understanding of the virus. Because the vaccine was initially offered only to adolescent girls against cervical cancers, the information that HPV could cause health problems in men has lacked visibility,

especially in studies that were conducted before the official recommendation of HPV vaccination in men in the USA. The recent studies on the HPV vaccine uptake amongst MSM in the USA showed increased levels of HPV knowledge and this trend is likely to be strengthened, given the provision of health education highlighting the need for HPV vaccination in both sexes.

Amongst MSM that know about HPV, most feel they are not at risk of the virus and that it does not cause any major health problems. Most MSM are not concerned about HPV infection, but they perceive HPV-related genital warts and cancers as severe. Similar perceptions were observed in studies on hepatitis A-B vaccination in Chapter III demonstrating that the majority of MSM were not concerned about hepatitis and other STIs, but HIV. In addition, several studies (MacKellar et al, 2007; Mimiaga et al., 2007; Downing 2014) on risk perceptions of STIs showed that MSM did not perceive themselves to be at risk of STIs, suggesting that perceptions of likelihood to either acquire an STI or develop STI-related symptoms may vary depending on specific contexts. Van der Snoek et al. (2006) argued that MSM have much better knowledge about HIV than other STIs and they reported lower perceived risk of acquiring other than HIV STIs. Thus, this review supports the evidence that MSM do not perceive themselves at risk of STIs including HPV. They also have a poor understanding that the HPV infection is essential in the development of genital warts and therefore, MSM are likely to perceive their own risk of HPV and genital warts separately.

4.4.2. HPV vaccine acceptability amongst MSM

Despite little knowledge about HPV, two thirds of MSM would be willing to accept the HPV vaccine, suggesting that HPV knowledge is not necessary for the vaccine to be accepted. The observed differences in acceptability could be explained by variations in HPV awareness, specific perceived barriers such as perceived vaccine cost, uncertainty about personal eligibility, side effects and perceptions of vaccine effectiveness. These findings are useful in the context of targeted vaccination, as little knowledge about HPV, low perceived susceptibility to HPV infection, negative attitudes towards the vaccine and lack of readiness to discuss same-sex practices with HCPs are likely to compromise the effectiveness of this preventive method. Previous studies on hepatitis vaccination, reported in this doctoral thesis (Chapter III) showed comparable factors associated with vaccine acceptability, indicating that hepatitis and HPV vaccinations may be both acceptable in MSM.

This high acceptability rate could be explained by the context of vaccinations for MSM and existing female-oriented HPV vaccination. For individuals unaware of HPV, attitudes such as the willingness to accept vaccination are likely to be constructed instantly rather than revealed if faced with vaccination offer. These attitudes are usually weak, unstable and most likely dependent on the environment under which the decision is made (Payne et al., 1992). It is possible that HPV-unaware MSM would construct stronger HPV vaccination preferences when facing a doctor's recommendation in a clinical setting rather than answering a vaccine-related questionnaire. The studies from the USA represent a shift in HPV awareness and HPV vaccine acceptability, with recent studies reporting higher HPV knowledge about acceptability. In contrast, in China, where the HPV vaccine is not recommended to either men or women, HPV awareness and HPV vaccine acceptability were modest. It is possible that existing female HPV vaccination programmes influence the perceptions and beliefs of MSM. Therefore, future studies need to assess HPV vaccine acceptability in the specific context of MSM-targeted vaccination incorporating information about the potential compromised effectiveness (due to the risk of HPV infection), settings, price, delivery methods and so on. Health promotion campaigns needs to consider the distinction between HPV vaccination in MSM and women to increase perceived relevance of the HPV vaccine amongst MSM. Robust acceptability measures might portray scenarios, under which the hypothetical decision is going to be made, in order to increase individual understanding of the vaccination context, assess vaccine desirability and to identify the consistency of these preferences.

HPV awareness might be related to vaccine acceptability, and therefore, it is crucial to examine whether educating MSM about HPV would predict higher vaccine acceptability. Additional health promotion could also encourage younger MSM to disclose sexual orientation to facilitate discussions of HPV vaccine availability. Knowledge about hepatitis B vaccine and openness about sexual orientation to HCPs predicts hepatitis B vaccination (Yee and Rhodes, 2002). UK data demonstrate a 90% uptake of hepatitis B vaccine among MSM at sexual health clinics, suggesting MSM are willing to adopt protective behaviours against STIs (Public Health England, 2014). Australian data indicate that high coverage of MSM-targeted hepatitis B vaccination has contributed to increased levels of hepatitis B immunity in MSM (Gemagedara et al. 2013). Although this suggests that MSM-targeted vaccination is acceptable and achievable, uncertainty exists as to what degree HPV and

hepatitis B vaccination strategies can be compared across various healthcare systems and countries. Consideration should be also given to the specific additional resources needed for this strategy to succeed such as information campaigns encouraging vaccination when evaluating its practicability.

There has been no study examining the feasibility of targeted vaccination in various settings (e.g. primary care, pharmacies, specialised sexual health services, alternative settings) and further investigation is needed to identify strategies to enable a large number of MSM to accept HPV vaccination. Willingness to accept HPV vaccine at an early stage of sexual activity is likely to play an important role in establishing effectiveness of this risk-based strategy. Correspondingly, future studies need to examine HCP's attitudes towards offering HPV vaccination to their MSM patients and identify potential training requirements, as doctor's recommendation is a significant factor likely to influence the efficacy of this strategy.

4.4.3. Limitations

Although this is the first systematic review reporting beliefs about HPV and perceptions of the HPV vaccine amongst MSM, there are a number of limitations. Only once study of King et al. (2015) attempted to examine HPV vaccine acceptability amongst MSM in the UK and no correlated were reported. Majority of the studies were conducted before official recommendations of HPV vaccination for MSM in various countries. The specificity of healthcare systems, such as the difference between insurance-based healthcare system in the USA and publicly funded healthcare system in the UK, is likely to have an impact on HPV vaccine acceptability, healthcare access and disclosure of sexual orientations. The structure, funding and accessibility of sexual health services for MSM differ across countries, so the attempt to compare HPV vaccine acceptability might not be valid. The majority of studies were conducted in the USA and they present an increase in HPV vaccine acceptability and eventually vaccine uptake in time, with studies published most recently reporting high HPV vaccine acceptability and uptake. This could be the effect of awareness campaigns and the policies recommending the HPV vaccine to MSM. Thus, HPV vaccine acceptability is expected to be lower in countries such as the UK, where male HPV vaccination is not yet introduced. Similarly, countries such as China and Malaysia, where female HPV vaccination is not recommended, showed the lowest acceptability rates. Therefore, this review identifies

factors associated with HPV vaccine acceptability, but their relevance to MSM-targeted HPV vaccination in the UK needs to be established.

Correspondingly, as reported in the review on hepatitis vaccination (Chapter III), the measures used to ascertain HPV vaccine acceptability and uptake were heterogeneous. In the absence of standardised HPV vaccine acceptability tool, studies utilised various measures to predict willingness to receive the HPV vaccine. Most of them were based on a single item and were reduced to a question about perceived willingness, likelihood or acceptability. Thus, the comparability of findings is limited as various constructs are likely to present different psychological properties. For example, studies that utilised ‘intention’ measures showed lower acceptability than studies that used ‘willingness’ measures, suggesting that these tools might examine different aspects of HPV vaccine acceptability, desirability, readiness and planning. Therefore, there is a need for a sensitive, valid and reliable measure of HPV vaccine acceptability able to estimate the future uptake.

Although seven studies applied psychological frameworks in their design, most studies used constructs from various models. The two models used in these studies were the Health Belief Model and the Theory of Planned Behaviour. These models were not primarily developed for vaccination behaviours specifically and their focus is on beliefs and cognitive processes associated with planning. These frameworks are reduced to decision-making processes and may not distinguish between contextual, social or political influences. Thus, the results of this review are subject to the selection of theoretical models from researchers designing studies on HPV vaccine acceptability in MSM. It is possible that the use of other theoretical models would enable the identification of other factors associated with vaccination behaviours amongst MSM. In addition, none of the studies that used theoretical models found that all model components were predictive of vaccine acceptability and uptake. Instead, only one or a few constructs from each model were significantly associated with HPV vaccine acceptability. Therefore, future studies on motivation for HPV vaccine in MSM need to abolish a selection of a single model and use a more holistic approach that will account for demographic, behavioural, contextual and psychological factors all together. A qualitative study with MSM would facilitate the identification of key factors that are relevant to MSM-targeted HPV vaccination in MSM in the UK.

4.5. Conclusion

Even without knowledge about the virus and the diseases it can cause, the majority of MSM are receptive to HPV vaccination. Factors related to their sexuality, such as the openness about sexual orientation, access to sexual health services, regular medical check-ups and doctor's recommendation to obtain the HPV vaccine, are associated with the willingness to accept it. Only one study assessed HPV vaccine acceptability in the UK showing that 83% of MSM will agree to receive the vaccine. However, the study did not assess the correlates of HPV vaccine acceptability and did not explore barriers to obtaining the HPV vaccine amongst MSM. Thus, future research is needed to identify barriers and facilitators to the introduction of MSM-targeted HPV vaccination, targeting young MSM who would benefit most from HPV vaccination. A qualitative study of beliefs about HPV and perceptions of the HPV vaccine amongst MSM in the UK is required to explore if any of the identified factors, such as perceived severity of HPV-related cancers or perceived effectiveness of HPV vaccination could be related to HPV vaccine acceptability. A qualitative approach will also facilitate the identification of factors that might not have been reported in studies within this systematic review.

Chapter V – A qualitative study of the impact of information about HPV and HPV vaccination amongst men who have sex with men

5.1. Background

To date, only three studies using qualitative methods have explored beliefs about HPV, genital warts and HPV vaccination. A mixed-methods using questionnaires and group discussions with young African American MSM indicated that although 41% reported an awareness of HPV, their understanding of the virus and the HPV vaccine varied substantially between participants (Gutierrez et al., 2013). Most men believed the vaccine was only available to women and not available to MSM. Although several MSM correctly associated HPV with genital warts, some thought HPV also caused blisters and ulcers commonly associated with genital herpes, suggesting that young men struggle to recognise individual STI symptoms. Also, most men struggled to conceptualise HPV as an asymptomatic STI. Despite their incomplete knowledge about HPV, nearly all MSM had positive attitudes towards the HPV vaccine, suggesting that the knowledge about HPV is not necessary for the vaccine to be accepted. HCPs' recommendations to obtain the HPV vaccine were seen as important influences on individual decision-making, indicating that the motivation to vaccinate is strongly associated with HCPs' endorsement.

The second qualitative study explored attitudes towards genital warts using 15 individual interviews and three focus groups with MSM sex workers in Lima, Peru (Nureña, Brown, Galea, Sánchez, & Blas, 2013). This study found a lack of awareness about HPV and its associations with genital warts. Men who had heard about the virus thought it was only related to female health problems. In general, MSM were aware of genital warts, but some were describing them as “scars”, “wounds” or “haemorrhoids”, suggesting that some men might have difficulties recognising genital warts. Genital warts were considered embarrassing, distressing and physically unbearable, potentially causing pain, bleeding and discomfort. Men expressed worry about having genital warts, but they were uncertain how they were acquired or transmitted to their partners. Several men decided not to inform their sexual partners about the infection due to fears of rejection and relationship break-up.

The third study conducted in Denmark investigated the quality of life amongst six MSM with diagnosed genital warts. Although the researchers did not explore attitudes and beliefs

about HPV, some perceptions were relevant to the context of potential MSM-targeted HPV vaccination (Mortensen & Larsen, 2010). In general, genital warts were perceived as a stigmatising infection about which they did not know much before being diagnosed. Once diagnosed, MSM expressed a strong need for more information about the consequences of genital warts and mechanisms of transmission. Once given the explanation of the HPV vaccine, some men perceived it to have benefit over the standard treatment they were receiving. The participants had difficulties understanding the relationship between genital warts and cancers, reporting worry and apprehension about their risk of developing anal cancer. Although genital warts were perceived as a serious and frustrating condition, their concerns were dependant on the information and communication style of their doctors. Genital warts were also perceived having a significant impact on social functioning, with some men fearing isolation and being labelled as promiscuous. When comparing genital warts to other STIs, respondents stated that they were relatively mild, and not as severe as HIV. All participants admitted that genital warts had a negative physical and psychological effect on their lives. This study demonstrated that MSM diagnosed with genital warts express significant concerns about them and perceive the HPV vaccine as potentially useful in their treatment.

The samples of young African Americans, Peruvian sex workers and Danish men with diagnosed genital warts might not represent general beliefs and perspectives of MSM living in the UK because of the differences in HPV awareness, attitudes to vaccinations and engagement with sexual health services. For example, the perceptions of HPV vaccination in the US would differ from the UK perspective as some American men are asked to pay the vaccine themselves if their insurance does not cover it. While the lack of knowledge about HPV and perceptions of genital warts are likely to be similar across various countries, the views on HPV vaccination are likely to differ depending on individual healthcare systems and the public health education. Also, none of the above studies have examined the views on HPV in the context of targeted HPV vaccination delivered through sexual health clinics, as recommended in the UK.

5.1.1. HPV risk communication

The above studies have highlighted that men's knowledge about HPV is poor and they had difficulties to understand the relationship between HPV, genital warts and anal cancers. In order to assess perceptions of the HPV vaccine, there is a need to communicate what HPV

is and what the potential consequences of the infection might occur. Various ways of risk communication and message framing could facilitate more accurate perceptions as MSM need a better understanding of their own risk when evaluating the personal value of the HPV vaccine.

Risk communication is used in medical research and public health education to convey messages about personal risks and potential benefits of preventative programmes or specific treatments. It is to encourage better understanding of personal susceptibility to adverse events and facilitate more accurate decision-making (Elwyn, Edwards and Kinnersley, 1999). The primary aim of any risk messages is to change personal beliefs and influence behaviours to reduce individual threat of adverse events. Usually, the information about risks enables the development of perceptions, beliefs and attitudes and prompts the best course of action to minimise any hazards. The assumption behind risk communication is that a change in patient's knowledge about their susceptibility allows more accurate risk perceptions, leading to a better compliance with actions that can prevent adverse events or diseases.

The evidence about the impact of risk messages on changing health behaviours is modest. For example, a review of studies on HPV communications (Anhang, Goodman, & Goldie, 2004) has demonstrated that information about HPV and HPV diagnosis caused anxiety, anger, fears of cancer, regret and a decrease in physical intimacy activities amongst women offered HPV screening. In some studies, the information about HPV increased perceived susceptibility to HPV-related diseases, notably cervical cancer, but also resulted in the uncertainty and hesitation towards HPV testing. While risk communication changed certain cognitions such as perceptions of personal likelihood of cancer, it also evoked strong emotional reactions, particularly anxiety and worry. In effect, HPV communication about the virus and available screening discouraged some women to accept the HPV test. Thus, risk messages may have unintended negative effects on behaviours. However, the studies were conducted in the population of women attending cervical screening, so the communication of potential risk of HPV were in the context of cancer, which were likely to lead to elevated risk perceptions and anxiety.

5.1.2. Theoretical approach

The results of the scoping review (Chapter III) and the systematic review (Chapter IV) have shown a number of factors associated with vaccine acceptability amongst MSM. They

showed that the level of knowledge about hepatitis and HPV, access to sexual health services, the extent of sexual experience and specific perceptions about the virus and the vaccine were related to the willingness to receive the vaccine and uptake. Although several previous studies on HPV vaccine acceptability were guided by the constructs of the Health Belief Model and the Theory of Planned Behaviour, a number of factors, such as patient-doctor communication, openness of sexual orientation or experience of vaccination in the past, were also identified. These two models focus on decision-making processes, mainly related to beliefs and action planning. Although theory-driven approach might inform the analysis of concepts that could be omitted through inductive processes, there is a possibility that it could be overly reductive if individual meanings and beliefs are not critically interrogated (MacFarlane and O'Reilly-de Brun, 2012). Therefore, this study aimed to acknowledge the key factors associated with HPV vaccine acceptability, notably knowledge, risk perceptions, vaccine effectiveness, but also to facilitate an exploration of ideas and views that might have not been identified in previous qualitative and quantitative studies. Hence, the design and the analysis of this study were not supported by any particular theoretical framework. Instead, the topic schedule only referred to the most commonly cited significant factors associated with HPV vaccine acceptability: knowledge about HPV and the HPV vaccine, the perceived likelihood and perceived seriousness of the HPV infection, genital warts and anal cancer, and perceived barriers to obtaining or accepting the HPV vaccine. This was an exploratory study to examine various beliefs and opinions about HPV and the HPV vaccine in order to identify potential barriers to HPV vaccination amongst MSM in the UK.

5.1.3. Study aims

The specific aims of this study were:

Aim 1: To examine knowledge levels, beliefs about HPV and attitudes towards the HPV vaccine amongst MSM in the UK

Aim 2: To identify barriers to the introduction of an MSM- targeted HPV vaccination programme in the UK

5.2. Methods

This qualitative study followed the Consolidated Criteria for Reporting Qualitative research (COREQ) checklist (Tong et al., 2007).

5.2.1. Qualitative design

Five qualitative approaches: grounded theory, phenomenology, ethnography, narrative and case study research, were considered in the design of this study. Grounded theory was deemed unsuitable, as its methodological aim is to develop a theory, while the aim of this study was to explore lived experiences and perceptions of MSM in the context of their risk to HPV infection and the availability of the HPV vaccine. The ethnographic approach was also excluded, as its primary focus is on the description of groups of people or specific cultures, rather than individual perceptions and health beliefs. It was thought that while MSM could represent a culture, the ecological context of each man was not of prime relevance in this study. The narrative approach was considered inappropriate, because its objective is to gather rich data on individual stories over time. The case study approach was judged as useful, because it could provide insight in the depth of views and perspectives on HPV vaccination for each individual, but a group dynamic and exchange of perspectives could be absent with this methodology. In the light of available scientific evidence and adopted pragmatic epistemological approach, phenomenological methodology was considered as the most suitable, because it enables an investigation of both personal and shared experiences. According to Moustakas (1994) phenomenology presents experiences as they appear, but also the method is capable of acknowledging the principle of perceptions and motivation.

This study applied ‘methodological pluralism’ utilising both focus groups and individual interviews to collect data. Methodological pluralism offers a more comprehensive and holistic approach, as it enables multiple approaches to answer a particular research question. Morse & Chung (2008) argued that the utilisation of individual methods by themselves provide a segmented and incomplete perspective on a research problem. The use of various methodological approaches enables a more thorough and systematic examination of views, perspectives and perceptions (Olsen, 2004). In this study, two different data collection methods, individual face-to-face interviews and group discussions, were selected to capture not only the depth of views but also the range of perspectives on the HPV vaccination. Such methodological pluralism helped to overcome specific limitations of each individual collection method. For example, participants rely on the interaction with the researcher during face-to-face interviews, but the focus groups, where the researcher only encourages the participants to discuss different views or disagreement with each other producing valuable data. For example, the exchange of views between participants during focus groups

may prompt in-depth discussions resulting in a variety of opinions, which could not be captured within an interview. This diversification of opinion during focus groups could enrich the data and allow the identification of a range of perspectives, beliefs and perceptions.

5.2.2. Ethical approval

The study was approved by the Brighton and Sussex Medical School Research Governance and Ethics Committee (Reference number: 14/036/LLE; Appendix D).

5.2.3. Participants

Between 2012 and 2015, the UK JCVI was considering the cost-effectiveness of a HPV vaccination programme targeting MSM. In November 2014, JCVI published an interim statement suggesting that HPV vaccination in MSM up to the age of 40 years, delivered through sexual health clinics was likely to be cost-effective and worthwhile. Thus, this study aimed to recruit MSM between 16 and 40 years old, potentially eligible to receive the HPV vaccine. All self-identified men who are sexually attracted or had already had sex with other men included in the study.

The specific inclusion and exclusion criteria were:

5.2.3.1. Inclusion criteria

- Self-identified men who are sexually attracted to men

5.2.3.2. Exclusion criteria

- Men below the age of 16 and above the age of 40 years old
- Self-identified women
- Self-identified heterosexual men
- Men not able to understand sufficient English to participate in an in-depth discussion about sexual health
- Men unable to provide informed consent

5.2.3.3. Sampling

The initial sampling aimed to form three separate focus groups based on participants' age: 16-20, 21-26 and 27-40 and a corresponding number of face-to-face interviews with

participants aged 16-40 years. However, due to participants' limited availability, last minute drop-outs and the difficulty accessing locations where focus groups and interviews were taking place, it was impossible to retain the sampling consistency. Additional recruitment, notably a visit to AllSorts, a community-based project for young LGBT and targeted recruitment from the Brighton branch of the Terrence Higgins Trust, enabled the formation of two focus groups. One represented views of HIV-positive MSM between the ages of 22 and 28 years, another was predominantly a group of young MSM aged 18-23 years.

5.2.4. Recruitment

Recruitment was conducted between October 2014 and January 2015. There were three methods of recruitment: posters, online advertisement and face-to-face engagement.

Poster, leaflets and adverts

Standard A3 posters and A6 leaflets (Appendix E) were developed to advertise focus group discussions and individual interviews, explaining that the discussions were for gay and bisexual men about their views on sexual health and new vaccines against sexually transmitted infections. Men were offered £15 and the reimbursement of any travel costs within Brighton and Hove as an incentive for their participation. The posters emphasised that all discussions were anonymous and confidential. Men were able to tear off a part of the poster with the study investigator's email address and telephone number.

The posters, leaflets and adverts were distributed in various community locations in Brighton such as gay bars, sauna, clubs and cafes where MSM were likely to gather. They were also circulated in local branches of the Terrence Higgins Trust, Brighton and Hove LGBT Community Safety Forum, Queer Tango classes, Pink Fringe, Access for All, Queer in Brighton, LGBT Health and Inclusion Project (LGBT HIP), Brighton Bothways, MindOut, GScene Magazine, Eyes Wide Open, Brighton & Hove LGBT Switchboard, Changing Attitude Sussex, Allsorts Youth Group, Anything but..., Young People's Centre (YPC), The Gender Trust, Brighton Lesbian and Gay Sports Society, BourneOut, Rainbow Chorus - Brighton, Gay Sunday Walking Group, Cheek2Cheek and Sussex Beacon.

Online advertisement

Multiple e-posters, similar in format to the physical posters described above inviting MSM to participate in discussions, were posted on social media (i.e. Facebook and Twitter).

Specific accounts of local commercial gay bars (e.g. Revenge, The Legends or Doctor Brighton) and a page of Gay Pride Brighton were targeted for advertisement. The University of Brighton and the University of Sussex LGBT student societies were also contacted to distribute the email containing the e-poster. Any men visiting these pages or e-posters were able to anonymously view the investigator's contact details.

Face-to-face engagement

Men were also approached in two gay clubs, three bars and one local LGBT group. The study investigator visited the Brighton branch of AllSorts organisation that supports and empowers young people under the age of 26 years who are lesbian, gay, bisexual, transsexual or unsure of their sexual orientation or gender identity. The study was advertised during one of their meetings and men who were willing to participate were invited to a quiet room on the site. They were then given study information and were able to discuss anything related to the study before taking part.

5.2.5. Procedure

Men interested in participating were asked to email or call the investigator. This was to check the eligibility criteria and to forward the study information sheet and consent form. Once contacted, the investigator screened participants asking about their gender, age and whether they identified as MSM or were sexually attracted to men. Respondents that did not meet the inclusion criteria were thanked for their interest and encouraged to take part in any future studies. The contact details of respondents who met inclusion criteria were entered into a database. They were contacted by the investigator to arrange a specific time and location for the focus group or interview. Everyone had a chance to discuss the consent and their rights to confidentiality and withdrawal via email and face-to-face before the discussion. Individuals were only allowed to participate once. Initially, respondents were invited to the focus groups and once these were conducted, other men of similar age were offered an interview.

Focus groups and interviews took place between November 2014 and March 2015. They were conducted of either the Terrence Higgins Trust office in Brighton or in a quiet room at the Brighton and Sussex Medical School in the Falmer Campus, with an exception of one focus groups formed of AllSorts young project members, which took place at their centre in Brighton. On arrival, the participants were reminded about their rights and asked to fill in a

short demographic questionnaire developed by the investigator. All participants were reminded about the confidentiality of topics and issues discussed during the focus group. All discussions were audio-recorded on two digital recorders and lasted between 45 minutes to 1 hour and 20 minutes. The participants received their ‘thank you’ gratuity (£15 in cash) once the discussion was finished. They had a chance to leave their contact details if they wished to be sent an executive summary of the study results.

Demographic questionnaire

The short demographic questionnaire contained nine questions (Appendix F). The participants were asked to tick boxes that best represented how they felt about themselves, including self-identified gender (with four possible options: ‘male’, ‘female’, ‘transgender – male to female’ and ‘transgender – female to male’) and who they were sexually attracted to (with three possible options: ‘men’, ‘women’, ‘both men and women’, and additional three responses ‘rather not say’, ‘I have never had sex with a man’ and ‘I have never had sex with a woman’). The participants were asked their age, self-identified ethnicity, the age they had their first sexual/romantic encounter with a man and the number of years and/or months they had lived in Brighton and Hove area (with an additional option of ticking a box in case they lived outside the area). Participants were also asked to tick a box representing the lifetime number of male sexual partners they had had (with three options: ‘none’, ‘less than five’ and ‘more than five’). These categories were set to identify men at the beginning of their sexual activity and in relation to female HPV acquisition, which estimates that having five lifetime sexual partners puts women at a sufficient risk for the HPV infection (Tedeschi et al., 2000). The last question asked to specify their employment status (with six options: ‘full-time employed’, ‘part-time employed’, ‘looking for a job’, ‘a student’, ‘on disability support’ and ‘other’).

Topic schedule

All discussions and interviews were semi-structured and guided by a topic schedule (Appendix G). This was developed based on the results of the scoping review and the systematic review (Chapters II and III), which highlighted the various health-related and vaccine-related perceptions in decision-making processes about hepatitis and HPV vaccination. In particular, the topic schedule aimed to explore perceived likelihood of HPV and perceived severity of HPV-related diseases.

At the beginning, the participants were asked about their experiences of disclosing sexual orientation to HCPs with a broad opening question such as “What sort of experiences have you had discussing your sexuality with a GP or any other doctor or nurse?”. Their views on the disclosure and non-disclosure of sexuality to HCPs were explored in detail. This was set up to facilitate a general discussion about perspectives on sexual healthcare and allow participants to engage in debate.

Table 6. Information about HPV during focus groups and interviews

The sequence of information	The content of the message
Information 1:	Genital Human Papilloma Virus (HPV) is a common virus and most sexually active people will have HPV at some time in their lives. HPV can infect the genital areas of men, including the skin on and around the penis or anus. Most men who get HPV never develop any symptoms or health problems.
Information 2:	About 1% of sexually active men have genital warts at any one time, as a result of HPV infection. There are one or more growths and they usually do not hurt.
Information 3:	HPV infection in men can result in cancers of the penis, anus and back of throat, but these cancers are very rare.
Information 4:	Gay and bisexual men (men who have sex with men) are about 17 times more likely to develop anal cancer than men who only have sex with women.
Information 5:	There is an HPV vaccine that can help protect you against the types of HPV that most commonly cause problems in men. It protects against new HPV infections; it does not cure existing HPV infections or disease (like genital warts). It is most effective when given as early as possible, ideally before you start having sex. The vaccine is not currently available for men in the United Kingdom, but health authorities are considering whether to vaccinate gay and bisexual men in the future.

Next, participants' knowledge, beliefs and attitudes towards vaccines against sexually transmitted infections were assessed. The aim was to examine how much MSM knew about these vaccines without providing any information about HPV at this stage. Previous studies have shown that MSM knew little about HPV and HPV related diseases. Therefore, throughout the discussion, the study investigator presented five pieces of information about HPV, HPV-related disease and HPV vaccine (Table 6). These messages were read out loud and presented to participants on printed cards so they could process the content of the

message in their own time. The wording of each message was adopted from a leaflet ‘HPV and Men’, which is aimed at MSM living in the US that are eligible for the HPV vaccine (Centre for Disease Control and Prevention, 2013). Before and after reading each consequent piece of information, participants’ beliefs and attitudes were re-examined to explore whether being provided information had any impact on their perceptions. For example, men were asked about their perceptions about the severity of HPV infection at the beginning of the interview and asked again after they read the information that HPV infection can result in cancers in men. All discussions followed the same topic schedule and the study investigator encouraged the participants to expand their views.

5.2.6. Data analysis

All discussions were recorded and transcribed verbatim.

Data on the beliefs and attitudes towards HPV and the HPV vaccine were analysed using the Framework Analysis Approach guided by the topic schedule (Gale, Heath, Cameron, Rashid, & Redwood, 2013). The technique involved familiarisation with data (e.g. listening to recordings and reading transcripts) to enable a precise examination. It was then followed by identification of concepts and themes guided by the framework. Newly identified concepts that were not part of the framework were classified as ‘novel’. Next, the codes that corresponded with each concept were indexed by coding of passages to form a thematic map or matrix. Data were then sequenced according to the thematic reference, using headings and subheadings. Passages of text were referenced to participants. This was followed by an interpretation phase, where all views were compared and contrasted. As a result, a specific map of responses representing patterns of issues was created. Due to the character of the study and the sensitivity of the topic, the participants were not offered the opportunity to provide feedback on transcripts of data analysis. Microsoft Office Excel software was used to facilitate the analysis.

5.2.7. My role in this study

This study was conceived and designed by myself with my supervisors: Dr Carrie Llewellyn, Professor Helen Smith and Dr Daniel Richardson. I developed a detailed protocol (including topic guide), gained ethical approval, constructed consent forms and study information sheets. After gaining the ethical approval, this study was then designated to two fourth-year medical students Ms Anja Berglund and Ms Sarah Hurst as their final independent research

project and I took on a supervisory role. Their role was to assist with study recruitment, data collection and transcription. Their analysis was not included in this analysis. Data from interviews and focus groups were analysed individually by myself. The themes were then validated by Mr Alex Pollard, an independent researcher at Brighton and Sussex Medical School. Any inconsistencies and ambiguities were discussed to achieve the final version of the results reflecting themes and sub-themes. Dr Llewellyn was consulted to resolve any significant disagreement between two data analyses.

In accordance with the COREQ checklist, I declare that I had previously conducted one qualitative study as part of my undergraduate training. The participants were informed that I was a doctoral researcher at Brighton and Sussex Medical School and I had an interest in sexual health of MSM.

5.3. Results

Fifty-one men contacted the study investigator expressing their interest in taking part in the discussion. Eight men did not meet the inclusion criteria as they were above the age of 40 years. Eight men did not respond to the study invitation after being sent the blank consent form and the information sheet and three men did not show up on the day the discussion was taking place, with no further contact maintained.

5.3.1. Sample characteristics

A total of thirty-two participants took part in four focus groups and thirteen individual interviews, resulting in seventeen transcripts. The average age of participants was 25 years ($SD = 5$, range: 18-40), 84% (27/32) identified as White and three self-identified as transgender men (female to male). While 21% (7/32) reported to be sexually attracted to both men and women, 79% (25/32) were sexually attracted to men only. The average age of sexual debut was 16 years ($SD = 3$, range: 8-28) and 83% (26/31) reported having more than five lifetime male sexual partners. While 40% (13/32) reported either growing up or living in the Brighton/Hove area for more than five years, 34% (11/32) indicated that they either lived outside of Brighton or had lived in the Brighton/Hove area for less than one year. Fifty-four percent (17/31) were still in education and 22% (7/31) were in full-time employment. Eighty-seven percent (27/31) had already disclosed their sexuality to a HCP. Table 7 presents characteristics of each participant.

Table 7. Characteristics of participants taking part in the qualitative study about HPV and HPV vaccination

ID	Gender	Age (years)	Sexual attraction	Years (y) and months (m) in Brighton	No. of sexual partners	Age at sexual debut (years)	disclosed sexuality to a HCP	Self-identified ethnicity	Employment status	Focus group (F) interview (I)
1	Male	30	Men	10 y	>5	16	yes	White	Part-time	F1
2	Male	26	Men	3 y 4 m	>5	13	yes	White	Part-time	F1
3	Male	27	Men	3 y 6 m	missing	11	yes	White	Part-time/disability	F1
4	Male	33	Men	elsewhere	>5	15	yes	White	Full-time	F1
5	Male	missing	Men & Women	1 y 4 m	>5	17	not sure	White	Student	F2
6	Male	22	Men	3 y 2 m	>5	18	yes	White	Part-time/student	F2
7	Male	26	Men	5 y	>5	13	yes	White	Full-time	F2
8	Male	20	Men & Women	3 m	>5	18	yes	White	Student	F2
9	Male	27	Men	10 y	>5	15	yes	White	Student	F2
10	Transgender	24	Men & Women	11 y	>5	14	yes	White	Volunteer	F2
11	Male	25	Men	elsewhere	>5	13	No	White	Full-time	F3
12	Male	28	Men	6 y	>5	13	yes	White	Student	F3
13	Male	26	Men	8 y	>5	17	no	White	Full-time	F3
14	Male	22	Men	3 y 3 m	>5	16	yes	White	Part-time/student	F3
15	Transgender	18	Men & Women	4 m	<5	16	yes	Mixed-Race	missing	F4
16	Male	21	Men	21 y 2 m	>5	14	yes	White	Full-time	F4
17	Transgender	20	Men & Women	20 y 6 m	<5	19	yes	White	Part-time	F4
18	Male	22	Men	7 y	0	16	yes	White	Student	F4
19	Male	23	Men	4 m	>5	15	no	Asian	Student	F4
20	Male	23	Men & Women	5 y 2 m	>5	19	no	White	Full-time	I
21	Male	20	Men	2 y 2 m	>5	15	yes	White	Part-time/student	I
22	Male	19	Men	1 y 2 m	>5	15	yes	White	Student	I
23	Male	25	Men	4 m	>5	18	yes	White	Student	I
24	Male	29	Men	4 m	>5	12	yes	Chinese	Student	I
25	Male	25	Men	5 m	>5	17	yes	Mixed-Race	Student	I
26	Male	25	Men	5 m	>5	17	yes	White	Student	I
27	Male	20	Men	20 y	<5	18	yes	White	Self-employed	I
28	Male	19	Men & Women	3 m	>5	8	yes	White	Student	I
29	Male	31	Men	1 y 4 months	>5	13	yes	Asian	Student	I
30	Male	40	Men	40 y	<5	20	yes	White	Part-time	I
31	Male	33	Men	9 m	>5	15	yes	White	Part-time/student	I
32	Male	33	Men	10 y	>5	28	yes	White	Full-time	I

5.3.2. Emergent themes

Six main themes were identified (Table 8). As predicted, there was poor awareness of HPV amongst interviewed MSM. Therefore, most perceptions and beliefs were constructed in response to novel information about HPV and the HPV vaccine at the time of the research.

Table 8. Themes from the qualitative study on HPV vaccination in MSM

Theme	Sub-theme
1. Attitudes towards vaccinations against STIs prior to information about HPV	Poor knowledge about vaccinations against STIs Positive attitudes towards vaccinations Perceptions of HPV and HPV vaccine
2. Perceptions after information that HPV is common in men	The comparison between HPV and other STIs Perceived likelihood of HPV infection in men The lack of concern about HPV
3. Perceptions after information that HPV causes genital warts	Perceptions of genital warts Anxiety about genital warts Difficulty in linking HPV and genital warts
4. Perceptions after information that HPV causes cancer	The lack of knowledge about an STI causing cancer The comparison between HPV-related and other cancers The perceived risk of HPV-related cancers The comparison between cancers and genital warts
5. Perceptions after information that MSM are at higher risk of anal cancer	The lack of understanding of causes of anal cancer Change in risk perceptions and levels of concern Perceived methods of protection against HPV
6. Perceptions of HPV vaccination	HPV vaccine acceptability Sexuality as a perceived barrier to HPV vaccination Motivational barriers to HPV vaccination Information needs for decision-making Attitudes towards targeting MSM Acceptable setting for HPV vaccination

5.3.2.1. Attitudes towards vaccinations against STIs prior to information about HPV

Poor knowledge about vaccinations against STIs

The discussions started with the exploration of knowledge about vaccines against STIs. At the beginning, several participants reported not being aware of any vaccines that would protect them against STIs. Some men were able to recall a vaccine being offered at sexual health clinics, but their knowledge of the particular virus, for which the vaccine was protective against, was limited. Men listed the hepatitis and herpes vaccine as well as post-exposure prophylaxis (PEP) against HIV, suggesting a poor understanding of what is regarded as vaccination. Amongst men that were aware of hepatitis vaccinations, some were unable to differentiate between the hepatitis types believing there were injections against hepatitis A, B and C. The dialogue between men during focus groups showed that most MSM knew little about vaccines against STIs.

*I probably don't know any then. Well is there some for hepatitis?
I've had one for hepatitis. Is it B? (#3, Part-time student with a
disability, 27)*

*"Hep B, Hep A and C, isn't it? PEP? That's not a vaccine, is it?
No, it's not a vaccine. Is it post exposure prophylaxis? It's a viral,
reduces the viral load" (#19, Student, 23)*

Amongst men who were aware of a vaccine offered at sexual health clinics, over half knew about hepatitis vaccination for gay and bisexual men. Several participants recalled the hepatitis vaccine being offered alongside HIV testing. However, some men had difficulties remembering the exact circumstances of receiving it.

*"I know about the hepatitis B for gay and bisexual men, apart from
that not really." (#1, Part-time employee, 30)*

*"I don't recall whether I got the vaccine before. They gave me a
test, and the results show that I don't have it, so they didn't talk,
they didn't go further with that question." (#5, Student, age
unknown)*

The vaccinated participants stated that they had not received detailed information about hepatitis and the hepatitis vaccine when it was offered to them. Some men were unclear whether they would ever require a booster or if the vaccine provided them protection for life.

*"I remember when I got it [vaccination], they didn't give much
information. Especially at the time when you're offering it to
people, there should be more information. Then more information,
in general, not specifically at the time" (#3, Part-time student with
a disability, 27)*

Men were unable to identify if any of their friends had also received the vaccine. Several MSM believed that because hepatitis vaccination had not been widely covered in the media,

young gay men were generally uninformed of the available vaccinations and the value of boosters. None of the participants mentioned the HPV vaccine at this stage of the discussion.

Positive attitudes towards vaccinations

Despite reporting little knowledge about vaccines against STIs, most men reported positive attitudes and willingness to undergo vaccinations. Several men stated that they would obtain any vaccine that could protect them against STIs, even if they knew little about the virus, indicating that the lack of knowledge about the vaccine might not prevent the receipt. The participants perceived vaccinations as beneficial, protective and advantageous. They were also compared to other health behaviours such as consistent condom use or regular testing at sexual health clinics. The majority of participants agreed that vaccines were highly acceptable if they were capable of preventing future diseases.

“If it’s gonna help me in the long run against anything harmful then I would say yes.” (#5, Student, age unknown)

“I mean we get medical vaccines quite regularly like we get shots and everything so, yeah I’d be more than willing to get one if it could help an STI or an STD.” (#4, Full-time employee, 33)

Additionally, several men disclosed that they would be willing to receive any vaccine against STIs even if they were not proven to be fully effective, but could potentially reduce their risk of acquiring an infection. The participants discussed vaccine effectiveness and some men agreed that it would be better to receive vaccination even if effectiveness was limited or unknown, rather than to refuse it and risk becoming ill later.

“If it’s meant to be something that could kill you then [a disease], of course, it might be a good idea to be immune to it. I mean it might, even if it doesn’t work, I’d rather be thinking ‘ok, at least I’ve got this and have less of a chance’ rather than ‘oh yeah, I could if I have sex with another guy I could die of this.’ That won’t be good, will it?” (#14, Part-time student, 22)

However, vaccinations in general were not perceived to play a major role in sexual health. Men agreed that they did not seek any particular vaccines in the past and did not approach

any HCP requesting to be vaccinated. Instead, any vaccine received was due to a specific doctor's recommendation. Most participants reported that a doctor's recommendation and encouragement was a key factor encouraging them to receive various vaccines.

"When I was booking a routine screening he just said 'oh do you fall into any of these categories? If so we can offer these vaccinations. Might be a good idea to just get you started' (...). They would have been free for me, having the fact that I was homosexual." (#9, Student, 27)

A few men disclosed that they would not attend a SHC with the primary aim of receiving a vaccine. Visits to SHCs were thought to be in relation to concerns over a potential acquisition of an STI rather than to receive vaccination. Men believed that SHCs were related to diagnosis and treatment of STIs rather than prevention.

"I never see my doctors. Only when I'm really unwell or I've done something with myself but if I need to check up on something whatever but I think I'll only go see a nurse or something at a sexual health clinic." (#9, Student, 27)

Awareness of HPV and the HPV vaccine

Before any message about HPV was presented to participants, most men showed little knowledge of the virus or the HPV vaccine. Typically, older MSM were unaware of HPV and were unable to recall anything related to the HPV vaccine. Younger men were able to recall HPV and the HPV vaccine being offered to girls at school. They believed that HPV only affects women and the infection could cause cervical cancer. The HPV vaccine was perceived as a "*cervical cancer vaccine*" and most participants thought men did not need to be vaccinated.

"I know that it's more dangerous for girls. It can cause genital warts and it can also increase their chances of cervical cancer?"
(#6, Part-time employee and student, 22)

"That's the one where they offer it to young girls before they have their first sexual experience and they're now trying to like extend

it to older girls as well. I don't know much about it." (#10, Volunteer, 24)

5.3.2.2. Perceptions after information that HPV is common in men

At this stage in the discussion, the participants were presented with the following information:

"Genital Human Papilloma Virus (HPV) is a common virus and most sexually active people will have HPV at some time in their lives. HPV can infect the genital areas of men, including the skin on and around the penis or anus. Most men who get HPV never develop any symptoms or health problems."

The comparison between HPV and other STIs

After reading the information about HPV, the participants compared HPV to other STIs and perceived the virus to be relatively harmless and insignificant. Men thought that there were "bigger ones" to worry about referring mainly to HIV infection. Men perceived themselves as being knowledgeable about HIV through various media campaigns and they reported that the lack of media coverage about HPV led them to believe that HPV was not relevant for men or deserving of attention. Several participants described HPV using analogies with HIV, herpes or chlamydia such as the use of tablets for prophylaxis that need to be taken within 72 hours from potential exposure, or that HPV is only spread orally and causes blisters.

"I know people who have had them but it's not something that, you know, being concerned about getting, because HIV they're the ones that are kind of in the media. HPV it's just through personal experience that I've become aware of it" (#11, Full-time employee, 25)

"Is the HPV something when you get it you have a low viral load and then it becomes, like HIV, becomes sensationaly high? Then again reduces, it goes down again so your viral load can no longer spread and then it just stays on you?" (#4, Full-time employee, 33)

Where HPV infections were thought to be asymptomatic, some men compared HPV to chlamydia, gonorrhoea and herpes. The lack of definite symptoms was related to the

perception of HPV being relatively innocuous and trivial. Some men thought HPV was easily curable and the majority of participants did not express any worry or concerns.

"It's like cold sores isn't it? People just carry cold sores and never actually get." (#9, Student, 27)

"There's a lot of concern for the other, where this seems kind of minor. There seems like the kind of thing you can just sort out and not have to worry about." (#12, Student, 28)

Two participants argued that any STI was an issue for their health, regardless of symptoms, and any infection was taken seriously. HPV was perceived to be undesirable and distressing as men reported to be generally sensitive to any problems that affected their genital areas.

"I take my health very seriously so anything would be a big issue for me. Well I think most men are sensitive about their penises and to an extent their anuses so yes I think that would be particularly nasty." (#27, Self-employed, 20)

"I'm sure if I had it, I would freak out because I freak out over everything. I'd probably treat it very severely, even if it is light."
(#4, Full-time employee, 33)

Perceived likelihood of HPV infection in men

After reading the information provided, most men had been surprised and unsettled to learn that HPV could also affect men's health. Some participants were unsure how to respond to the message, with several men repeatedly saying "*I didn't know*". A number of men stated that they had not realised that HPV was also a man's issue. Again, the participants referred to female HPV vaccination at school to highlight the gender-specific, female-oriented messages, which had lead them to believe that HPV only affected women. Several participants believed themselves to be knowledgeable about STIs and yet they were concerned and apprehensive about their lack of awareness of HPV.

"I didn't realise this was an issue for men. I've heard of HPV because when I was at school all the girls had to have

vaccinations for it and they all had the afternoon off and had to queue up for their vaccinations and I thought it was. I mean I knew both sexes could get it cos that's how girls get it they get it from sleeping with men and stuff, but I didn't realise it was really an issue for men I thought if it was then we would've been told about it at school as well rather than them just focusing on girls you know." (#9, Student, 27)

"I think it's kind of a concern that I don't know about this... to be told this. It's concerning that my knowledge isn't as good as I thought it was." (#3, Part-time student with disability, 27)

The participants were unable to estimate how common male HPV infections were. MSM agreed that there was a lack of publicity on the prevalence of HPV infection in men and an absence of clear advice on HPV symptoms they could look for. Some participants assumed that HPV was a rare STI as they had no experience of their male peers having it. Others thought that every sexually active person was susceptible to HPV infection, but it was difficult to tell if they were already infected.

"I think everybody who has sex would be [at risk], if it's most sexually active people will have it at some point in their life then everybody not just gay people but everybody that has sex." (#9, Student, 27)

"My first thought was do I have HPV at the moment. If you can have it with no symptoms." (#19, Student, 23)

Despite now accepting that HPV is common, most participants did not perceive themselves to be at risk and were struggling to estimate their own susceptibility to the virus. Men were unsure if they were ever exposed to HPV as they did not hear about the virus before the study. While some MSM believed that having two sexual partners would be sufficient to acquire the virus, others thought that only promiscuous men are at risk for STIs, including HPV. Several participants believed that being in a monogamous sexual relationship and using condoms would protect them from acquiring HPV.

“I didn’t know what it was until now, so I didn’t know how you got it. I guess I didn’t know anything about the risk I suppose.” (#13, Full-time employee, 26)

“I think everyone is [at risk], from what I’m getting from it. Although, do you mean me specifically because, in terms of like risk? Because if you are only with one person or you use condoms I would imagine you’re fine.” (#23, Student, 25)

Several men were not extensively concerned about their risk of HPV infection. The perceived lack of potential symptoms or health problems in men was associated with a lack of worry or apprehension about HPV. Some participants believed there was no need for concern if most men would not develop any visible signs that their partners would be able to notice. Several men thought it was almost inevitable to acquire the virus if they were sexually active so they accepted their risk of HPV.

“I’m sexually active with other people who have sex with other people so I would say probably quite a big risk of HPV, and I would just get on with it and say that’s probably gonna be part of my life at some point. So, not scared of that one.” (#21, Part-time student, 20)

Men had difficulty understanding their negative STI test results in relation to their HPV risk. For example, some participants believed their consistent negative results following a sexual health screening indicated they were free from any infection, including HPV. Others were uncertain whether HPV was included in standard STI screening and most expressed a willingness to test for the virus in the future.

“[Not at risk of HPV] On the basis that I was sort of tested for everything that was available and so was my sexual partner and neither of us had anything.” (#25, Student, 25)

“When I’ve had sexual health check-ups, I don’t know if they are checking for this, but I always thought it was just chlamydia gonorrhoea and all those things. So, I don’t know if I have been

checked for this. I don't know if I do have this now." (#8, Student, 20)

"The thing I like to be aware about these things, so I can go and get tested [for HPV]" (#1, Part-time employee, 30)

Although most men perceived cervical cancer to have a severe impact on women's health, they believed HPV infections in men were minor and insignificant at this stage in the discussion. Men were perceived to be only the carriers of the virus and HPV was mainly associated with cervical cancer at this stage of the discussion. HPV infection was also perceived to be easily treatable and to not cause any long-term health problems in men. Interestingly, the association between HPV and genital warts was not mentioned by any participant at this point.

"I think if I got it, I don't think it would be that serious. It seems like you can get rid of it and I think it doesn't really cause that many problems for you. I would say not very serious." (#22, Student, 19)

"People are aware of HPV and are aware that it's quite common and that lots of people do have it or carry it, so I guess it might be one that people take less seriously or are less worried about."
(#25, Student, 25)

5.3.2.3. Perceptions after information that HPV causes genital warts

The participants were presented with the following information:

"About 1% of sexually active men have genital warts at any one time, as a result of HPV infection. There are one or more growths and they usually do not hurt."

Perceptions of genital warts

After reading the second message about HPV, nearly all participants perceived genital warts as visually disturbing and distressing. Some described genital warts as "disgusting", "awful", "scary" or "atrocious". Most men agreed that genital warts required medical attention and immediate suspension from any sexual activity.

"It's a choice between going to the doctors and saying 'this needs being seen' to or never getting sex again because no one is going near it. You're going to go to the doctors, aren't you?" (#4, Full-time employee, 33)

The participants thought genital warts were embarrassing and socially unacceptable, having a psychological effect on confidence and self-esteem. If any of their sexual partners were found to have genital warts, men stated they would withdraw from any sexual intercourse. The participants also mentioned the stigma of genital warts and some would fear being judged by their partners if they had developed a skin mutation around genital areas. Genital warts were perceived as highly contagious, and men were concerned that they could pass it to their partners.

"They don't really look that nice, do they? So if I was going to be sleeping with a man that had one I'd be a little bit turned off. I'd be a little bit like 'what's that?' And I'd probably, like if I saw somebody with that, I'd probably wouldn't then sleep with him. I'd probably be like 'Nah, I don't really want to go there'. (#27, Self-employed, 20)

"You'd be the absolute idiot if you had it and then passed it on to everyone else just because of the fact that you didn't get it sorted out." (#12, Student, 28)

Anxiety about genital warts

Men expressed significant concerns and anxiety about genital warts. Most reported being worried and apprehensive about the possibility of developing warts. Several participants stated that they were generally nervous about being infected with any STI, in particular HIV, but while there was low concern about HPV, genital warts were perceived as a more serious condition. The participants focussed on the visual and social aspect of genital warts and the majority agreed that the message about the causal role of HPV in the development of genital warts increased their level of concern and worry.

"From reading this and it's from a scale from 0-10¹, for me I think and my risk is very low but I think if you have genital warts, it's probably quite serious, it's probably like a 7, I don't know." (#32, Full-time employee, 33)

"I wouldn't want them. I think for me honestly the idea of genital warts is something that is really worrying and I think if you had them they're one of those sexually transmitted diseases that I think people would be embarrassed about because you know warts are a bit gross and you don't want them on your bits." (#25, Student, 25)

Despite concerns, some men saw genital warts as somewhat trivial, minor and treatable. Similarly, to the perception of HPV, the majority of participants had difficulties estimating their risk of genital warts. Some believed their use of condoms, being in a monogamous relationship or being selective about their sexual partners protected them from developing genital warts. Men who had not heard of genital warts stated that it was difficult to differentiate genital warts from other STIs.

"I'm going just to say not [at risk] though because I feel like I'm at risk for sort of all STDs because I'm a sexually active person, but then because I'm cautious. I'm going to go with no." (#23, Student, 25)

"I suppose it depends upon your level of vanity because I don't believe they're life threatening or that they hinder your body in any major way but I think any, any infection is pretty bad but obviously it's worse if it's going to harm you in a considerable way." (#26, Student, 25)

Difficulty linking HPV and genital warts

Over a half of men had difficulty in associating genital warts with HPV infection. Men thought about genital warts and HPV as two separate STIs requiring different treatment. It was believed that warts were passed through skin-to-skin contact but not as a viral infection.

¹ Participant referred to a scale, which was not part of the study, to represent the perception of risk

A few participants perceived warts and HPV as a bacterial infection that could be treated with antibiotics. While several participants failed to understand that HPV is a necessary cause of genital warts, even after reading the provided information, others were surprised to learn about the link.

"It says here as a result of HPV. Genital warts are another STI and you should treat them as such. If you can always link it with HPV I'm not sure." (#28, Student, 19)

"Is HPV the only way you get genital warts? That's quite surprising actually that you can get them as a result of the HPV infection."

5.3.2.4. Perceptions after information that HPV causes cancer

The participants were presented with the following information:

"HPV infection in men can result in cancers of the penis, anus and back of throat, but these cancers are very rare."

The lack of knowledge about an STI causing cancer

The majority of men had never heard of penile and anal cancers. They were “surprised”, “shocked” and “disappointed” to read that they could develop genital cancers because of an STI. While some acknowledged that HPV was not predominantly “a women’s issue”, others believed that these cancers would only affect heterosexual men, but not MSM. The participants acknowledged that they were surprised about their lack of knowledge that a common STI, other than HIV, could have serious health consequences.

"I have never come across it in my life. Any type of anal cancer. With anybody I've heard of it but I've never known it and I've never seen it in the media with regards to any more famous celebrities that are gay or I've never read about it with studies in regards to this" (#18, Student, 22)

The lack of awareness about HPV and cancers per se caused apprehension and nervousness. Participants were anxious, because most men perceived themselves to be knowledgeable

about STIs before the discussion. Several men expressed elevated concerns because any form of cancer was perceived as a serious and potentially life-threatening disease. Some men appeared to perceive all cancers as severe, regardless of their type, genesis or anatomical location.

"I had no idea about this. It makes me feel even more concerned about this HPV thing that I had no idea about 20 min ago. It could go as far as give me all these cancers if I were to have it and I didn't even know about. It makes me a bit nervous." (#27, Self-employed, 20)

The perceived risk of HPV-related cancers

While some men were alerted about HPV and genital cancers, others did not perceive themselves to be at risk. They had difficulty understanding how common these cancers were, describing that the lack of previous knowledge of anogenital cancers influenced the way they believed they were at risk of these diseases. Some expressed perceptions of HPV being very common and seeing cancers as very rare. Several participants recognised that they might had already been infected with HPV, but they felt that the possibility of developing cancers because of HPV infection was distant.

"I would most probably think that I have HPV, but I'm not going to get cancer from it. I'm like one of those people who will always think that's not going to happen to me. May happen to someone else but me." (#1, Part-time employee, 30)

While the provided information increased participants' perceptions of being at risk of the virus and genital cancers, a lack of direct experience of HPV-related cancers was associated with the absence of worry and concern. Despite perceiving cancers as a serious and devastating disease, men argued that the lack of direct contact with anyone who had suffered from anogenital cancers made it difficult to estimate their own risk.

"I think that's serious. Though I still don't know anyone, as I've never had a friend that is a gay man that's had HPV that lead to cancer or genital warts." (#21, Student, 20)

Some participants believed that they were unlikely to acquire HPV and develop cancer because of their careful lifestyle choices and protection provided by condoms. Several men compared their risk of HPV-related cancers to the risk of other cancers. Men believed that an accumulation of various risk factors made them susceptible to many different diseases. Some believed that it was difficult to reduce completely their risk of developing all types of cancer. Some men thought that a number of various lifestyle and environmental factors could cause cancer.

“I think that we still live in a society where you mention the word cancer everyone sort of panics. But it says it’s quite rare, so I suppose we also sort of live in the world where everything can cause cancer apparently. You have to kind of level itself out I suppose.” (#2, Part-time employee, 26)

Some participants assessed their lifestyle to conclude that they were more concerned about developing cancer because of other risk-risk factors such as smoking, drinking alcohol or being overweight. For example, lung or testicular cancers were recognised as more common than anal cancers and they were more likely to learn about these cancers from their friends and the media. Several men believed that everyone was at some risk of a cancer. Thus, some agreed that it was difficult to be constantly preoccupied with a cancer worry. They referred to an overload of cancer education and fatigue in being constantly hypervigilant. They indicated bad luck, helplessness and the lack of control over one’s likelihood to develop cancer.

“I think I probably see myself at risk of various other cancers before that is a thing to be worried about. On the grand scheme of worrying about things. I smoke socially, I would probably be considered to be a binge drinker, I have been. I know I drink in a way that is considered to be binge drinking. I’m slightly overweight, there’s a history of bowel cancer in my family, there’s lots of other health factors which I’m aware of and trying to deal with. That I think would maybe be more alarming.” (#5, Student age unknown)

The participants were divided in their views on their concern about genital warts and cancers. While half of the men thought cancers were more concerning because they were more severe, others were more concerned about genital warts as these were perceived to be more common. Although potentially dangerous and damaging, cancer was perceived as a distant and rare disease, alongside other life events that also involve risk. Warts were seen to be curable and most participants focussed on their detrimental social and psychological impact.

“Genital warts you can have them removed. I think with cancer that can be dealt with, but it can still come back but then so can genital warts. I’d say out of the two I’d be more concerned with cancer.” (#31, Part-time employee/student, 33)

“Genital warts, because cancer, as I say obviously, I really don’t want to have cancer, but if you start worrying about ‘am I gonna get cancer’ you’re gonna start worrying about other things like I gonna get hit by a bus when I walk out of here or am I gonna get stabbed or is someone gonna steal my car or whatever. Because the cancer is such a low risk in this situation, probably lower than the 1% of genital warts, I should be more worried about genital warts than cancer.” (#21, Part-time, 20)

5.3.2.5. Perceptions after information that MSM are at higher risk of anal cancer

The participants were presented with the following information:

“Gay and bisexual men (men who have sex with men) are about 17 times more likely to develop anal cancer than men who only have sex with women.”

Change in risk perceptions

The information that MSM are 17 times more likely to develop anal cancer than men who have sex with women influenced participants’ risk perceptions. Several men stated that the information made them feel susceptible to HPV and anal cancer. There was a parallel increase in anxiety, concern and worry about HPV.

“Now I feel a lot more at risk. Because I am seventeen times more likely than someone who’s only had sex with a woman,

statistically... umm, to develop anal cancer. Yeah, it's definitely something to think about." (#1, Part-time employee, 30)

Men expressed a need for more facts about anal cancer in MSM. Some participants had a difficulty to understand the '17 times higher' estimate of anal cancer risk for MSM and several men questioned the credibility of the provided information showing disbelief and scepticism. They wanted to know what percentage of all MSM suffer from anal cancer. They declared a willingness to test for HPV and to know if they could potentially be at risk of warts and cancers.

"I don't even know how they would check that. If I hadn't known that, I would never have thought to ask a doctor, but now I feel like I probably should. Like getting checked up on things like that"
(#14, Part-time student, 22)

Comparisons with the risks of women having penetrative sex were also made. While some men became more concerned about their health, others disclosed hopelessness about being diagnosed with cancer, or optimism that they would certainly not develop it. In general, the message was reported to be informative, revealing and useful.

The lack of understanding of the causal role of HPV in anal cancer

Men had difficulties understanding the association between sexual orientation and an increased risk of anal cancer. They struggled to comprehend how penetrative anal intercourse could result in an anal tumour. Several men believed that physical damage to the anus itself is a sufficient risk factor for cancer and so they stated a lack of surprise after reading the message. Participants agreed that men who engage in receptive anal intercourse were at higher risk of anal cancer than those who only practice insertive anal intercourse.

"Gay and bisexual men most probably gonna have anal sex and you're probably gonna damage something inside, which could lead to granulation, or it could lead to something going wrong, something having cancer, so I can understand why it'd be that high, because anal cancer, anal sex and the damage to the anus."
(#21, Part-time employee/student, 20)

Men were unsure whether anal cancers are caused by HPV and questioned whether this was due to the infection. Some participants perceived the anus as biologically unprepared for sexual intercourse and that this increased the risk of passing bacteria and viruses. Although anal intercourse was seen as a high-risk activity, most participants indicated that they would not refrain from this practice, as it was an essential part of their sex life. One participant argued that the message should highlight that unprotected anal intercourse may cause anal cancer because the current message was unclear if condoms were protective against cancers.

“Yeah, probably is linked. I would say. But then, of course, you could have sex with someone who doesn’t have HPV for all of your life and not get HPV but have anal cancer, so probably is linked but not a massive thing.” (#22, Student, 19)

Perceived methods of protection against HPV

Most participants believed that condoms provided protection against HPV. Several men were encouraged to use condoms after reading about HPV, and believed that condoms were sufficient against genital warts and cancers. Selection of sexual partners, who look after their sexual health, discussions about the history of STIs, being in a monogamous relationship and undergoing regular sexual health screening were listed as protective behaviours against HPV-related diseases.

“Well, I’d use condoms when you’re having sex. Make sure that the condoms are in date, and you’ve looked at them and bought them from a reputable place. You ask the person ‘Have you got anything? Have you got any STI?’ and weigh up how well do I know this person, how likely is this person to be honest with me, does this person have a reputation of sleeping with lots of people or having STIs and is using your judgement of if I have sex with this person is it worth the risk?” (#2, Part-time employee, 26)

A small number of men were unsure if condoms were effective against HPV because of the possible skin-to-skin route of transmission. Some participants were concerned that HPV could be acquired through oral sex or anal sexual practices such as rimming.

"I suppose it's like any other STIs you know, use condoms. But then there are things that obviously condoms don't work like or condoms work or people don't do them with condoms, sort of oral sex without condoms. Then also if they do rimming, for instance, they probably can't do it with a condom, or you can't put like something, you can't put a piece of plastic or something that would be weird." (#23, Student, 25)

5.3.2.6. Perceptions of HPV vaccination

The participants were presented with the following information:

"There is an HPV vaccine that can help protect you against the types of HPV that most commonly cause problems in men. It protects against new HPV infections; it does not cure existing HPV infections or disease (like genital warts). It is most effective when given as early as possible, ideally before you start having sex. The vaccine is not currently available for men in the United Kingdom, but health authorities are considering whether to vaccinate gay and bisexual men in the future"

HPV vaccine acceptability

All men expressed willingness to be vaccinated against HPV. Some participants signalled their readiness to request the vaccine asking about the place where they can request it. Others reported that they would prefer to wait until an HCP offered it to them. Men perceived doctors as a trusted source of information and their opinions and recommendations would influence their decision whether to obtain the vaccine or not. Several men expressed willingness to receive the HPV vaccine even when they did not believe they were at risk of HPV.

"I would be perfectly happy to be vaccinated against it just in case yes. Definitely I'd like to protect my health in any way possible even if I'm not at substantial risk at the present of catching the virus." (#4, Full-time employee, 33)

Three men indicated that they would only be willing to be vaccinated if it was free of charge. They stated that they would decline vaccination if they had to cover its cost. Offering the

vaccine alongside regular sexual health screening or GP consultation was perceived as suitable and adequate.

"I think I'd be more likely to accept it if it were offered than I would actively request it. I think because if it was, if it was recommended to you it would be coming from a trusted source. Even though the information, you know that you've relayed to me now, here may be exactly the same as that's put up on a wall, the, I think the perception would be you know if your GP was like 'you should consider having this vaccination', um, there'd be a certain amount of weight and trust and perceived knowledge and wisdom from that party, as opposed to just the information that you've just read and then leaving you to make the decision." (#1, Part-time employee, 30)

Sexuality as a perceived barrier to HPV vaccination

Participants perceived sexuality as a barrier to HPV vaccination. Several men argued that sexuality is fluid, and they had known men who identified as heterosexual but had sex with other men. It was perceived that teenagers and young adults experiment with sexuality, which is not reflective of their sexual orientation. Men believed that same-sex sexual contacts were becoming more acceptable and it was difficult to identify the boundaries between men that identify as gay or straight. Two participants referred to a trend amongst teenagers to disclose bisexuality and experiment with both boys and girls. Thus, some men argued that MSM, who do not identify as gay or bisexual might not have a chance to receive the vaccine if it was only offered to self-declared gay or bisexual men. Participants considered men who engaged in same-sex practices but did not want to be associated with the 'gay culture' and potential risks of HPV if it only affected gay men.

"I think sexuality for the majority of people is more fluid and flexible than we like to think about most of the time. You know the whole 'tick box' thing is very easy, but I know many people who identify as heterosexual or straight but at some point in their lives experimented with the same-sex partner." (#1, Part-time employee, 30)

One participant stated that he had never been to a sexual health clinic and therefore, the vaccine needed to be available in other accessible settings. Also, one participant was not willing to disclose his sexuality to a doctor and would not like to be labelled as ‘gay man’. Thus, he perceived himself to be unlikely to uptake the HPV vaccine.

“I’m the kind of person that I don’t want to reveal my sexual orientation and if the leaflets keep telling me that if you’re gay then it’s more serious and if you’re not than it’s not, that it’s fine, then probably I still don’t want to take it because I don’t want to be labelled that I’m a gay man. When I’m balancing to be reviewed and to get the vaccination and since it’s not that high risk, so I wouldn’t choose to be vaccinated.” (#19, Student, 23)

Although several participants believed that young men did not feel comfortable discussing their sexuality with HCPs, nearly all agreed that it would not stop them being vaccinated. Another participant also indicated that he searches for signs of friendliness towards gay and bisexual men in HCPs before he is ready to discuss any issues related to sexuality.

“Just body language. I guess a reluctance to make conversation or just being almost cold in that they’re just getting information without taking into account that this could be some sort of sensitive issue. Especially if sexuality is involved.” (#25, Student, 25)

One man stated that offering the vaccine to women and gay men at the same time would undermine men’s masculinity because the vaccine has been initially introduced to combat female genital diseases. One participant stated that men who only engage in inserted anal intercourse would be less likely to accept the vaccine if it was only to prevent anal cancer.

“It may be that masculinity aspect of it if it’s been given to women only previously [laughs]. Services that are exclusively given to women I suppose seem feminine and if a man doesn’t, I can’t, I don’t know anybody like this and I’ve never met anybody like this but I can imagine that are some people who would resist against

something if they thought it had feminine associations to it.” (#9, Student, 27)

Motivational barriers to HPV vaccination

Men also perceived several additional obstacles to HPV vaccination for MSM. For example, a few participants emphasised the need to educate MSM about the vaccine to encourage them to visit their doctor and ask to be vaccinated. Some men were afraid that the vaccine could have serious side effects or even lead to autism. Participants also questioned the effectiveness of the vaccine in sexually active men who might already have been exposed to HPV or had genital warts in the past. Some of them thought that the vaccine would probably be ineffective and they did not need to be vaccinated.

“I suppose the only reason why you would not is because it says it does not cure existing HPV infections so if you already have it, that would be the only reason, don’t need that.” (#2, Part-time employee, 26)

A dislike and distrust of vaccinations were also perceived as barriers. Some men questioned if the vaccine was being tested on gay and bisexual men. Fear of needles and aversion to injections were also expressed. One participant reported being overwhelmed with various information about safe sex and the risk of different STIs, arguing that it was difficult to understand the symptoms of each infection. Some MSM associated the vaccine with promiscuity and expressed concerns about stigma if they were to accept the HPV vaccination. Several men stated that despite seeing vaccination to be important for their health, they never felt an urge to be vaccinated against any disease. They expressed a ‘fatigue’, when they might be aware of the value of vaccination, but still not make any effort to obtain it.

“You can push and push and push with posters and campaigns and stuff but the people that ain’t gonna do it ain’t gonna do it.” (#1, Part-time employee, 30)

Information needs in decision-making

Several men requested additional information about HPV vaccination. They wanted to know if the HPV vaccine is harmless and safe, and whether it could cause any adverse side effects.

“I would need to know about any possible side effects, possible risks like long-term issues. Um, any time the vaccine fails or has failed or if it just general information about any, any effect it could have on my body besides actually the HPV.” (#2, Part-time employee, 26)

The participants wanted to know about the vaccine effectiveness in sexually active men. Men who declared being HIV-positive were concerned about the interaction between the HPV vaccine and their treatment against HIV. Several participants had difficulties understanding why MSM are at an increased risk for HPV-related diseases and requested more statistics on the prevalence of these diseases in gay and bisexual men. They wished to know more about HPV symptoms, routes of transmission, and whether they could be tested for it. A few participants suggested that having a picture of genital warts and HPV-related cancers would help them to understand these diseases. Men wanted to know how much the vaccine costs and where they can obtain.

“I want to know how and where or even when it could be available, or where can I get it and how it works, how long is it staying in your body. “(#9, Student, 27)

Attitudes towards targeting MSM

Most participants were in favour of gender-neutral HPV vaccination at school. They expressed regret and a sense of injustice that HPV vaccination was not routinely offered to boys, as HPV affects all men, not just gay or bisexual. Men were concerned that their sexual experience could put them at greater risk of HPV and reduce the vaccine effectiveness.

“If it’s been proven to protect you against problem in men then yeah I’m a man so... I would be more concerned about why health authorities are considering whether to vaccinate gay or bisexual men in the future. What are they gonna do? Cos it seems to me like

it's all men, not just gay and bisexual men. So they should just offer it with the girls at school." (#25, Student, 25)

A few participants believed that highlighting the additional risk of anal cancer amongst MSM only would increase stigma and prejudice, comparable to the AIDS epidemic. Some men believed that a targeted HPV vaccination programme for MSM would not be received well by the gay community that have already been marginalised because of the high incidence of HIV.

"If there's another virus, like HPV, it's going to be strongly linked to gay men community again. I don't think it's a good thing for people because it will strengthen the gay label to this specific disease. I don't think people will like it. Since they just got rid of HIV labels and they don't want another stigma again." (#28, Student, 19)

Acceptable settings for HPV vaccination

The majority of men thought targeted HPV vaccination of MSM at school was not acceptable, most believed sexual health clinics would be the most suitable setting that would attract many MSM. These healthcare settings were perceived as relevant to sexual health and the openness and non-judgemental attitudes of sexual HCPs were thought to be reassuring. HPV vaccination was most acceptable when given alongside sexual health screening and together with hepatitis vaccination. Although some men had difficulties discussing sexual health with their general practitioners, a few believed that the vaccine should be offered at GP surgeries because most young men do not access sexual health services.

"If they start routinely testing for this at GUM clinics, and you're negative and not carrying it, then it should be suggested to you at the same point [like] they would suggest a hepatitis A and C vaccine. "#4, Full-time employee, 33)

"I think the best thing is to do it at your GP everywhere, offer it so don't make it like you have to go to a place to get it cos then there is potentially like, oh I have to make an appointment at a sexual health clinic, two, there's a stigma oh I need to go to a sexual

health clinic so remove all that offer it at GP, if you want it, you'll get it." (#1, Part-time employee, 30)

5.4. Discussion

5.4.1. Low levels of awareness about HPV

This study shows that MSM had a poor understanding of vaccines against STIs. Although most were aware of a hepatitis vaccine, men had difficulties recalling the circumstances in which they had received it. Some MSM were able to remember a vaccine delivered through a sexual health clinic alongside HIV screening, but they were unsure about the specific STI type. Men also expressed dissatisfaction with the lack of information they received while undergoing vaccination. Previous studies have demonstrated that people have difficulties remembering the specific vaccine types they received (Stupiansky, Zimet, Cummings, Fortenberry, & Shew, 2012). For example, a study of HIV-positive MSM has shown that men had difficulties recalling whether they had received vaccinations against hepatitis A or B or both (Taylor et al., 2011). Only 37% of vaccinated men were certain about the type of hepatitis vaccination they received. Similarly, there has been a discrepancy between self-reported vaccine receipt and actual HPV vaccination status amongst women in the USA. Those with significantly more extensive sexual experience are more confident in receiving the HPV vaccine, suggesting an association between the amount of sexual experience and the ability to recall vaccination receipt. Bolton, Holt, Ross, Hughart and Guyer (1998) have also argued that some people are likely to overestimate the number and types of vaccinations received when compared to medical notes, suggesting a specific 'vaccination recall bias'. The authors claimed that the recall bias is mainly due to the passive acceptance and low social desirability of various vaccines. Individuals submissively agree to receive vaccination when facing immediate vaccination offer, with a short time for consideration. Therefore, the findings suggest that the poor recall of MSM past vaccinations could be a universal phenomenon across various populations. Despite poor knowledge, men expressed positive attitudes towards immunisation.

The findings demonstrate that MSM were in favour of vaccination programmes against STIs. Despite low levels of knowledge about vaccines, men perceived them as beneficial, protective and harmless. Several men were concerned about any possible side effects. While the majority perceived vaccines to be as important as condoms and regular STI screening, men disclosed the lack of urgency and determination to receive vaccinations. The

participants argued that even if vaccine effectiveness was speculative, they still would be willing to accept it. Walsh et al. (2008) indicated that despite poor knowledge about the HPV vaccine in 2008, 88% of the UK public showed positive attitudes towards the vaccine and were willing to allow their child under care to receive it. Therefore, the cognitive construct of a vaccine and its association with prevention or harm reduction is likely to influence MSM's beliefs and attitudes towards vaccination. The results suggest that men hold positive attitudes towards vaccinations against STIs even without having prior knowledge or understanding.

MSM had significant knowledge gaps about HPV. The majority did not hear about HPV before any information was presented. Younger men perceived HPV as a female problem and HPV vaccine as an aid to prevent cervical cancers. Men were not concerned about HPV and thought the virus was not relevant to them. This study supports previous findings of Gutierrez et al. (2013) reporting that young gay men perceived the HPV vaccine to be directed at women only having little or no concerns about the infection. Similarly, this qualitative study has indicated that men have a poor understanding of the virus and related diseases.

5.4.2. The impact of information about HPV, genital warts and anogenital cancers

The information presented to participants about HPV had an influence on individual perceptions. After reading that HPV is common in men, the participants started to compare HPV to familiar STIs. The contrast was related to the severity, symptomaticity and the perceived likelihood of these infections. For example, the absence of symptoms indicating HPV infection was compared to asymptomatic chlamydia or gonorrhoea infections. MSM also compared HPV to HIV, believing that the HPV infection was relatively minor and harmless. These findings support the results of a qualitative study on beliefs about HPV in the US which showed that apart from HIV/AIDS individuals show little knowledge and concern about other viral and bacterial STIs (Friedman & Shepeard, 2007). Also, McCaffery, Waller, Nazroo and Wardle (2006) have demonstrated that women who received positive HPV results confused HPV with other STIs such as herpes when attempting to consider potential symptoms. Therefore, the information about HPV encourages men to consider the characteristics and risks of HPV infection.

Although the information that HPV was common in men increased perceived likelihood of the infection in some MSM, it was not associated with a rise in concerns about HPV. Men were surprised to learn that they could also be affected by HPV. Some expressed disappointment with their levels of knowledge about STIs, perceiving themselves as well-informed and educated about sexual health and yet not being aware of HPV. In general, men had difficulties estimating their risk of HPV and to understand how most sexually active men could acquire the virus at some point in their lives. Several MSM believed that they were not at risk of HPV believing that condoms and monogamous relationship status would protect them against the infection. These findings are in contrast to the results of Gutierrez et al. (2013) who found that most MSM participants perceived themselves at risk of HPV due to their sexual practices. This could be due to health promotion campaigns that informed men about their risk of HPV and its sexually transmittable nature. This information has not been publicly available in the UK. Likewise, the results if this study can be compared to the findings of McCaffery et al. (2006) who demonstrated women's shock and disappointment about their positive HPV results. Women expressed concerns they had not perceived themselves to be at risk of HPV. The present study also indicates that although MSM were concerned about having an STI, although they were not specifically worried about HPV. Some believed that negative results following STI screening were a proof that they were free from any STI. The majority of men were unsure whether they can get tested for HPV.

Although most men were aware of genital warts, some had difficulties understanding how they are contracted. In general, MSM found genital warts distressing and disturbing, potentially causing embarrassment and stigma. Men expressed anxiety about the possibility of contracting genital warts in the future. They were concerned about negative reactions of their sexual partners if they developed genital warts. Mortensen and Larsen (2010) also indicated anticipated negative psychological and social consequences of the infection such as anxiety and apprehension. Concerns about prolonged treatment timeline, effectiveness and visible symptoms were associated with psychological burden. Mays et al. (2000) also showed that young women in the US misunderstood the symptoms of genital warts, which were unappealing and distressing. For some MSM, the severity of the HPV infection is judged by the visual and social implications of genital warts.

Despite having negative attitudes, MSM in this study had difficulties comprehending that HPV is a cause of genital warts. Men struggled to understand why only 1% of those infected

with HPV would ever develop genital warts and how this estimate was related to their own risk. Studies from the US (Wheldon, Daley, Buhi, Nyitray, & Giuliano, 2011; Reiter, Brewer, McRee, Gilbert, & Smith, 2010) showed that at least a half of MSM knew that HPV could cause genital warts. It is possible that such a low awareness of HPV as a cause of genital warts in MSM in the UK could be related to the differences in specific vaccination strategies between the UK and the US. While the US has implemented gender-neutral HPV vaccination against cancers and genital warts using Gardasil that protects against four HPV types, the UK has focussed on the prevention of cervical cancers using Cervarix that only protects against high-risk HPV types. The information that the HPV infection is associated with genital warts was omitted in UK public health campaigns and may contribute to MSM's ability to understand that genital warts result from the HPV infection. MSM will continue to perceive genital warts and HPV as two discrete STIs without adequate health education campaigns.

MSM were not aware that an STI could cause genital cancers in men. They perceived the HPV vaccination campaign in the UK to be addressed to adolescent women only. The lack of awareness that they could develop cancer because of HPV was associated with nervousness and anxiety. However, while several men reported significant concerns about their personal risk of cancer, others compared HPV-related cancer to other cancers that could result from lifestyle choices. These participants expressed fatigue with the received media information about various risk factors for cancer, indicating that many of their habits such as drinking or smoking has already put them at risk. Such desensitisation with information about HPV-related cancers could be associated with information overload, when individuals stop processing or absorbing relevant health information (O'Connor et al., 2014). The participants reported being aware of anal cancer before the study, so they compared their risk to more pertinent and significant diseases such as testicular cancer. Men were unable to understand how common HPV-related cancers were and how HPV could progress into cancers. Some men also expressed 'comparative optimistic bias' referring to their low perceived susceptibility to HPV-related cancers in comparison to other people of similar age. Eaton et al. (2008) have demonstrated similar optimistic bias to HPV infection and cancers amongst women who have sex with women in the US. The study showed that women's perceived HPV-related disease prevalence and their current sexual practices were associated with perceived risk. These findings suggest that the understanding of personal characteristics

related to an increase in risk may influence MSM perceived susceptibility to HPV-related cancers.

Nevertheless, when MSM were informed about being 17 times more likely to develop anal cancer than men who had sex with women, their perceptions, feelings and beliefs changed. They reported to be more worried and concerned about their health. Men were disappointed that they were not informed about their increased risk in any health campaigns. While some people accepted the statistics, others wanted to know the prevalence of anal cancer in MSM to understand better their susceptibility. Men compared themselves to women, with some participants suggesting that MSM that engage in insertive anal intercourse were not at risk of anal cancer. There has been no study assessing the impact on information about anal cancer on risk perceptions amongst MSM. However, a study that examined comparative risk perceptions of cervical cancer in young women showed an increase in risk perceptions after information about the role of HPV in cervical cancer was presented (Nadarzynski et al., 2012). The results suggest that informing MSM about HPV and its association with anal cancer could increase their knowledge and alter the perceptions related to HPV vaccine acceptability.

5.4.3. Perceived barriers and attitudes towards the HPV vaccine

Despite the lack of knowledge about HPV and related genital warts and anal cancer, MSM were willing to be vaccinated. MSM indicated that they would be more likely to accept the vaccine if it was offered to them by healthcare professionals as these were perceived as a trusted source of information and medical advice. Previous quantitative studies amongst MSM demonstrated that doctor's recommendation is one of the strongest predictors of HPV and hepatitis vaccine acceptability in the US (Rhodes et al., 2005; Reiter et al., 2010; Thomas and Goldstone; 2011). Although MSM are willing to be vaccinated against HPV, the vaccine desirability is low. Such a low perceived demand for the vaccine could be a significant barrier impeding the implementation of the HPV vaccination programme. This study identified that doctor's recommendation and active promotion are likely to play a major role in achieving the optimal uptake in MSM.

The openness about same-sex experiences and discomfort talking about sexuality with healthcare professionals amongst young MSM are likely to impede the vaccination programme that targets MSM. Several participants reported that younger men experiment

with sexuality and do not identify as gay or bisexual, suggesting a lack of self-identification and delay in the disclosure of sexual orientation. A previous study of hepatitis A and B vaccine in the USA has showed that non-disclosure was negatively correlated with vaccine uptake (Yee and Rhodes, 2002). A meta-analysis of disparities in HIV infection has indicated that some MSM, in particular from ethnic minority background, were less likely to identify as gay and disclose their same-sex behaviours. Therefore, aspects of membership to sexual and ethnic minority could act as a barrier to HPV vaccination. Thus, factors related to sexuality, such as the extent of sexual experience, self-identification, self-disclosure or access to specific sexual health services for MSM are likely to be associated with HPV vaccine acceptability and uptake.

MSM also perceived other motivational obstacles. They expressed the need to educate MSM about HPV and HPV vaccine as unaware men would be unlikely to access sexual health clinics and seek vaccination. Men expressing more concerns about side-effects or vaccine effectiveness in sexually active men could be less likely to accept the vaccine. In general, men did not perceive the HPV vaccine as a relevant and urgent intervention to prevent potential HPV infection. Despite the enthusiasm, men may experience fatigue with various programmes within sexual health. Although HPV vaccine is highly acceptable amongst MSM when HCPs offer it, their motivation to uptake the vaccine might be modest. This study supports previous findings of the systematic review on HPV vaccination in MSM highlighting similar perceived barriers (Chapter III). Knowledge and perceptions of HPV and the HPV vaccine are likely to influence individual motivation for HPV vaccination. Therefore, individual decision-making processes are likely to play an important role in MSM-targeted HPV vaccination. Future studies need to assess the motivation for HPV vaccination amongst MSM and its relationship with vaccine acceptability and uptake.

No previous study has explored the attitudes of MSM towards a targeted HPV vaccination programme. The results show that MSM were in favour of universal male vaccination at school due to their concerns about compromised vaccine effectiveness in sexually active men. The participants thought that if the vaccine was most effective before sexual debut then the best method of protecting MSM would be to vaccinate all young men. They were also concerned about possible stigma to gay and bisexual men similar to that during the AIDS epidemic in the 1980-90's and still present in various countries and parts of the UK (Fish and Williamson, 2016). Men were concerned that the vaccine would be branded as 'gay'

further dividing the society and widening the inequality. A study of acceptability towards a potential AIDS vaccine in the US between 2002 and 2003 demonstrated that MSM were likely to experience stigma associated with concerns and worries about the confidentiality and any potential problems caused by receiving vaccination (Crosby, Holtgrave, Bryant, & Frew, 2004). Therefore, the lack of understanding of the reasons for targeting MSM due to insufficient knowledge about HPB and MSM as well as perceived marginalisation as a population that requires selective vaccination programmes could be received negatively by the MSM community. There is a risk that negative in-group attitudes towards a targeted HPV vaccine programme may impede acceptability and uptake.

The findings of this study identified several potential factors have been associated with HPV vaccine acceptability that were not previously identified in the systematic review (Chapter IV). For example, one participants believed that the provision of HPV vaccination could undermine men's masculinity, suggesting that perceived heteronormativity or internalised homophobia could have a negative influence on HPV vaccine acceptability and uptake. Pyun et al. (2014) demonstrated that MSM who reported higher levels of internalised homophobia were less likely to utilise HIV testing, arguing that the stigma associated with sexual orientation could be a barriers to health interventions targeting MSM. Thus, MSM that live in smaller communities might express higher levels of internalised homophobia due to the reduced access to sexual networks and opportunities to meet other MSM. Also, the participants believed that being in a monogamous relationship could have a protective effect against HPV. Future studies need to explore the relationship between relationship status and HPV vaccine acceptability. In addition, men were deliberating about various healthcare settings for HPV vaccination, indicating that some MSM would have limited or infrequent access to SHCs. Several participants suggested that young MSM in particular have difficulties utilising sexual health services and they could be more likely to access HPV vaccination through primary care settings such as general practice. As such, the lack of access to specific screening and vaccination services at SHC in the context of the UK healthcare system is likely to be associated with HPV vaccine acceptability. This study was not guided by a theoretical framework and these identified factors would inform the development of a quantitative examination of correlates of HPV vaccine acceptability amongst MSM in the UK.

5.4.4. Limitations

This is the first study to examine HPV and the HPV vaccine related perceptions amongst MSM in the UK. However, there are several limitations of this research. The geographical area of Brighton and Hove has a relatively large population of MSM compared to other UK cities. Although it is hard to ascertain reliable data on the size of MSM population in the UK, the Census 2001 (Office for National Statistics, 2011) data have shown that there was a significantly higher number of same-sex couples in Brighton and Hove (1.2%) than in other parts of the UK (national average 0.2%). This geographical area is known to attract sexual minorities influencing the local culture, social norms, knowledge about STIs and individual perceptions. The Brighton and Hove community is characterised by activism and engagement with various LGBT issues. Also, the majority of the study sample were White British men corresponding to the population in Brighton. Therefore, the sample might be less representative of views amongst MSM from the non-white ethnic background and those that live in the parts of the UK where LGBT matters are not visibly represented. Also, the level of education and health literacy of the sample was not assessed, risking the possibility of self-selection bias if men who were willing to take part in the study had already high levels of knowledge about STIs and sexual health services. However, the study advert was designed to invite men who could talk about their experiences of disclosing same-sex behaviours to their doctors in particular, so that MSM with no knowledge of STIs could be included in discussions. Future studies need to explore if men with lower educational qualifications and those from higher social and economic deprivation areas represent similar views on HPV and the HPV vaccine.

There are specific challenges associated with risk communication about anal cancers to MSM. These cancers are very rare and most MSM reported not having any awareness or direct experience with anyone suffering from anal cancer. During the discussions, MSM were informed about the 17 fold increase in the risk of anal cancer when compared to MSW. Men were not given any estimates of the absolute risks to enhance the understanding of the disease incidence. Stone, Yates and Parker (1994) have argued that a single presentation of either absolute or relative risk to patients for low-probability risks is likely to change the way individuals perceive themselves to be vulnerable to these risks. While the absolute risk or incidence rate representation were associated with optimistic biases in estimates of personal risks, the relative risk estimators were associated with the value of comparison statistics rather their susceptibility (Rothman, Klein, & Weinstein, 1996). Therefore, the

information on the relative risk of anal cancer in MSM could evoke unrealistic expectations about the prevalence of anal cancers in MSM. The attitudes towards HPV vaccine might have been different if men were made aware of the prevalence of anal cancers in the population.

There is a need to design a quantitative study to measure HPV vaccine acceptability and related factors in a representative sample of MSM in the UK. Qualitative research was used to gauge the understanding of potential barriers to an MSM-targeted HPV vaccination programme. The method enables the exploration of barriers to HPV vaccine acceptability such as self-identification, the openness about sexuality and access to sexual health services. Despite its methodological limitations, this study was conducted to inform the development of a measurement capable of estimating HPV vaccine acceptability in a wider and more representative sample.

5.5. Conclusion

The study shows that the majority of MSM know little about the relationship between HPV and anogenital warts or cancers. Most thought that HPV affects women only and that it was not relevant to their health. After reading the information about HPV, genital warts and anal cancers in MSM due to the infection, the majority of MSM expressed concerns, worry and an elevated perceived risk of HPV-related diseases. However, a number of MSM still believed that they were not susceptible to HPV infections and related diseases, because they thought that their lifestyle could not expose them to the virus. While nearly all MSM expressed willingness to receive the HPV vaccine if it was offered to them by their doctors, only about a half were prepared to ask for the vaccine themselves, indicating that individual motivation and doctor's recommendation were related to HPV vaccine acceptability. Therefore, MSM need to be informed about the HPV vaccine and their motivation to obtain it must be measured to identify men who would rely on the vaccine offer from an HCP. Doctor's recommendations are likely to play a significant role in HPV vaccine acceptability in the UK and therefore, HCPs' attitudes towards MSM-targeted HPV vaccination need to be measured to identify the level of support towards MSM-targeted HPV vaccination. Low levels of support for this vaccination strategy amongst HCPs would result in suboptimal uptake rates if eligible MSM were not offered the vaccine.

MSM perceive several other barriers to the implementation of HPV vaccination. The lack of awareness about the HPV vaccine, poor self-identification as a gay or bisexual man eligible to receive vaccination, the inability to discuss sexual orientation with a HCP and moderate levels of motivation for obtaining the vaccine were thought to be associated with unwillingness to be vaccinated amongst some MSM. Some MSM were also concerned about a potential stigma if the vaccine was associated with predominantly gay identity, suggesting that it could lead to stereotyping of MSM as promiscuous. Most participants were supportive of gender-neutral HPV vaccination in schools due to their concerns that the vaccine could be less effective in sexually active men, as they might have already been exposed to HPV. Thus, awareness about HPV and motivation for HPV vaccination needs to be examined using a large sample and quantitative methods. Concerns about the vaccine effectiveness were considered as a significant barrier, so it is important to identify if the perception of compromised effectiveness is negatively associated with HPV vaccine acceptability. Future studies need to measure behavioural and psychological factors associated with HPV vaccine acceptability, and if those are stable over time.

Chapter VI – Predictors of HPV vaccine acceptability amongst men who have sex with men: an online survey

6.1. Background

To date, only one study has examined HPV vaccine acceptability amongst MSM in the UK. King et al. (2015) asked 522 MSM attending one of the largest sexual health clinics in central London about their views on potential HPV vaccination. A quarter of the sample was MSM below the age of 26 years and 53% were born outside the UK. Around 87% reported being vaccinated against hepatitis B and 54% demonstrated some knowledge about HPV. One fifth believed they were at average risk of acquiring an STI and almost one in three thought they were below average risk. Interestingly, 41% of MSM reported attending a SHC for the first time after their 25th birthday, suggesting that a significant proportion of MSM might not access HPV vaccination if it was only available for men below the age of 26 years. Also, only 39% had disclosed their sexual orientation to a GP, indicating that primary care settings were less acceptable than specific SHCs for discussion about sexual health issues. King et al. asked MSM to indicate how likely they were to accept the 3-dose HPV vaccine with five possible answers ranging from '*Definitely not*' to '*Definitely*'. They found that 83% of MSM expressed willingness to receive the vaccine (either "*Definitely*" or "*Probably*"), demonstrating that the majority of MSM attending SHCs in London are receptive to HPV vaccination. However, these data from a large SHC in London might not be representative of the MSM population in the UK and men living outside of London might be less likely to access SHCs, disclose sexuality and accept the vaccine. Also, the study did not report on factors associated with willingness to receive the HPV vaccine or identify possible barriers to HPV vaccination. Hence, there is a need to conduct a population-based study recruiting MSM below the age of 26, at the beginning of their sexual activity, to measure if these men would be willing to accept the vaccine.

The two reviews, conducted in this doctoral thesis, (Chapters III and IV) demonstrated that sexual identify, duration of homosexual activity and openness about sexual orientation to HCPs play a major role in vaccine acceptability. For example, men that did not access sexual health services or were not able to discuss their same-sex experiences with HCPs were less likely to accept vaccinations (Reiter et al., 2015). Thus, access to healthcare and the disclosure of sexual orientation affect acceptability and uptake. Also, several psychological

variables were associated with MSM's willingness to be vaccinated. MSM, who did not perceive themselves at risk of HPV and/or hepatitis and did not consider these infections to have a damaging impact on health, were less likely to accept the vaccines. Those men, who had positive attitudes towards the vaccines and believed they, were beneficial for their health were willing to receive it. Perceived barriers, such as the lack of knowledge about the virus or the lack of time to receive it were associated with HPV and hepatitis vaccines acceptability. Knowledge about the virus and vaccines as well as the perception that a doctor would recommend the vaccine to MSM were amongst the strongest predictors of vaccine acceptability. Although these studies report factors associated with vaccination behaviours in MSM, it is uncertain how these findings can be translated into UK vaccination settings. An examination of factors associated with HPV vaccine acceptability amongst MSM in the UK is required to identify barriers to the introduction of MSM-targeted HPV vaccination.

The qualitative study (Chapter V), showed that MSM have a poor understanding of HPV and associated diseases. Many were not aware that men could be affected by the virus. Before being given the health promotion messages about HPV, most MSM did not perceive themselves at risk of the virus and thought the infection was not severe. However, after receiving the messages, nearly all men expressed concerns about HPV and willingness to receive the vaccine, showing that informing MSM about HPV and HPV vaccination influenced how they perceived their risk. MSM were also concerned that their sexual experience could have exposed them to HPV and they were unsure about the vaccine effectiveness. It is possible that the perceived compromised effectiveness of the HPV vaccine could affect the willingness to be vaccinated. Men who believed that the vaccine would not be effective for them may be less likely to accept it. Also, it is necessary to measure if HPV vaccine acceptability is stable over a period of time following exposure to messages about HPV.

6.1.1. Study aims and hypotheses

The specific aims of the following study were:

Aim 1: To estimate baseline HPV vaccine acceptability amongst MSM in the UK.

Hypothesis 1: Based on the findings from King et al (2015), 83% of MSM in the UK are willing to accept the HPV vaccine.

Aim 2: To identify factors associated with HPV vaccine acceptability amongst MSM.

Hypothesis 2: MSM with good knowledge about HPV are more likely to accept the vaccine.

Hypothesis 3: HPV vaccine acceptability is associated with educational attainment, hepatitis B vaccination status and openness about sexual orientation at baseline.

Hypothesis 4: HPV vaccine acceptability is associated with perceptions of HPV risk, seriousness of HPV infection, vaccine effectiveness, benefits of HPV vaccination and barriers to HPV vaccination after receiving information about HPV and the HPV vaccine.

Aim 3: To examine the impact of information about HPV and the HPV vaccine on HPV vaccine acceptability.

Hypothesis 5: Information about HPV and the HPV vaccine is associated with higher HPV vaccine acceptability.

Hypothesis 6: An increase in HPV vaccine acceptability is stable over the period of four weeks.

Hypothesis 7: Information about compromised HPV vaccine effectiveness in sexually active men is associated with lower HPV vaccine acceptability.

6.2. Methods

This quantitative study followed the Strengthening the reporting of Observational Studies in Epidemiology (STROBE) checklist (Von Elm et al., 2007).

6.2.1. Design

A longitudinal, quasi-experimental, between group design was used to assess HPV vaccine acceptability and to examine whether the information about HPV and HPV vaccine increases HPV vaccine acceptability amongst MSM. The primary independent variable was manipulated information about HPV and the HPV vaccine. The dependent variable was HPV vaccine acceptability. The study utilised an online questionnaire to collect data.

HPV vaccine acceptability was assessed at three time points: *at baseline* (time 0), *after the exposure to the information about HPV and the HPV vaccine* (time 1) and *at a follow-up* four weeks later (time 2). The four-week follow-up was set to examine whether HPV vaccine

acceptability was stable over time and to collect additional data on HPV vaccine-related perceptions and beliefs.

Information condition

All participants were randomly assigned, using an integrated randomisation algorithm as part of the online questionnaire, to receive one of two pieces of information about the HPV and HPV vaccine (Table 9). In both information conditions, the participants were first informed that HPV was common and that it did not usually cause any health problems, but in rare cases it could result in genital warts and cancers. Men were also informed that gay, bisexual and other MSM were at higher risk of genital warts and anal cancer. This information was adapted from the “HPV and Men – Fact Sheet” leaflet to promote HPV vaccination in MSM in the US (Centre for Disease Control and Prevention, 2013). *‘Information I’* informed men about the HPV vaccine highlighting that it was most effective before men start having sex, because it could only protect against new HPV infections. Because the HPV vaccine in women is most effective when given before sexual debut, the *Information I* was developed in accordance with this paradigm to emphasise the possibility of compromised effectiveness against the HPV strains if sexually active men have already been exposed to these HPV types. *‘Information II’* informed men about the HPV vaccine highlighting that the vaccine was most effective against new HPV infections and also that it could treat existing infection in half of the men who have been exposed to HPV. *Information II* stressed that sexually active men would also benefit from the HPV vaccine and that some doctors at sexual health clinics recommend the vaccine to their gay and bisexual patients. This message was developed based on the study suggesting that HPV vaccine was associated with 59% reduction in HPV persistence amongst vaccinated MSM (Palefsky et al., 2011).

Each piece of information was assessed using Flesch-Kincaid readability test for reading ease (Williamson and Martin, 2010). The test score was 56% indicating that the two pieces of information were easily understood by 15-year-olds.

Table 9. Two information conditions used in the online survey on HPV vaccine acceptability amongst MSM

	Information condition I (compromised effectiveness of the HPV vaccine)	Information condition II (benefit of the HPV vaccine for sexually active men)
Identical information between groups	Human Papilloma Virus (HPV) is a common sexually transmitted infection. HPV infection does not usually cause any symptoms or health problems, so most men will not know that they are already infected. In very rare cases, HPV can lead to genital warts and cancers.	Gay, bisexual and other men who have sex with men are at much higher risk of genital warts and anal cancers, as a result of HPV infection. HPV vaccine can help protect these men against the types of HPV that most commonly cause health problems such as genital warts.
Distinct information between groups	However, it only protects against new HPV infections. It does not cure existing HPV infections or disease (like genital warts). HPV vaccine is most effective when given as early as possible, ideally before men start having sex. It is because sexual experience increases the likelihood of HPV infection, making the vaccine less effective.	HPV vaccine is most effective against new HPV infections. However, the vaccine could also treat existing infection in half of the men who have already been exposed to HPV. Therefore, sexually active men may also benefit from HPV vaccination. Some doctors at sexual health clinics recommend this vaccine to their gay and bisexual patients.

6.2.2. Ethical approval

The study was approved by the Brighton and Sussex Medical School Research Governance and Ethics Committee (Reference number: 15/098/LLE; Appendix H).

6.2.3. Participants and context

At the time of the study, HPV vaccination was not officially recommended to MSM in the UK. Anecdotally, HCPs from various sexual health clinics in London were already vaccinating some of their gay and bisexual patients. The results from the Genitourinary Medicine Clinic Activity Dataset (GUMCAD; Savage et al., 2013) indicated that 313 men received the HPV vaccine at sexual health clinics in 2013, suggesting that some HCPs were offering the vaccine to their male patients (Public Health England, 2014). However, the circumstances of these vaccinations and the characteristics of men were unknown. In November 2014, JCVI published an interim statement proposing that a targeted HPV vaccination for MSM up to the age of 40, was likely to be cost-effective (The Joint Committee on Vaccination and Immunisation, 2014).

There were several inclusion and exclusion criteria for participation. There were no restrictions on participant's sexual and gender identities. Some MSM do not identify as gay or bisexual and, therefore, men of all sexual identities were allowed to take part (Pathela et al., 2006). However, all self-identified women and heterosexual men who had not had sexual intercourse or who were not attracted to other men were excluded from the study. Self-identified transgender men and women were invited to take part as both were relevant for HPV vaccination. The study did not implement any age restriction, because some men experience their first same-sex intercourse late in life. However, because sexual experience increases the likelihood of HPV infection, the study recruitment concentrated primarily on young MSM, who might be at the beginning of their sexual activity, as these men would benefit the most from HPV vaccination. The study also used a population-based sampling method to recruit men from various parts of the UK to increase its representativeness. Respondents that were born outside of the UK and were resident overseas were excluded from the study, because of their relevance to MSM-targeted HPV vaccination in the UK..

6.2.3.1. Inclusion criteria

The study had following inclusion criteria:

- Self-referred, self-identified men who have sex with men

6.2.3.2. Exclusion criteria

The study had following exclusion criteria:

- Self-identified women
- Self-identified heterosexual men with no experience of same-sex experiences
- Men that were born and were resident outside the United Kingdom
- Men who received HPV vaccination in the past

6.2.4. Recruitment

The study recruitment was conducted between July and November 2015. Two separate methods of recruitment, via leaflets and online advertisement, were used. In addition, snowball sampling was utilised by encouraging the participants to invite their gay and bisexual friends and acquaintances to take part in the survey.

The study employed a web-based survey, hosted by www.SurveyMonkey.com, so all potential participants were directed to the same web address www.Surveymonkey.com/r/vax1. The survey was adapted to various devices so that it could be viewed on computers, tablets and mobile phones. The web-based survey allowed access to a large number of young people throughout the UK to take part in the study. Some of these men might be less likely to access gay-oriented events such as gay pride. The use of an online survey also permitted intimate questions about sexual health that men could find difficult in a face-to-face interview. The online questionnaire was utilised to protect the anonymity and confidentiality of participants by avoiding the physical handling of data. Additionally, the survey was designed to force responses, with option ‘not sure’ or ‘prefer not to say’ to minimise the possibility of missing data. The online survey eliminated the possibility of human error associated with manual data entry, as all responses were automatically entered into the analytical database.

The potential participants were encouraged to fill in the questionnaire by being entered into a prize draw for a voucher worth £75 for completing the survey. Men were asked to complete the survey only once. On completion, a randomisation tool (www.random.org) was used to select the prize winner.

6.2.4.1. Leaflet

Standard A6 leaflet (Appendix I) was developed to advertise the study. The leaflets contained the link to the website and the following working: “*Would you like to be vaccinated against sexually transmitted infections? Fill in our online survey for a chance to win £75. Brighton and Sussex Medical School has launched a confidential online survey on attitudes towards new vaccines available to gay and bisexual men*”. In August 2015, approximately 1200 leaflets were distributed during the Brighton and Hove Pride, which attracts a large number of gay and bisexual men from various parts of the UK. The leaflets were handed out by the main researcher and two sexual health nurses from a SHC in Brighton, who explained the purpose of the study and the recruitment process.

6.2.4.2. Online advertisement

Between July and September 2015, a Facebook advertisement tool was utilised to recruit participants using digital media (www.facebook.com/business). Facebook is the biggest social media for networking and information. Every account holder has their own ‘wall’,

which presents information about members of its networking groups. The Facebook advertisement facilitates the distribution of targeted adverts on an individual's wall. For example, Facebook allows businesses to create various adverts on their products so they can be viewed by certain Facebook members. The main aim of the Facebook advertisement is to drive online sales, promote websites and mobile applications, and raise brand awareness. Facebook has also been utilised to recruit survey participants in previous studies (Nelson et al., 2014; Zhang et al., 2015). MSM are considered a 'hard-to-reach' population, due to difficulties with disclosure and openness of sexual orientation, so the online recruitment method allowed access to young men who might not access gay-oriented facilities (e.g. bars, pubs, social groups or sexual health clinic). Also, this method did not require face-to-face recruitment offering confidentiality and privacy.

First of all, a special advert account was created to manage the recruitment strategy. Next, a specific Facebook page was developed (Appendix J) to distribute a link to the online survey, hosted on SurveyMonkey. The page informed potential participants about the study and the £75 incentive. The Facebook advertisement targeted men who expressed their interest in other men, in the age group between 16 and 26 years, resident in the UK. The advertisement used the following criteria to target MSM:

- Location: United Kingdom
- Gender: Male
- Interested in: Men
- Age: 16-26
- Language: English

6.2.5. Procedure

Once potential participants accessed the link, they were presented with the information and the consent page describing the purpose of the study and highlighting that it aimed to recruit men only. The participants were assured of their confidentiality and their right to withdraw at any point. Men were informed that they were going to be asked to read a short piece of information about vaccines for men and that it would take several minutes to complete the survey. The participants were also told that they would be asked to provide their email address at the end of the survey in order to be contacted with a follow-up questionnaire a few weeks later and to be entered into the prize draw. The consent page asked the participant

to tick if they agreed to participate in the survey, for researchers to use their anonymous data and to be contacted by email with the follow-up survey. Participants that did not indicate their consent were not permitted to proceed further and fill in the questionnaire.

Once they consented to take part in the study, the participants were asked to specify their age, gender and sexual orientation. At this point, any female participants were directed to a ‘thank you’ page appreciating the interest in the study and explaining that it aimed to recruit men only. All excluded respondents were welcomed to contact the main researcher – Tom Nadarzynski with any questions related to the study. All men, as well as self-identified transgender men and women, were able to fill in the questionnaire.

At the end of the survey, the participants were asked to provide an email address and were given an opportunity to receive the results of the study via email by ticking a box with the request. Men were also provided with a type box if they wished to leave any comments about the survey. Finally, participants were presented with an additional page containing links to the NHS Choices website, Terrence Higgins Trust and London Lesbian and Gay Switchboard in the case of any distress or concerns.

Approximately four weeks after the completion of the initial survey, the participants were sent an email inviting them to fill in the follow-up questionnaire by pressing a link. Before the participants were able to answer the questions, they were asked to type their email address. Both initial and follow-up questionnaire were matched by participants’ email. The follow-up survey took around 5 minutes to complete. At the end, men were informed that the aim of the study was to examine perceptions of HPV and the HPV vaccine amongst MSM. Finally, they were again presented with additional links to the NHS Choices website, Terrence Higgins Trust and London Lesbian and Gay Switchboard for support and advice.

6.2.6. Measurements

Figure 9 outlines the order of measurements used in the study. The survey included questions related to socio-demographic characteristics, behavioural risk indicators, access to healthcare, the disclosure of sexual orientation, hepatitis vaccination status, HPV knowledge, HPV vaccine acceptability, risk perceptions, perceived benefits and barriers to HPV vaccination, perceived vaccine effectiveness and hesitancy. All the measures were

intended for self-administration. The exact format of the initial and follow-up questionnaires is in Appendix K.

6.2.6.1. HPV vaccine acceptability

The dependent variable was measured using a seven-item scale. The scale was developed by the main researcher in response to the review of HPV vaccine acceptability measures indicating a lack of homogeneity and consistency of acceptability constructs (Allen et al., 2010). HPV vaccine acceptability instruments did not report reliability or validity and were not based on any theoretical framework. Consistent labelling of constructs and rigorous validation of measures were recommended in prospective studies on HPV vaccine acceptability. The scale was adopted from two previous studies of Gerend et al. (2009) and Bonafide (2015) which measured HPV vaccine acceptability in men. Although both scales showed excellent internal consistency ($\alpha = 0.94$ and $\alpha = 0.91$), they were addressed to a largely heterosexual population. However, these instruments did not reflect specific challenges to HPV vaccination in MSM such as the access to sexual health services and the openness about same-sex experiences, which are necessary for vaccination receipt.

This study used the HPV vaccine acceptability scale, which reflected individual motivation and preparedness to initiate and complete the HPV vaccination course. The participants were asked to estimate the likelihood of performing seven activities related to HPV vaccination by choosing one of five responses: “Very unlikely”, “Somewhat unlikely”, “Neither likely nor unlikely”, “Somewhat likely” and “Very likely”. They were asked to answer how likely it was to i) “Consider being vaccinated against HPV”, ii) “Seek information about HPV”, iii) “Visit a sexual health clinic to be vaccinated against HPV”, iv) “Tell your doctor that you have sex with men in order to be vaccinated against HPV”, v) “Ask your doctor about HPV vaccine”, vi) “Accept HPV vaccine if a doctor offered it to you” and vii) “Receive a course of 3 injections of HPV vaccine over a 6 month period”. There were seven individual scores and a composite score was calculated by averaging responses from items. A score of 1 indicated that participants did not accept the HPV vaccine and a score of 5 indicated that the vaccine was highly acceptable.

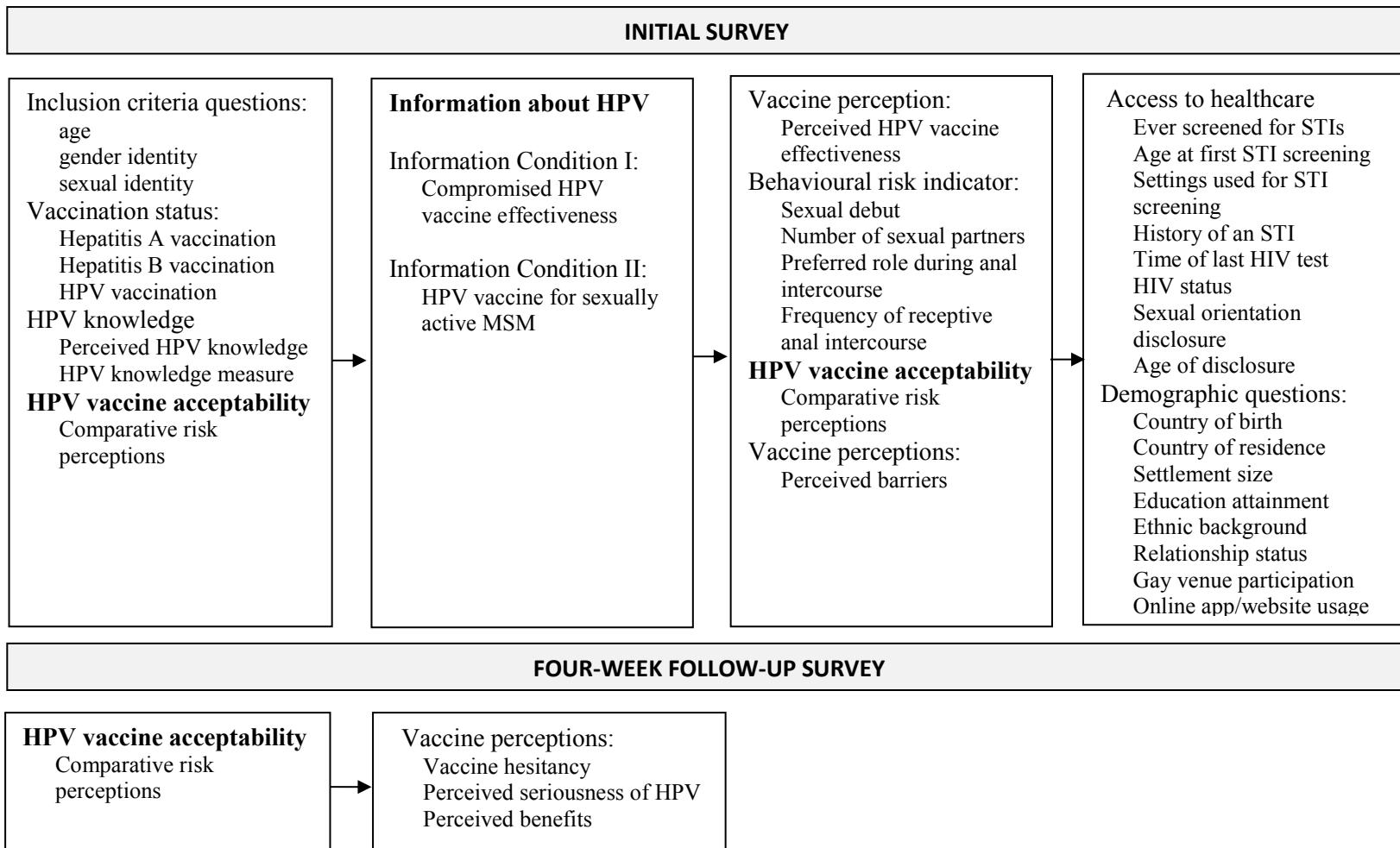


Figure 9. The order of measurements used in the online survey on HPV vaccine acceptability

6.2.6.2. Socio-demographic variables

At the beginning of the survey, the participants were asked to type their age in a provided box. This continuous variable was converted into five categories: “14-18”, “19-21”, “22-24”, “25-30”, and “31-63” to represent the sample composition. Also, the participants were asked to specify their gender with four options: “A man”, “A woman”, Transgender/transsexual (man to woman)” and “Transgender/transsexual (woman to man)”. The gender identity question was selected to assess the eligibility criteria and those that answered “women” were not permitted to fill in the questionnaire. Next, the participants were asked to indicate one out of five options that best described how they thought about themselves: “Heterosexual or Straight”, “Gay or Lesbian”, “Bisexual”, “Prefer not to say” and “Other, please specify”. The sexual identity question was chosen to compare whether MSM that identified themselves as gay were more likely to accept the vaccine than those that identify as heterosexual, bisexual or other. The gender identity and sexual identity questions were originally developed by researchers from the Office for National Statistics (2014) and were part of the set of harmonised questions used in a range of government and health-related surveys.

Three demographic questions asked about participants’ location. They were invited to state if they were born in the UK (“Yes” and “No” answers) and to specify their country of residence with five options: “England”, “Northern Ireland”, “Scotland”, “Wales” and “Elsewhere,”. Men who were born and resided outside the UK were excluded from the analysis because the study focussed on HPV vaccine acceptability of MSM in the UK. The participants were asked to specify the size of the settlement that they were living in with five options: “A very big city or town (a million or more people)”, “A big city or town (500,000-999,999 people)”, “A medium-sized city or town (100,000-499,000 people)”, “A small city or town (10,000-99,000)” and “A village / the countryside (less than 10,000 people)”. This question was selected to examine whether MSM that lived in smaller settlements were less likely to accept the HPV vaccine, suggested by the qualitative study (Chapter V). These questions were adapted from the European MSM Internet Survey (EMIS) (Weatherburn et al., 2013), which is the largest online survey of MSM in Europe, to examine participants’ eligibility for the study.

Two questions were asked about educational attainment and ethnicity. Men were given six options to indicate their highest education qualification: “No secondary qualification”, “CSE

(CSE Grades 2-5, NVQ/ SVQ Level 1, GNVQ/ GSVQ Level 1, City & Guilds Certificate Part 1, RSA Stage 1, 2 or 3, Recognised trade apprenticeship completed)", "O' level (or CSE Grade 1, GCSEs, SCE Standard, NVQ/ SVQ Level 2, GNVQ/ GSVQ Level 2, City & Guilds certificate-Ordinary/Part 2, RSA Diploma)", "A' levels (or AS levels, SCE Higher, NVQ/ SVQ Level 3, GNVQ Advanced/ GSVQ level 3, City & Guilds certificate-Advanced/Part 3, ONC, OND, BTEC National, SCOTVEC National, RSA Advanced Diploma)", "Higher education below degree level (e.g. HNC, HND, Higher Level BTEC, RSA Higher Diploma or other advanced training)" and "University degree completed (e.g. Bachelors, Masters, PhD)". The participants were also asked to select their ethnic background from five options: "White", "Mixed/Multiple ethnic groups", "Asian/Asian British", "Black/African/Caribbean/Black British" and "Other, please specify". The two questions were derived from the set of harmonised demographic measurements for the UK population developed by the Office for National Statistics (2014).

Three demographic questions were adopted from EMIS specifically for MSM. The participants were asked to indicate if they were in a steady relationship with five options: "Yes, with a man", "Yes, with more than one man", "Yes, with a woman", "Yes, with more than one woman" and "No, I'm single". Next, men were asked to indicate how often they usually went to gay pubs, bars or clubs with six options: "At least once a week", "Less often but at least once a month", "Less often but at least twice a year", "Less often but at least once a year", "Less often than once a year" and "Never". Men were then asked to indicate how often they usually used websites or apps to meet other men with similar response categories. These questions aimed to explore if men that were in relationships or those that have reduced access to sexual networks were less likely to accept the HPV vaccine, as indicated by findings from the previous qualitative study (Chapter V).

6.2.6.3. Behavioural risk indicators

Four questions asked men about their sexual health in order to indicate their risk of HPV infection. Men were invited to report how old they were the first time they had intimate contact with a man involving genital areas. They were also asked to estimate the number of men they had sexual intercourse with in their life. This continuous data was then transformed into seven categories: "None/zero", "1-5", "6-10", "11-25", "26-50", "51-100" and ">100" for descriptive statistics. The participants were asked to indicate which of the provided roles best described their preference during anal sex with five options: "Top/Active (mostly

insertive anal sex or fucking)", "Bottom/Passive (mostly receptive anal sex or being fucked)", "Versatile (both insertive and receptive anal sex)", "Other" and "Not applicable". Men were then asked to specify how often they had had receptive anal sex with a man in the last 12 months, explaining that the question was about a partner's penis in the participant's anus (rectum or back passage) with seven options: "Not at all", "1-2 times", "3-10 times", "11-30 times", "31-50 times", "More than 50 times" and "Prefer not to say". Men who were younger at their first sexual experience, had a higher number of lifetime sexual partners, preferred bottom/passive sexual role during anal sex, and who engaged in receptive anal sex in the last 12 months were considered to be at higher risk of HPV infection and anal cancer. These questions were set to determine if the access to sexual network and extent of sexual experience are associated with HPV vaccine acceptability, as indicated by the systematic review (Chapter IV) and the qualitative study (Chapter V). These questions were adapted from the European MSM Internet Survey (Weatherburn et al., 2013).

6.2.6.4. Access to sexual healthcare

Eight questions estimated MSM's existing use of sexual health services. One question asked participants to indicate all sexual health settings that they have used to test for STIs (they could tick as many as applied): "At a general NHS practice / family surgery", "At a private practice", "At a sexual health clinic", "At a hospital", "At an HIV testing service (this is not in a hospital or clinic)", "At a community service (e.g. Terrence Higgins Trust / youth service)", "At a blood bank, while donating blood", "I use a home testing kit", "In a bar, club, pub or sauna", "Mobile medical unit" and "Other, please specify". Next, men were asked to indicate whether they had ever had a test for STIs at a sexual health clinic with "Yes", "No" and "Maybe / Not sure" responses. If they did, they were shown a box to type how old they were the first time they had an STI test at a sexual health clinic. One question asked men to indicate if they had ever been diagnosed with an STI other than HIV with "Yes", "No" and "Prefer not to say" responses. Afterwards, the participants were asked when they had their last HIV test as a sexual health clinic with eight options: "Within the last 7 days", "Within the last 4 weeks", "Within the last 6 months", "Within the last 12 months", "Within the last 2 years", "Within the last 5 years", "More than 5 years ago" and "Never had an HIV test at a sexual health clinic". Men were then asked to indicate what they thought their HIV status was with six options: "Definitely negative (I don't have HIV)", "Probably negative", "Probably positive", "Definitely positive (I do have HIV)", "I don't know" and "Prefer not to say". The participants were then asked whether they had ever told any health professional

(doctor or nurse) that they have sex with men with “Yes”, “No” and “Maybe/Not sure” responses. Also, they were asked to type how old they were the first time they told any health professional that they had sex with men. These questions, adapted from the EMIS study (Weatherburn et al., 2013), were to assess if men that did not access sexual health services and those that were not open about their sexual orientation to HCPs were less likely to accept the HPV vaccine.

6.2.6.5. Vaccination status

Three questions assessed whether men had received hepatitis A, hepatitis B and HPV vaccinations in the past. The wording of these questions was “Have you ever been vaccinated against...” with discrete versions “hepatitis A”, “hepatitis B” and “HPV”. Six possible responses were offered: “No, I am naturally immune to hepatitis A/B/HPV”, “No, and I don’t know if I’m immune”, “Yes, and I completed the course of 2 injections (for hepatitis A version and 3 for hepatitis B and HPV versions)”, “Yes, but I did not complete the course of 2 injections”, “Yes, but I did not respond to the vaccination” and “I don’t know”. The two hepatitis A and B questions were adopted from the European MSM Internet Survey (Weatherburn et al., 2013) and the HPV question was created specifically for this study to examine the baseline proportion of MSM already vaccinated against HPV. Men that had received the HPV vaccine in the past were excluded from the analysis. The hepatitis questions were to indicate if men have had been offered these vaccines in the past and to assess if men that received vaccination were more likely to accept the HPV vaccine.

6.2.6.6. HPV knowledge

Participant’s knowledge about HPV was assessed using two questions. A question about perceived knowledge and awareness asked men to specify how much did they knew about HPV with four options: “Never heard of it before”, “Very little”, “Some” and “A lot”. The perceived knowledge question aimed to indicate if men were aware of the virus and how they viewed their knowledge about it. The question was previously used by Bonafide (2015) as a predictor of HPV vaccine acceptability in adolescent men.

Next, regardless of their perceived knowledge, the participants were asked to read eleven statements about HPV and to indicate whether they were true or false. They were given a “Don’t know” option to express uncertainty. The statements were adopted from two studies assessing HPV knowledge and HPV vaccine acceptability (Wheldon et al., 2011; Reiter et

al., 2010). Men were asked about their knowledge of HPV symptoms, whether it could affect men and how common it is. The example statements were: “HPV can cause genital warts”, “Men cannot get HPV”, “HPV is very rare”. Incorrect responses and all “unsure” answers were given a score of 0. Responses that were selected correctly were given a score of 1. A composite score was then calculated by summing all eleven scores. While the final score of 0 indicated no knowledge about HPV, the score of 11 indicated good knowledge about HPV. The participants were grouped depending on their scores into three groups “Poor knowledge (0-4)”, “Moderate knowledge (5-8)” and “Good knowledge (9-11)”.

6.2.6.7. Vaccine hesitancy

Vaccine hesitancy measured the extent to which participants were reluctant to receive the HPV vaccine. This measurement, previously used in a review of the World Health Organisation Strategic Advisory Group of Experts on Vaccine Hesitancy (Larson et al., 2015), consisted of four questions with “Yes” or ”No” responses. It asked whether men believed that HPV vaccine could protect them from serious diseases and whether the participants believed that most men like them would be willing to receive all recommended vaccinations. It also asked if any men had ever been reluctant or hesitant to be vaccinated against sexually transmitted infections and if they had ever refused vaccination. Vaccine acceptability measurement was incorporated in this study to examine its association with HPV vaccine acceptability, assuming that men who were hesitant to vaccinations would have lower levels of HPV vaccine acceptability. As such, there were four possible scores ranging from 0 to 4. The highest degree of hesitancy was indicated by a score of 4.

6.2.6.8. Risk perceptions

Perceived severity of HPV and comparative perceived risk of HPV and related diseases were assessed. A four-item scale was used to measure perceived seriousness of HPV. The items were adopted from Reiter et al., (2010) showing satisfactory internal consistency ($\alpha = 0.69$). The participants were first asked to indicate how much their lives might be impacted by i) HPV, ii) genital warts, iii) oral cancer and iv) anal cancer. Next, they were asked to specify about the perceived seriousness of HPV, oral cancer and anal cancer. All seven questions could be answered by indicating one of four options: “Not at all”, “A little”, “Moderately” and “Extremely”. There were seven possible scores ranging from 1 for “Not at all” to 4 for “Extremely”. A composite score was calculated by averaging responses from all seven items

(range 1-5). A score of 4 indicated that participants believed HPV and HPV-related cancers were severe.

A four-item scale was used to measure perceived likelihood of HPV infection. The items were adapted from Klein and Weinstein (1997) and also used in the previous study on HPV-related risk perceptions (Nadarzynski et al., 2012). The participants were asked “Compared to other men your age, what do you think are the chances of you...” i) “... contracting a sexually transmitted infection”, ii) “... ever being infected with HPV”, iii) “... having anal genital warts, sores or blisters”, and iv) “... developing genital or anal cancer”. There were five possible responses: “Much below average”, “Below average”, “Average”, “Above average”, and “Much above average”. There were five possible scores ranging from 1 for “Much below average” to 5 for “Much above average”. A composite score was calculated by averaging responses from all four items (range 1-5). Scores below 3 indicated that participants thought they were not at risk of HPV and scores above 3 indicated that participants perceived themselves to be at risk of HPV.

6.2.6.9. Perceived vaccine effectiveness

The perception of vaccine effectiveness was assessed using six items. They were adopted from The Carolina HPV Immunization Attitudes and Beliefs Scale, which showed satisfactory internal consistencies ($\alpha = 0.69$) (McRee et al., 2010). The participants were asked to indicate how effective they thought the vaccine was with five possible options: “Not effective”, “Slightly effective”, “Moderately effective”, “Very effective” and “Extremely effective”. The items asked participants about the effectiveness of the HPV vaccine i) in preventing genital warts, ii) in preventing anal cancer, iii) for men who are already sexually active, iv) for men who had genital warts in the past, v) for men who are infected with HIV and vi) specifically for the participant in the study. For each situation there were five possible responses ranging from 1 for “Not effective” to 5 for “Extremely effective”. A composite score was calculated by averaging responses from all six items (range 1-5). A lower score indicated that participants perceived the vaccine to be less effective.

6.2.6.10. Perceived benefits

Perceived benefits of HPV vaccination were assessed using a 13-item scale. They were adopted from the Birmingham Measurement, which assessed beliefs about hepatitis B vaccination amongst MSM (Rhodes et al., 2008) and showed excellent internal consistency

($\alpha = 0.88$). The participants were presented with 13 statements and to indicate to what extent they agreed or disagreed with each of them. For example, the statements described protective effects of the HPV vaccine against genital warts and anal cancer, a reduction in worry or fear about HPV and social approval from friends following vaccination (e.g. “HPV vaccine would reduce my risk of genital warts”, “My friends would think I am smart being vaccinated against HPV” or “There would be one less thing to worry about if I got vaccinated against HPV”). Five possible scores ranged from 1 for “Strongly disagree” to 5 for “Strongly agree”. A composite score was calculated by averaging responses from all 13 items (range 1-5). Lower scores indicated that participants perceived fewer benefits of HPV vaccination.

6.2.6.11. Perceived barriers

A scale consisting 24 items was developed by the main researcher to examine perceived barriers to HPV vaccination. The scale was developed based on the items of the Birmingham Measurement for hepatitis B vaccination (Rhodes et al, 2008), the qualitative study of the impact of information about HPV and HPV vaccination amongst MSM (Chapter V) and a mixed-method study on HCPs’ attitudes towards HPV vaccination for MSM (Chapter VII). Men were provided with 24 statements and asked to indicate to what extent they agreed or disagreed with each of them. For example, the participants were asked to indicate their agreement with statements such as “My religious or moral beliefs will stop me from being vaccinated against HPV”, “I don’t want people to know I have sex with men”, “I don’t trust vaccines” and “I know where to go for an HPV vaccine”. Five possible scores ranged from 1 for “Strongly agree” to 5 for “Strongly disagree”. A composite score was calculated by averaging responses from all 24 items (range 1-5). In contrast to other scales in this survey, a lower score indicated that participants perceived more barriers to HPV vaccination.

6.2.7. Sample size calculation

There were no studies that had used a similar HPV vaccine acceptability measurement. Previously however, a priori analysis, based on a previous study which measured change in comparative risk perception amongst females that read information about HPV being a cause of cervical cancer, suggested that 480 participants were needed to achieve sufficient power $\beta=0.80$ (Nadarzynski et al., 2012). The information about HPV resulted in a significant decrease in comparative risk perception of HPV between the intervention group -0.64 ($SD=0.86$) and the control group -0.42 ($SD=0.82$). Thus, using the same model, sample size

calculation of alpha 0.05 and power of 0.80 showed that 240 participants were needed for each condition.

6.2.8. Questionnaire piloting

As part of the survey development the questionnaire, consisting of 35 questions, was tested amongst six MSM for clarity and comprehension. The piloting used a ‘think aloud’ technique where men were encouraged to describe the survey questions as they were completing the survey in the presence of the main researcher. It was arranged to identify whether potential participants understood and interpreted each survey question in the same way and to assess if there were any possible issues with the choices offered. In addition, advice, from two postdoctoral researchers and one clinical research fellow at Brighton and Sussex Medical School, was sought to offer insight into the methodological value of the proposed survey.

As a result, the wording of three questions relating to the measures of HPV vaccine acceptability, comparative risk perceptions and vaccine hesitancy, were changed to simplify their meaning. Also, one item (i.e. “I don’t need to be vaccinated against HPV”) was added as a perceived barrier to HPV vaccination when piloting. An average, the piloting took 10 minutes to complete the initial survey of 33 items and 5 minutes for the follow-up survey consisting of seven items.

The feedback from the pilot participants stated that the survey seemed repetitive, but all questions were easy to understand. It was recommended to move some of the questions from the initial survey to the follow-up, to reduce the amount of time it takes to complete the initial survey. Based on these recommendations, the questions about vaccine hesitancy, perceived severity of HPV and perceived barriers were transferred to the follow-up questionnaire.

6.2.9. Data analyses

Preliminary data analysis

The preliminary analysis was performed to identify whether the HPV vaccine acceptability variable met the assumptions of parametric tests, using the estimates of skewness. The internal consistencies of each scale were also examined using Cronbach’s alpha. Coefficients larger than 0.80 were indicative of satisfactory consistencies. The differences in baseline

HPV vaccine acceptability between two information conditions were initially tested using a Mann-Whitney U test to detect if the randomisation procedure was successful. Afterwards, independent sample tests (e.g. unpaired t-tests, Mann-Whitney U tests) and chi-square tests were performed to identify any differences between men that completed the follow-up survey and men that did not complete it. Also, collinearity diagnostics were performed on all categorical variables to calculate variance inflation factors (VIF) and identify factors that correlated highly with each other. This was performed to reduce data before fitting a linear model and to meet the assumptions of regression analysis.

Descriptive statistics

Descriptive statistics, notably frequencies, percentages, means and standard deviations were performed to describe the study population and the distribution of scores for each psychological measurement. Descriptive statistics were used to estimate HPV vaccine acceptability amongst MSM in the UK (aim 1).

Inferential statistics

HPV vaccine acceptability variable was not normally distributed and therefore, the scores were transformed into four categories: 1- strongly unacceptable, 2- unacceptable, 3 – acceptable and 4 – strongly acceptable. These scores corresponded to ranges between points on the scale 1 to 2, 2.05 to 3, 3.05 to 4 and 4.05 to 5. To identify correlates of baseline (Time 0) HPV vaccine acceptability, multivariate ordinal regression models were performed (aim 2). The variables were then entered into the multifactorial regression model for goodness-of-fit analysis. Similarly, to identify psychological correlates of HPV vaccine acceptability after the exposure to information about HPV and the HPV vaccine (Time 1), multivariate ordinal regression models were performed, adjusted for correlates: HPV vaccine acceptability at baseline (Time 0) and random allocation. The variables were then entered into the multifactorial regression model for goodness-of-fit analysis. Odds ratios with 95% confidence intervals were then calculated to represent the significant differences.

To examine the impact of different information about the effectiveness of HPV vaccine acceptability across three time points (i.e. baseline, after the exposure to information about HPV vaccination and four weeks later.) the Friedman test was performed (aim 3). Additional post hoc Wilcoxon signed-rank tests, with Bonferroni corrections, were calculated to detect whether differences in HPV vaccine acceptability between individual time points were

statistically significant. Multiple ordinal regression models were also performed to assess if there were statistically significant differences in HPV vaccine acceptability between the two information conditions. The models were adjusted for acceptability at baseline and random allocation to increase the precision and estimate the impact of the information.

All data were analysed in SPSS version 22.

6.3. Results

6.3.1. Preliminary analysis

6.3.1.1. Testing assumptions for parametric tests

The assessment of skewness and kurtosis of HPV vaccine acceptability scale showed it was not normally distributed (Table 10). Thus, non-parametric tests were performed on this variable.

6.3.1.2. Internal consistency

Cronbach's alpha coefficients calculations indicated that all subscales demonstrated good internal consistencies (Table 10).

Table 10. Diagnostics of parametric assumptions and internal consistency of subscales

Subscale	N	Scale mean and (SD)	Kurtosis	Skew ness	Cronbach's alpha
HPV vaccine acceptability Time 0	1317	3.94 (0.9)	1.28	-1.08	0.90
HPV vaccine acceptability Time 1	1078	4.10 (0.9)	2.03	-1.03	0.92
HPV vaccine acceptability Time 2	460	3.81 (0.9)	0.90	-0.94	0.91
Perceived effectiveness of HPV vaccine	1171	3.14 (0.7)	0.36	0.10	0.80
Risk perception of HPV infection Time 0	1317	2.65 (0.9)	-0.36	0.05	0.88
Risk perception of HPV infection Time 1	1078	2.73 (1.0)	-0.57	-0.01	0.92
Risk perception of HPV infection Time 2	460	2.86 (0.9)	-0.46	0.02	0.88
Perceived barriers to HPV vaccination	1055	3.94 (0.5)	5.36	-1.60	0.83
Perceived severity of HPV infection	454	3.56 (0.4)	13.2	-2.80	0.88
Perceived benefits of HPV vaccination	451	4.14 (0.6)	3.81	-1.19	0.89

6.3.1.3. Comparison of randomised groups

The between-groups comparisons showed that there were no significant differences in HPV vaccine acceptability at baseline suggesting that the randomisation procedure was successful.

6.3.1.4. Comparison of follow-up completers and non-completers

Figure 10 outlines the recruitment process and inclusion of participants for the online survey. Out of 1674 respondents that initiated the survey (166 cases were excluded as either not

meeting inclusion criteria or providing incomplete responses), 460 men completed the follow-up questionnaire. Men that did not complete it had significantly lower levels of HPV vaccine acceptability $U=17.35$, $p=0.001$, comparative risk perceptions $t(1312)=4.04$, $p=0.001$ and perceived HPV vaccine as less effective $t(1166)=3.03$, $p=0.002$ at baseline. Men that completed the survey were significantly more likely to be older [mean age completers = 27, SD=9.2, mean age non-completers = 23, SD=7.1; $t(1503)=9.32$, $p=0.001$, more knowledgeable about HPV $\chi^2(3)=40.2$, $p=0.001$, had a significantly higher number of lifetime sexual partners $t(1088)=3.17$, $p=0.001$ and report having received the hepatitis B vaccine $\chi^2(5)=69.6$, $p=0.001$.

6.3.1.5. Multicollinearity diagnostics

The collinearity diagnostics, using variance inflation factors (VIF), on all categorical variables have shown that VIFs did not exceed 2.5, so all variables were entered in regression models.

6.3.2. Sample characteristics

A total of 1674 individuals consented to take part in the survey and 1049 (64%) completed the initial survey. Next, 166 cases were excluded (12 women, 72 due to >80% of the survey being incomplete, 3 men self-identified as heterosexual with no experience of same-sex intercourse and 39 were born and resident outside the UK). As a result, 1508 cases were included in the analysis of factors associated with HPV vaccine acceptability (Table 11).

While 488 (46%) men completed the follow-up questionnaire, 18 cases were duplicated and 10 email addresses were not matched, leaving 460 cases that could be included in the analysis of change of HPV vaccine acceptability over time.

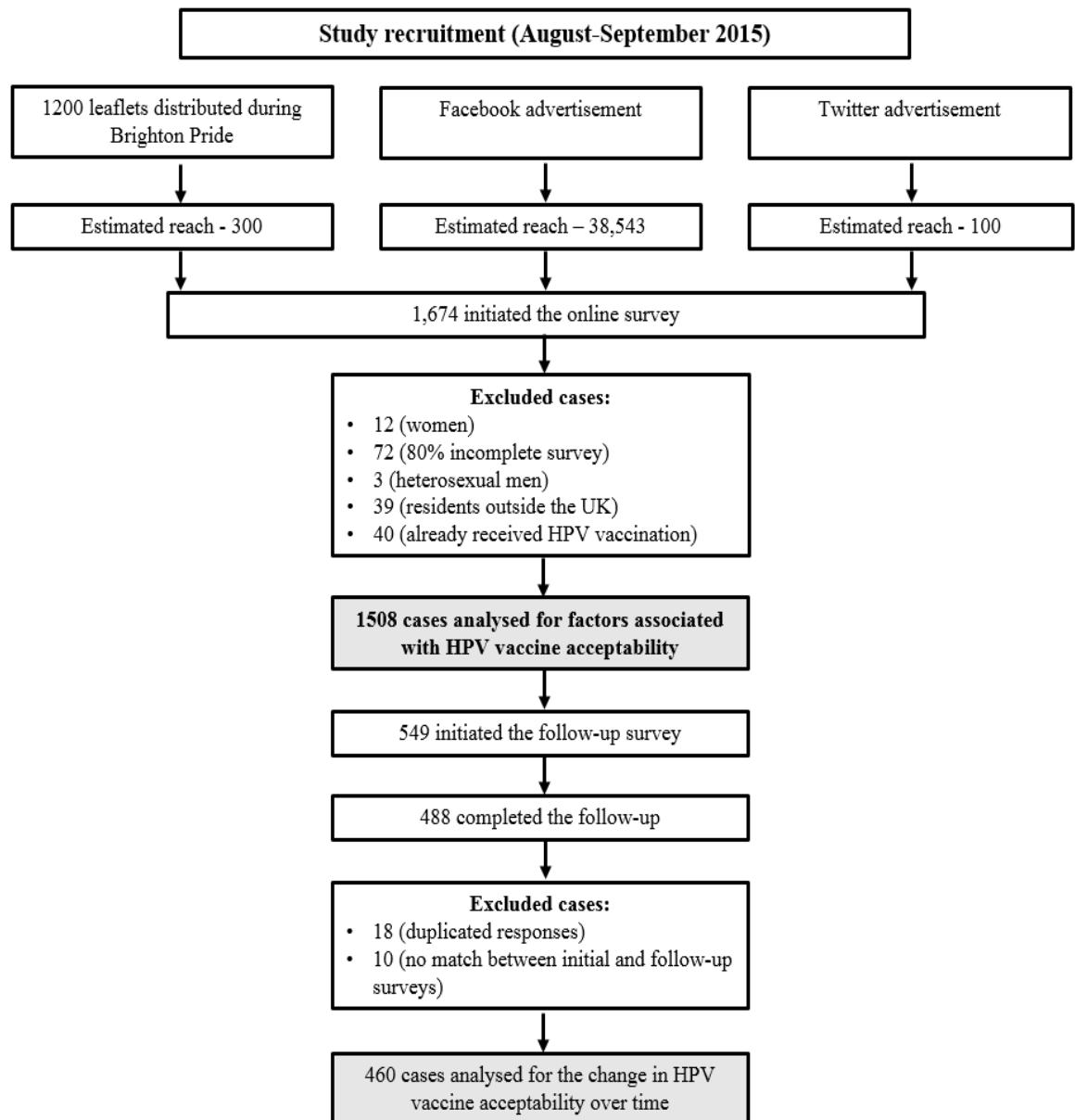


Figure 10. The recruitment process and inclusion of participants for the online survey

6.3.2.1. Socio-demographic characteristics

Amongst 1508 respondents, the median age was 22 years (range: 14-49), 93% self-identified as gay and 5% as bisexual. Just over 1% that self-identified as ‘other’ sexual orientation, reported to be “bi curious”, “demisexual”, “men who have sex with men”, “pansexual” and “queer”. Just over 1% of the sample self-identified as transgender/transsexual (women to men). The majority (85%) were born in the UK and 87% lived in England. Men were dispersed in various geographical locations ranging in size from a town/small city (29%) to a very big city (34%). Most participants were white (92%) and single (61%). Around 43% reported accessing gay venues (e.g. bar, pub or club) at least once a month and 47% reported using dating websites and mobile applications to meet other men at least once a month.

6.3.2.2. Behavioural risk indicators

Six percent had never had sexual intercourse with another man, but identified themselves as gay or bisexual. The median age of first same-sex sexual intercourse was 16 (range: 8-41) and amongst sexually active men 39% reported having up to 10-lifetime sexual partners. The majority (79%) reported engaging in receptive anal intercourse with various frequencies ranging from 1-2 times (19%) to more than 50 times (11%) in the last 12 months.

6.3.2.3. Access to healthcare

The variables examining access to healthcare showed that a third of the sample reported never having been tested for an STI at a sexual health clinic. The median age of the first sexual health screening was 19 (range: 13-48). While only about a half of participants (52%) have utilised sexual health clinics, 14% attended general practice for their sexual health screening. About half of the men (53%) had their last HIV test at a sexual health clinic within the previous 12 months. Just over 6% disclosed being HIV-positive and 38% reported a history of an STI, other than HIV. Approximately 26% of participants had not disclosed their same-sex behaviours to an HCP. Amongst men that have disclosed, the median age of the disclosure was 19 (range: 13-50), suggesting an average 3-year delay between sexual debut and the disclosure of sexual orientation to an HCP.

Table 11. Characteristics of participants taking part in the quantitative study about HPV and HPV vaccination

Variable	N (%) or [mean, SD]
Socio-demographic characteristics	
Total N [Age in years]	1508 [24.4, 8.0]
Gender	
Male	1488 (98)
Transgender (Male to Female)	1 (<1)
Transgender (Female to Male)	19 (1)
Sexual orientation	
Heterosexual or Straight	3 (<1)
Gay	1404 (93)
Bisexual	79 (5)
Prefer not to say	5 (<1)
Other	17 (1)
Ethnicity	
White	962 (92)
Mixed/Multiple ethnic groups	56 (5)
Asian/Asian British	17 (1)
Black/African/Caribbean	3 (<1)
Other	13 (1)
Education	
No secondary qualification	22 (2)
CSE (e.g. NVQ)	42 (4)
‘O’ Level (e.g. GCSE)	115 (11)
‘A’ Level (e.g. AS levels)	331 (31)
Higher education below degree	137 (13)
University degree completed	404 (39)
Relationship status	
With a man	361 (35)
With more than one man	39 (3)
With a woman	7 (<1)
Single	644 (61)
Settlement size	
A very big city (>1 million)	352 (34)
A big city (<1 million)	134 (13)
A medium-sized city (<500.000)	253 (24)
A small city (<100.000)	202 (19)
A village or town (<10.000)	110 (10)
Born in the UK	
Yes	896 (85)
No	154 (15)
Country of residence	
England	911 (87)
Northern Ireland	13 (1)
Scotland	79 (8)
Wales	43 (4)
Elsewhere	5 (<1)
Frequency of gay bar/club participation	
Once a week	111 (10)
Once a month	345 (33)
Twice a year	236 (23)
Once a year	59 (6)
Less often than once a year	88 (8)
Never	212 (20)
Frequency of dating app usage	
Once a week	271 (26)
Once a month	222 (21)
Twice a year	149 (14)
Once a year	65 (6)
Less often than once a year	91 (9)
Never	253 (24)

Table 11. Continuation

Variable	N (%) or [mean, SD]	
Behavioural risk indicators		
Age at first same-sex intercourse	1067	[16.5, 3.0]
Number of sexual partners		
None	68	(6)
1-5	293	(27)
6-10	136	(12)
11-25	174	(16)
26-50	172	(16)
51-100	102	(9)
101+	148	(14)
Sexual role during anal intercourse		
Mostly insertive	210	(20)
Mostly receptive	337	(31)
Both insertive and receptive	526	(48)
Other	15	(1)
Frequency of receptive anal intercourse (12 months)		
Not at all	281	(25)
1-2 times	212	(19)
3-10 times	257	(23)
11-30 times	176	(15)
31-50 times	82	(7)
More than 50 times	119	(11)
Access to sexual healthcare		
Age at first sexual health screening	802	[20.7, 4.4]
Ever tested for an STI at a GUM clinic		
Yes	810	(71)
No	324	(29)
Usual setting for STI screening		
At a sexual health clinic	770	(52)
Family surgery/ NHS practice	197	(14)
At a hospital	124	(8)
Using home testing kit	114	(7)
At an HIV testing service	84	(6)
At community service	74	(5)
In a bar, pub, club or sauna	25	(2)
At a private practice	24	(2)
Mobile medical unit	17	(1)
At a blood bank (blood donation)	13	(1)
Other	30	(2)
Last HIV test at GUM clinic		
Within 4 weeks	160	(14)
Within 6 months	287	(25)
Within 12 months	152	(14)
More than 12 months ago	171	(15)
Never tested	368	(32)
HIV status		
Definitely negative	629	(55)
Probably negative	377	(33)
Unsure	57	(4)
Probably positive	2	(<1)
Definitely positive	69	(6)
Prefer not to say	4	(<1)
Ever diagnosed with an STI (other than HIV)		
Yes	426	(38)
No	706	(62)

Table 11. Continuation

Variable	N (%) or [mean, SD]	
Disclosure		
Ever disclosed sexuality to a healthcare professional		
Yes	804	(71)
No	298	(26)
Unsure	36	(3)
Age at first disclosure of sexuality	[19.8, 4.3]	
Past vaccination		
Ever received HPV vaccine	30	(2)
No, naturally immune to HPV	967	(68)
Not received	40	(3)
Completed (3 injections)	6	(<1)
Initiated (not completed)	377	(26)
Unsure		
Ever received Hepatitis A vaccine		
No, naturally immune to Hep A	27	(2)
Not received	638	(42)
Completed (2 injections)	399	(27)
Initiated (not completed)	35	(2)
Unsure	404	(27)
Ever received Hepatitis B vaccine		
No, naturally immune to Hep B	19	(1)
Not received	391	(27)
Completed (3 injections)	719	(49)
Initiated (not completed)	120	(8)
Unsure	226	(15)
HPV Knowledge		
Perceived knowledge about HPV		
Never heard of it	455	(30)
Very little	540	(36)
Some	388	(26)
A lot	125	(8)
HPV knowledge score (range: 0-11)	1130	[4.3, 3.7]
Poor (0-4)	722	(52)
Moderate (5-8)	396	(29)
Good (9-11)	268	(19)

6.3.2.5. Past vaccination

Around 3% of men reported already being vaccinated against HPV, 68% had not received it and 26% were unsure. While 49% reported completing three doses of hepatitis B vaccine, 27% reported not receiving the vaccine and 15% were unsure. Similarly, 27% reported completing two doses of the hepatitis A vaccine, 42% reported not receiving the vaccine and 27% were unsure.

6.3.2.6. HPV knowledge

The majority (66%) had never heard about HPV before the study. The HPV knowledge measurement showed that over half (52%) of participants had poor knowledge about HPV, with the median score of 3 (range: 0-11). Only 19% of the sample presented with a good understanding about HPV.

Figure 11 outlines the percentage of responses to each statement in the HPV knowledge questionnaire. The majority of participants were unsure about HPV. While 56% knew that HPV could cause health problems in men, 34% and 28% knew that HPV is associated with genital warts and anal cancer, respectively. Around 18% thought that HPV could cause genital herpes.

6.3.2.7. Risk perceptions

Figure 12 presents the responses on the comparative risk perceptions measurement amongst MSM. The majority of participants did not perceive themselves at risk of HPV. When comparing their risk to other men of the same age, 45% believed theirs risk being below average and 27% indicated an above average risk of contracting an STI. Similarly, 42% believed their risk to be below average and 19% to have an above average risk of being infected with HPV. Around 44% and 35% perceived themselves have a below average risk of genital warts and genital/anal cancer, respectively.

Figure 13 presents the responses to the perceived seriousness of HPV infection measurement. While most men did not perceive HPV infection to be severe, HPV-related cancers were perceived to have a devastating effect on health. While 62% reported that it would not be ‘extremely serious’ to acquire HPV, 75% believed that HPV infection would not have or have only a ‘moderate’ impact on life.

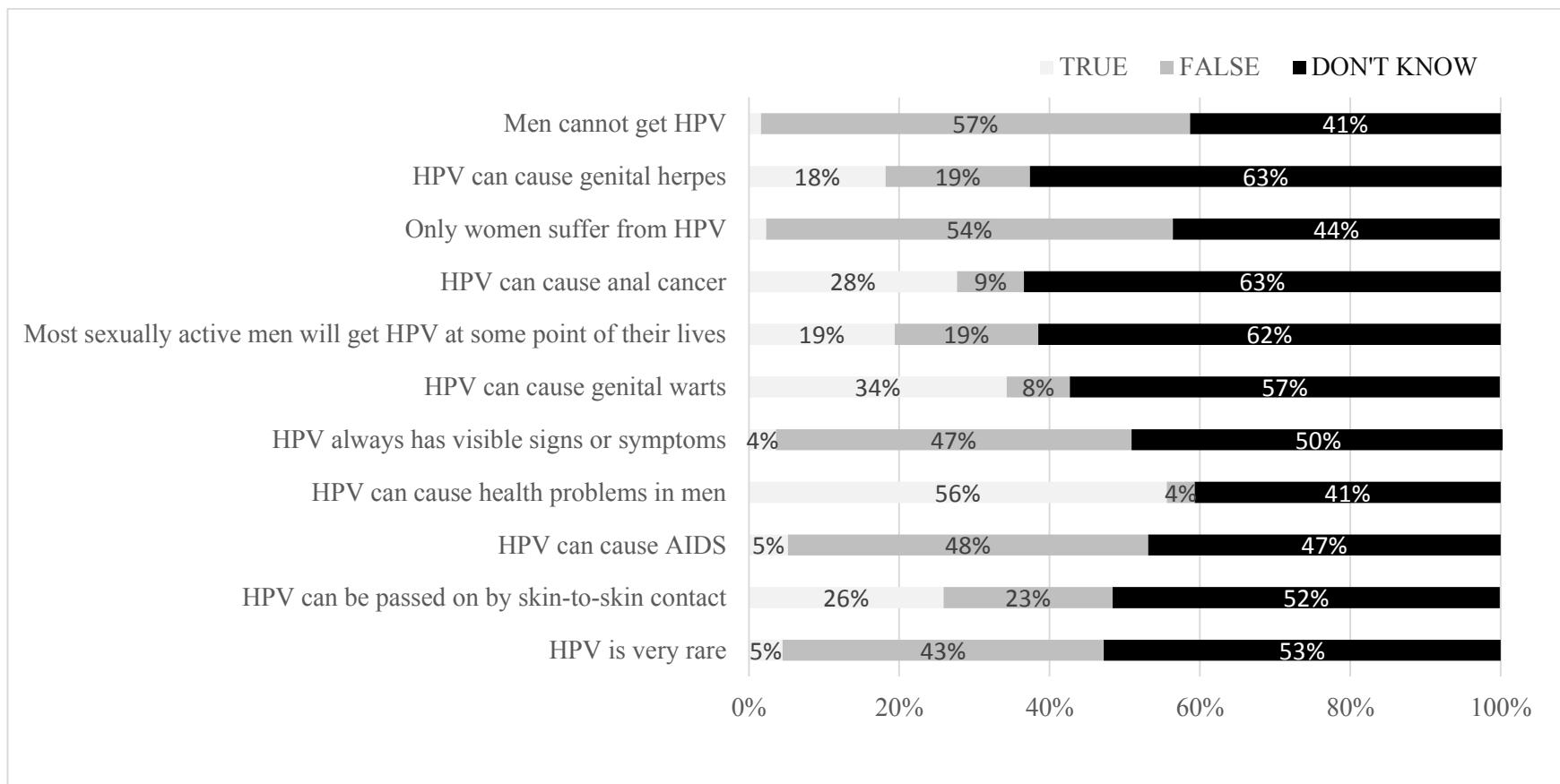


Figure 11. Knowledge about HPV amongst men who have sex with men

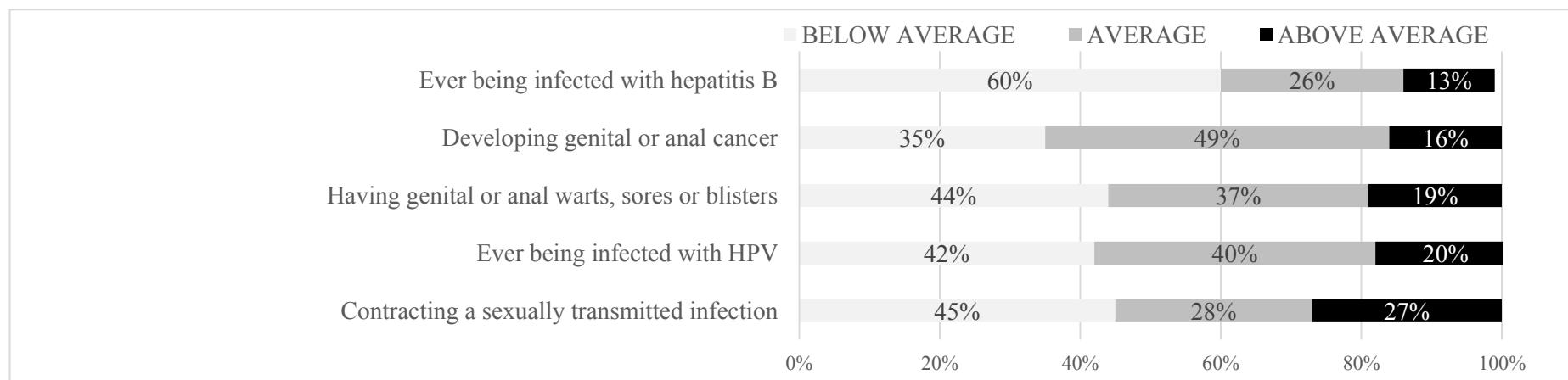


Figure 12. Comparative perceived risk of sexually transmitted infections and HPV-related diseases

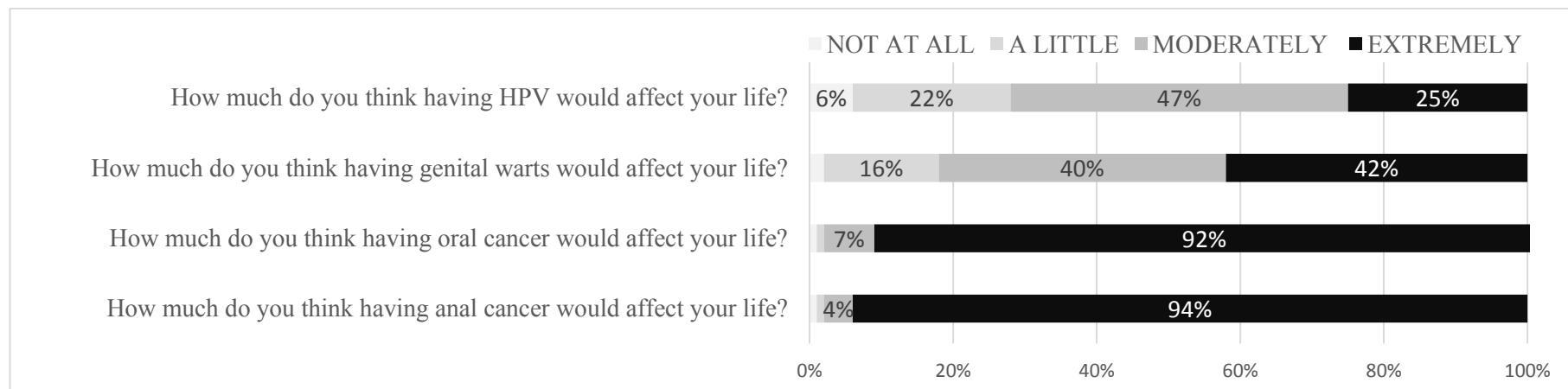


Figure 13. Perceived seriousness of HPV infection and HPV-related diseases

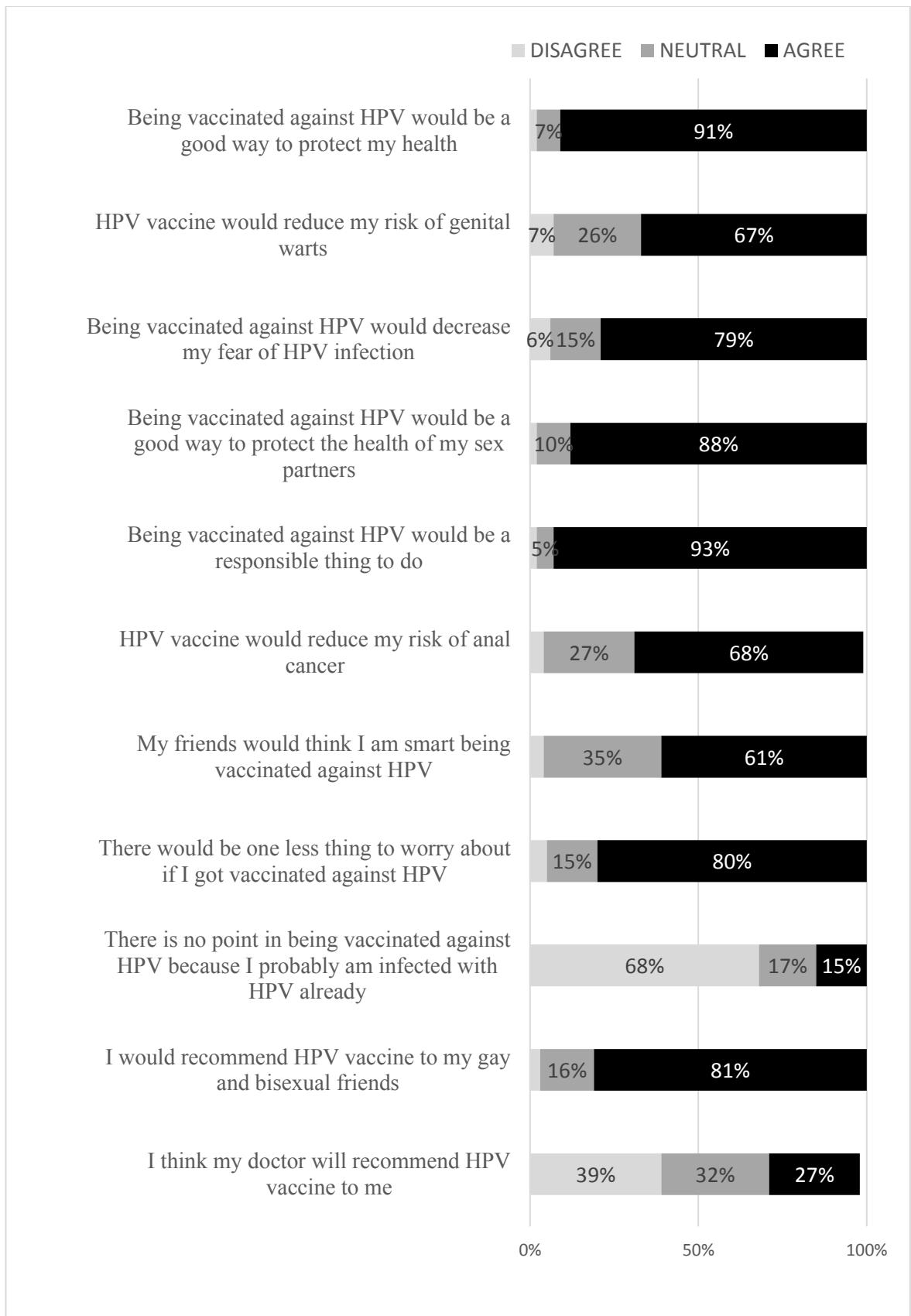


Figure 14. Perceived benefits of HPV vaccination

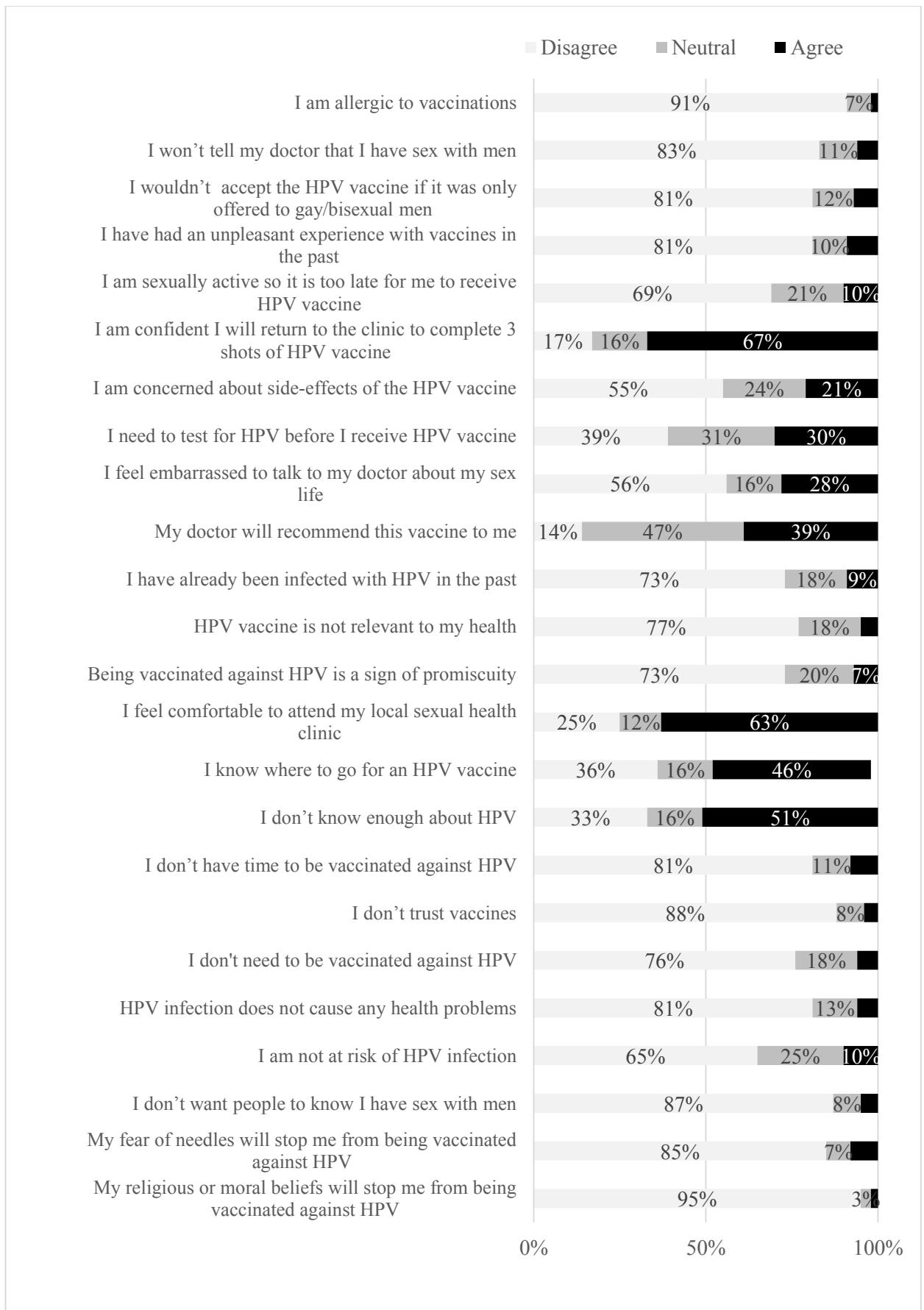


Figure 15. Perceived barriers to HPV vaccination

A larger proportion of men (42%) perceived having genital warts as having an extreme impact on life. Over 90% believed that having anal or oral cancer would be ‘extremely’ serious.

6.3.2.8. Perceived benefits of HPV vaccination

Figure 14 presents the responses on the perceived benefits of HPV vaccination measurement. Although the majority perceived the HPV vaccine to be highly beneficial, only 2% of the sample did not perceive any benefit of HPV vaccination. Over 90% agreed that HPV vaccine would be useful to protect their health, it would be a responsible thing to do and that it would reduce the risk of HPV and less than 3% disagreed. Also, 67% believed that the HPV vaccine would reduce their risk of genital warts and anal cancer, but around 26% were unsure. Similarly, 80% felt that the HPV vaccine would decrease the fear of HPV infection and worry. While 89% thought that the HPV vaccine would be a good way to protect the health of their sex partners, 61% perceived their friends as thinking that it was smart to be vaccinated against HPV. However, 39% believed that their doctor would not recommend the vaccine to them.

6.3.4.3. Perceived barriers to HPV vaccination

Figure 15 presents the responses on the perceived barriers to HPV vaccination measurement. The most commonly reported barriers were the lack of knowledge about HPV (51%) and the belief that doctors would not recommend the HPV vaccine (40%). Nearly 37% of MSM specified the lack of information about places that offer HPV vaccination and just over 30% felt they needed to test for HPV before receiving the HPV vaccine. About 28% admitted feeling embarrassed to talk to a doctor about sex and 24% reported not feeling comfortable attending a sexual health clinic. Around 21% reported concerns about the vaccine side-effects and 17% were not confident that they would return to a SHC to complete three doses of the HPV vaccine. Almost 10% believed it was too late to receive the vaccine because they were sexually active and a similar proportion of MSM thought they were not at risk of HPV infection. Around 9% reported having unpleasant experiences with vaccines in the past and 9% reported having already been infected with HPV. Around 8% reported not having time to be vaccinated and 7% disclosed a fear of needles. A similar percentage of participants would not accept the vaccine if it was only offered to gay and bisexual men and 7% thought being vaccinated was a sign of promiscuity. Nearly 6% would not tell their doctors about having sex with men, believed HPV does not cause any health problems or believed they did

not need to be vaccinated, and 4% reported a lack of trust in vaccines. Furthermore, 5% would not want people to know they have sex with men, 3% reported to be allergic to vaccinations and 2% reported conflicting religious beliefs that would prevent them from being vaccinated.

6.3.2.9. Perceived effectiveness of HPV vaccination

The two pieces of information about HPV vaccine effectiveness in sexually active men did not have any significant impact on perceived vaccine effectiveness. After reading the information about the HPV vaccine being most effective before sexual debut (Information condition I), 15% and 19% thought it was not effective or only slightly effective against genital warts and anal cancer, respectively. Around 29% of men believed the HPV vaccine was effective in sexually active men, 51% thought it was ineffective for men with a history of genital warts and 42% thought it was ineffective for HIV-positive men. Around 49% of participants believed the HPV vaccine would be effective for them.

After reading the information that sexually active men would also benefit from being vaccinated (Information condition II), 9% and 16% perceived the HPV vaccine to be ineffective against genital warts and anal cancer. Around 42% of men believed the HPV vaccine was effective in sexually active men, 39% thought it was ineffective for men with a history of genital warts and 52% thought it was ineffective for HIV-positive men. Around 51% of participants believed the HPV vaccine would be effective for them.

6.3.3. Aim 1: To estimate baseline HPV vaccine acceptability amongst MSM

Figure 16 outlines the baseline responses to each item of the HPV vaccine acceptability measurement. At baseline, the composite score indicated that 83% of MSM would be willing to receive the HPV vaccine (mean = 3.94, standard deviation = 0.91, median = 4, interquartile range: 3.4-4.7). Therefore, the hypothesis 1, that 83% of MSM would accept the HPV vaccine, is accepted. The analysis of individual scale item revealed that over 65% would seek information about HPV and 78% would consider being vaccinated. About 72% would visit a sexual health clinic in order to receive the HPV vaccine and 61% would disclose their sexuality to an HCP. Only 55% would ask a doctor about the HPV vaccine, but 89% would accept the vaccine if it was offered by a doctor. About 85% would return to a SHC to complete the 3-injection course of the HPV vaccination.

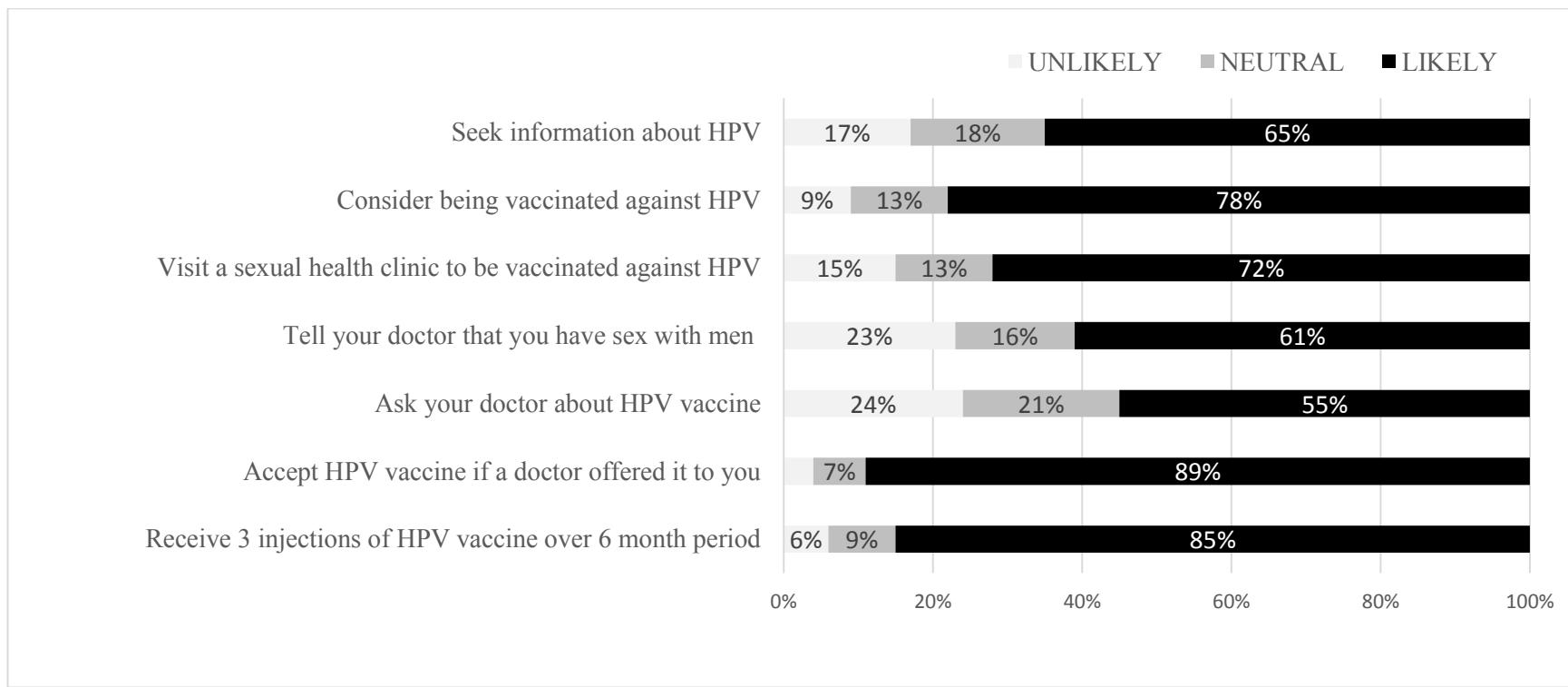


Figure 16. HPV vaccine acceptability amongst men who have sex with men

6.3.4. Aim 2: To identify factors associated with HPV vaccine acceptability

Table 12 presents socio-demographic associations of HPV vaccine acceptability at baseline. The univariate ordinal regression analyses showed that participants born in the UK, living in either a small town or a village, below the age of 18 years or were of non-White ethnic origin reported relatively lower levels of HPV vaccine acceptability. Examining behavioural risk indicators, men that had never participated in gay venues or had never used online apps/websites to meet other men, indicating a more distant relationship with the ‘gay scene’, also showed lower levels of HPV vaccine acceptability. The participants that reported higher numbers of lifetime sexual partners or engaged more frequently in receptive anal intercourse showed higher levels of HPV vaccine acceptability. Men that had disclosed their sexual orientation to a doctor, had utilised sexual health clinics for STI screening or had received hepatitis vaccination were more likely to accept the HPV vaccine. Also, men that had been given an HIV test in the previous six months, who had been diagnosed with an STI or were HIV-positive reported higher levels of HPV vaccine acceptability. Participants with good knowledge about HPV were also more likely to accept the HPV vaccine.

Five variables constructed the best fitting model. The analysis shows that men who use online apps/websites to meet other men had 1.5 times the odds of accepting the HPV vaccine than men that did not use apps/websites. Men that had disclosed sexually to an HCP had twice the odds of accepting the vaccine. Similarly, men that utilised sexual health clinics had 1.82 times the odds of accepting the vaccine than men that used other settings for their sexual healthcare. HIV-positive men were significantly more likely to accept the vaccine. Men that had a good knowledge about HPV had twice the odds of accepting the HPV vaccine than men with poor knowledge about HPV. Therefore, these findings indicate that participation in online networking, the openness to discuss sexual orientation, access to sexual health clinics, HIV status and HPV knowledge predict HPV vaccine acceptability. Accordingly, hypothesis 2, indicating that the HPV knowledge was associated with HPV vaccine acceptability is accepted. Hypothesis 3 is rejected, as only the openness about sexual orientation was associated with HPV vaccine acceptability.

Table 12. Socio-demographic correlates of HPV vaccine acceptability at baseline

Variable	Number (%) of men willing to accept the HPV vaccine	Unadjusted Odds Ratio (95% CI)	Adjusted Odds Ratio (95% CI)
Demographic variable			
Age			
14-18	235/302 (78)	1.00 for reference	
19-21	216/260 (83)	1.21 (0.88-1.65)	
22-24	219/275 (80)	1.07 (0.78-1.45)	
25-30	200/234 (86)	1.45 (1.05-2.00)	
31-63	224/246 (91)	1.83 (1.32-2.53)*	
Sexual orientation			
Gay	1030/1233 (84)	1.00 for reference	
Bisexual	46/62 (74)	0.69 (0.43-1.12)	
Ethnicity			
White	816/962 (85)	1.00 for reference	
Non-White	278/355 (78)	0.73 (0.58-0.92)*	
Education			
Below 'A' Level qualification	142/179 (79)	0.59 (0.42-0.83)*	
'A' Level (e.g. AS levels)	278/331 (84)	0.87 (0.65-1.15)	
Higher education below degree	114/137 (83)	0.81 (0.65-1.17)	
University degree completed	363/404 (90)	1.00 for reference	
Relationship status			
In relationship	315/372 (85)	1.12 (0.88-1.43)	
Single	559/653 (86)	1.00 for reference	
Settlement size			
A very big city	305/352 (87)	1.75 (1.17-2.63)*	
A big city	120/134 (90)	1.44 (0.89-2.32)	
A medium-sized city	123/253 (88)	1.52 (1.00-2.33)	
A small city	158/202 (78)	1.00 (0.64-1.54)	
A village or town	91/110 (82)	1.00 for reference	
Born in the UK			
Yes	758/896 (85)	0.70 (0.50-0.98)*	
No	138/154 (89)	1.00 for reference	
Behavioural risk indicator			
Participation in gay venues			
Never	165/212 (78)	1.00 for reference	
At least once a month	398/456 (87)	1.81 (1.33-2.47)*	
Several time a year	256/295 (88)	1.52 (1.09-2.13)*	
Once a year or less often	72/88 (82)	1.30 (0.81-2.08)	
Frequency of dating app usage			
Never	206/253 (81)	1.00 for reference	1.00 for reference
At least once a month	429/493 (87)	1.57 (1.18-2.09)*	1.50 (1.06-2.12)*
Several time a year	184/214 (86)	1.60 (1.13-2.27)*	1.54 (1.01-2.33)*
Once a year or less often	78/91 (85)	1.61 (1.02-2.56)*	1.25 (0.73-2.13)
Age at first same-sex intercourse			
17 or below	575/672 (87)	0.89 (0.70-1.13)	
Above 17	330/395 (83)	1.00 for reference	
Number of sexual partners			
None	56/68 (82)	1.00 for reference	
1-5	227/293 (77)	0.95 (0.58-1.55)	
6-15	169/203 (83)	1.40 (0.84-2.34)	
16-50	245/279 (88)	1.52 (0.92-2.50)	
51+	225/250 (90)	2.13 (1.28-3.55)*	
Sexual role during intercourse			
Both insertive and receptive	445/526 (84)	1.00 for reference	
Mostly receptive	288/337 (85)	1.12 (0.86-1.46)	
Mostly insertive	176/210 (84)	0.85 (0.63-1.16)	
Frequency of anal intercourse			
Not at all	229/281 (81)	1.00 for reference	
1-2 times in the last 12 months	179/212 (84)	1.31 (0.93-1.83)	
3-10 times	213/257 (83)	1.27 (0.92-1.74)	
More than 11 times	331/377 (88)	1.76 (1.13-2.36)*	

*p<0.05

Table 12. Continuation

Variable	Number (%) of men willing to accept the HPV vaccine	Unadjusted Odds Ratio (95% CI)	Adjusted Odds Ratio (95% CI)
Access to healthcare			
Disclosed sexuality			
Yes	718/804 (89)	2.54 (2.05-3.14)*	2.02 (1.39-2.94)*
No	376/513 (73)	1.00 for reference	1.00 for reference
Ever tested for an STI at GUM			
Yes	713/810 (88)	2.39 (1.87-3.05)*	
No	250/328 (76)	1.00 for reference	
Age at first STI screening			
19 or below	394/447 (88)	1.06 (0.81-1.40)	
Above 19	314/355 (88)	1.00 for reference	
STI screening setting			
At sexual health clinic	683/769 (89)	2.15 (1.60-2.89)*	1.82 (1.29-2.57)*
Other settings	157/201 (78)	1.00 for reference	1.00 for reference
HIV status			
Definitely HIV-positive	62/69 (90)	2.75 (1.59-4.75)*	1.96 (1.09-3.53)*
Probably HIV-negative	325/377 (86)	1.11 (0.87-1.42)	1.06 (0.79-1.42)
Definitely HIV-negative	530/629 (84)	1.00 for reference	1.00 for reference
Ever diagnosed with an STI			
Yes	390/426 (91)	2.05 (1.62-2.60)*	
No	568/706 (80)	1.00 for reference	
Last HIV test at GUM clinic			
Within 6 months	406/447 (91)	1.58 (1.19-2.10)*	
More than 6 months ago	281/323 (87)	1.00 for reference	
Hepatitis A vaccine status			
Not received	447/555 (80)	1.00 for reference	
Completed	319/358 (89)	1.89 (1.45-2.45)*	
Hepatitis B vaccine status			
Not received	246/330 (74)	1.00 for reference	
Completed	584/650 (90)	2.53 (1.96-3.26)*	
Knowledge			
Perceived HPV knowledge			
Never heard	298/393 (75)	1.00 for reference	
Very little	381/463 (82)	1.27 (0.99-1.64)	
Some	311/346 (90)	2.34 (1.77-3.09)*	
A lot	104/115 (90)	3.35 (2.18-5.15)*	
HPV knowledge measure			
Poor	513/656 (78)	1.00 for reference	1.00 for reference
Moderate	326/378 (86)	1.68 (1.32-2.14)*	1.55 (1.13-2.12)*
Good	224/247 (91)	2.89 (2.15-3.89)*	2.23 (1.53-3.26)*

*p<0.05

Six univariate ordinal regressions were performed to identify psychological variables associated with HPV vaccine acceptability. Table 13 shows that comparative risk perceptions, perceived seriousness of HPV infection and related diseases, perceived benefits and barriers to HPV vaccination, perceived HPV vaccine effectiveness and vaccine hesitancy were significantly associated with HPV vaccine acceptability after the information about HPV was shown to participants. Next, a multifactorial ordinal regression, adjusted for all significant variables, randomisation condition and baseline HPV vaccine acceptability was performed. The results show that all psychological variables, excluding vaccine hesitancy, were associated with HPV vaccine acceptability, with perceived barriers being the strongest determinant. Accordingly, hypothesis 4 is accepted.

Table 13. Psychological correlates of HPV vaccine acceptability

Variable	Mean (SD)		Unadjusted OR (95% CI)	Adjusted OR (95% CI)
	Not willing to accept the HPV vaccine (N=223)	Willing to accept the HPV vaccine (N=1094)		
Comparative risk perceptions	2.33 (0.93)	2.80 (0.96)	1.38 (1.12-1.55)*	1.31 (1.05-1.63)*
Perceived seriousness of HPV infection	3.42 (0.60)	3.58 (0.38)	1.56 (1.02-2.38)*	1.89 (1.16-3.01)*
Perceived barriers to HPV vaccination	3.51 (0.58)	4.02 (0.48)	5.40 (4.23-6.90)*	4.46 (2.95-6.73)*
Perceived HPV vaccine effectiveness	2.78 (0.78)	3.21 (0.71)	2.07 (1.76-2.44)*	1.54 (1.14-2.08)*
Perceived benefits of HPV vaccination	3.83 (0.50)	4.17 (0.63)	2.82 (2.09-3.80)*	1.61 (1.14-3.01)*
Vaccine hesitancy	0.76 (0.88)	0.43 (0.63)	0.52 (0.40-0.68)*	0.91 (0.67-1.23)

*p<0.05

6.3.5. Aim 3: To examine the impact of HPV information on HPV vaccine acceptability

Figure 17 presents the difference in HPV vaccine acceptability between two information conditions across three time points. At baseline, 83% (1086/1303) of participants indicated that they would accept the HPV vaccine. That proportion increased to 85% (921/1078) after the exposure to information and decreased to 80% (370/460) at the four-week follow-up.

Table 14 outlines the differences in HPV vaccine acceptability between two information conditions and across three time points to illustrate the impact of information on acceptability. There was an increase in mean HPV vaccine acceptability by 0.14 from the baseline and post information measures. There was a decrease in HPV vaccine acceptability by 0.27 between the post information and four-week follow-up measures. A decrease in HPV vaccine acceptability by 0.13 was also observed between the baseline and four-week follow-up measures.

Table 14. Differences in psychological factors between participants that received two messages about the effectiveness of HPV vaccination across three time points

Variable	Information condition I Mean (SD)	Information condition II Mean (SD)	Significance of between group differences
Time 0 (baseline)			
HPV vaccine acceptability*	4.09 (0.8)	4.07 (0.8)	p=0.826
Comparative risk perception of HPV	2.65 (0.9)	2.66 (0.9)	p=0.955
HPV knowledge*	4.45 (3.7)	4.32 (3.8)	p=0.507
Time 1 (post-information)			
HPV vaccine acceptability*	4.17 (0.8)	4.20 (0.9)	p=0.130
Comparative risk perception of HPV	2.70 (0.9)	2.76 (0.9)	p=0.319
Perceived HPV vaccine effectiveness	3.51 (1.0)	3.56 (0.9)	p=0.345
Perceived barriers to HPV vaccination*	3.90 (0.5)	3.99 (0.5)	p=0.001
Time 2 (follow-up)			
HPV vaccine acceptability*	3.88 (0.9)	3.75 (1.0)	p=0.193
Comparative risk perception of HPV	2.85 (0.9)	2.87 (0.8)	p=0.888
Perceived benefits of HPV vaccination*	4.14 (0.6)	4.14 (0.6)	p=0.794
Perceived severity of HPV infection*	3.55 (0.4)	3.57 (0.3)	p=0.943
Vaccine hesitancy*	0.51 (0.6)	0.42 (0.6)	p=0.058

Information condition I – compromised HPV vaccine effectiveness

Information condition II – HPV vaccine in sexually active men

*Non-parametric Mann-Whitney U test

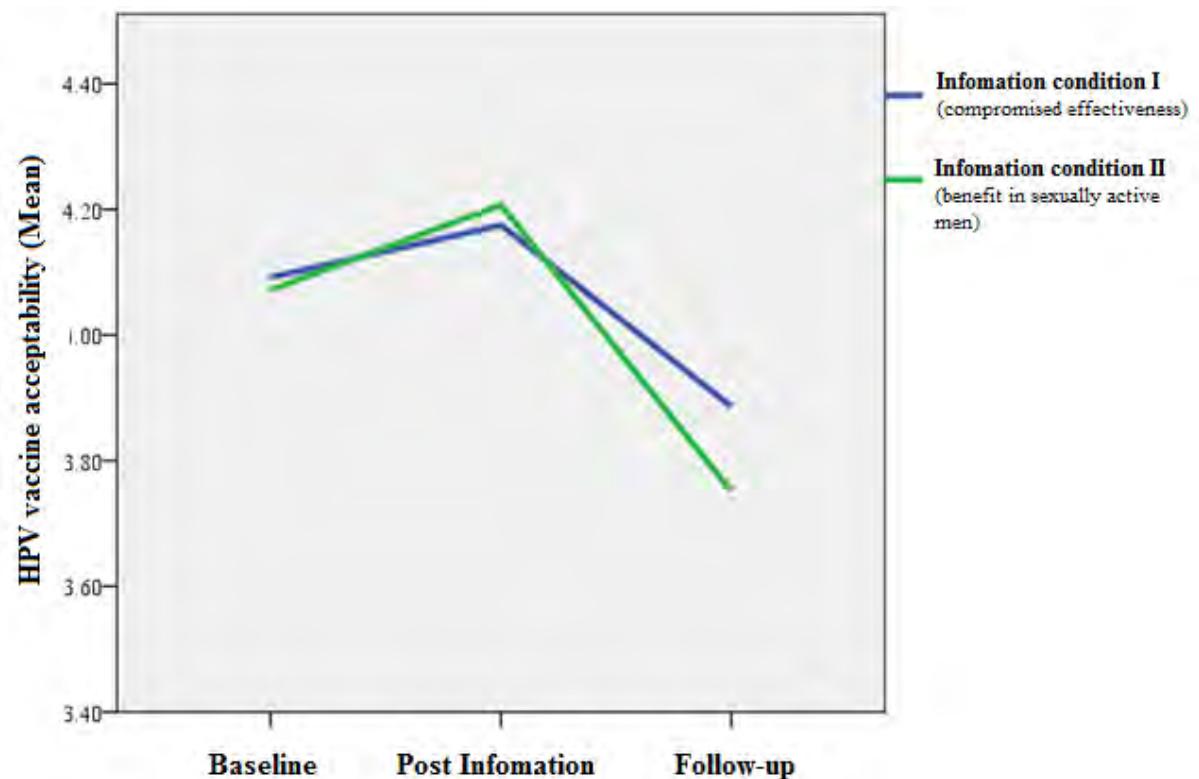


Figure 17. Mean HPV vaccine acceptability across two information conditions in three time points (N=460)

To detect whether the differences between each time measurement were significant a Friedman test with post hoc tests was performed on 460 follow-up cases. There was a statistically significant difference in HPV vaccine acceptability at the three time points [$\chi^2(2)=92.50$, $p<0.001$]. Post hoc analysis with Wilcoxon signed-rank tests was conducted with a Bonferroni correction applied, resulting in a significance level of $p < 0.017$. Median (IQR) for HPV vaccine acceptability at baseline, after receiving the information about HPV and at follow-up were 4.14 (3.67-4.80), 4.28 (3.85-5.00) and 4.00 (3.28-4.42), respectively. There was a significant difference in HPV vaccine acceptability between the baseline and post information measurements ($Z = -6.12$, $p<0.001$), between the post information and follow-up measurements ($Z=-9.12$, $p<0.001$), and between the baseline and follow-up measurements ($Z = -6.22$, $p<0.001$). The results indicate that there was an increase in HPV vaccine acceptability after the information about HPV was presented, followed by a decrease in HPV vaccine acceptability at the follow-up.

These results were confirmed by ordinal regression models, adjusted for randomised condition and baseline measurement. They showed that there was a significant increase in

HPV vaccine acceptability between baseline and the post information assessment [Wald = 507.26, Standard error = 0.108, p<0.001, the odds ratio of 11.2 (95% CI: 9.1-13.9)]. There was marginal, but not statistically significant effect of the type of information on HPV vaccine effectiveness [Wald statistic = 3.18, Standard error = 0.138, p=0.07, the odds ratio of 0.78 (95% CI: 0.59-1.02), when information condition about benefits in sexually active men was the reference category]. There was also a significant decrease in HPV vaccine acceptability between the post information and the follow-up assessments [Wald = 63.21, Standard error = 0.124, p<0.001, odds ratio of 2.68 (95% CI: 2.14-3.45)]. There was a marginal, but not statistically significant (at the 5% level) effect of the type of information on HPV vaccine effectiveness [Wald = 3.70, Standard error = 0.179, p=0.054, odds ratio of 1.40 (95% CI: 0.99-2.00), when information condition 2 was the reference category]. Finally, there was a significant decrease in HPV vaccine acceptability between the baseline and the follow-up assessments [Wald = 61.66, Standard error = 0.178, p<0.001, odds ratio of 2.57 (95% CI: 2.03-3.25)]. There was no statistically significant effect of the type of information on HPV vaccine effectiveness [Wald = 2.61, Standard error = 0.178, p=0.10, odds ratio of 1.33 (95% CI: 0.94-1.89), when information condition 2 was the reference category]. These findings indicate that there was no difference in HPV vaccine acceptability between the participants that received information about compromised HPV vaccine effectiveness and those that received information about the benefit of the HPV vaccine in sexually active men.

Additional Mann-Whitney U tests and Independent t-tests were performed to examine the impact of messages about HPV vaccine effectiveness on psychological factors. There were no significant differences in any of the psychological factors, apart from perceived barriers. Men that received information about compromised HPV vaccine effectiveness were more likely to perceive more barriers to HPV vaccination than men who received information that sexually active men may benefit from HPV vaccination.

6.4. Discussion

This study identifies behavioural and psychological barriers to HPV vaccination for MSM in the UK. It shows that two thirds of MSM were not aware of HPV and only a fifth had a good knowledge about the virus. A third of men knew about the relationship between HPV and genital warts as well as anal cancer. Over a half of MSM would ask about the HPV vaccine and only 1 in 20 would not be willing to accept the vaccine if a doctor offered it.

These findings demonstrate that while MSM are highly receptive to completing the vaccination course if they were encouraged by an HCP, their motivation for obtaining the vaccination is only moderate. Also, the HPV vaccine acceptability increased after the provision of information about HPV and the HPV vaccine, suggesting that education about HPV had a positive influence on MSM's motivation for obtaining the vaccination. Further analysis showed that the lack of motivation and demand for the vaccine in some men could be explained by the lack of awareness about HPV and HPV-related diseases, the poor ability to openly discuss sexuality with HCPs and the difficulty in accessing sexual health services. Men who were less likely to accept the vaccine did not perceive themselves at risk of the virus and perceived multiple barriers to HPV vaccination such as the lack of information about HPV vaccination and the discomfort discussing sexuality with HCPs. These behavioural and psychological barriers need to be addressed by policy-makers developing MSM-targeted HPV vaccination programmes to ensure that young MSM are adequately informed about their risk of genital warts and anal cancer and have unrestricted access to vaccinations against HPV.

6.4.1. HPV vaccine acceptability amongst MSM in the UK

Overall, 83% would be willing to accept the HPV vaccine and only 4% of MSM would refuse, when faced with the vaccine offer from their doctors. Although King et al. (2015) used a different measurement to examine HPV vaccine acceptability, their rates are comparable. They found that 83% of MSM in a SHC in London thought they would accept the three-dose HPV vaccine. Only 4% stated that they would "probably not" or "definitely not" accept HPV vaccination. Thus, this study supports the findings of King et al. (2015) and concludes that approximately 4 in 5 MSM would be willing to receive the HPV vaccine. The study by King et al. used a clinic-based sample, this study provides estimates using population-based sampling, which corresponds to a greater generalisability of findings. While most MSM in the UK are prepared to receive the HPV vaccine, even if their knowledge about the virus is poor or insufficient, access to sexual health services is an important barrier to acceptability.

Similar HPV vaccine acceptability rates have also been found in other Western countries. Overall, the majority of MSM in various countries, such as Sweden (79%; Sundstrom et al., 2010), the USA (86%; Sanchez et al., 2012), and Italy (89%; Giuliani et al., 2016), are willing to be vaccinated. This could be explained by general positive attitudes of MSM

towards vaccinations against STIs, as reported in the qualitative study in this doctoral thesis (Chapter V). MSM were enthusiastic about any initiatives that could protect them against STIs. MSM are most affected by the burden of HIV/AIDS, and therefore they might be highly receptive to any preventative programmes that could reduce their risk of future infection-related diseases. Thus, the observed HPV vaccine acceptability rates in the UK are comparable with acceptability rates amongst MSM in other parts of the world.

Unlike previous studies that have used a single-item measures of acceptability, this study utilised a 7-item scale to have a better understanding of the motivation for HPV vaccination amongst MSM. The tool demonstrated an excellent internal consistency and specified behavioural steps, such as the access to sexual health services and the disclosure of same-sex experiences, needed to complete the three-dose vaccine course. The results showed that a quarter of MSM were not willing to disclose their same-sex experiences to their doctors and only a half expressed willingness to ask for the HPV vaccine themselves, but 89% would be willing to accept the HPV vaccine if a doctor offered it. Thus, a significant proportion of MSM might not be motivated to obtain the HPV vaccine before they are exposed to the virus, because of specific physical and psychological barriers. Poor awareness about HPV and lack of perceived demand for the HPV vaccine, could substantially delay vaccine receipt, reducing the effectiveness of an MSM-targeted HPV vaccination programme. Almost all MSM would positively respond to the doctor's recommendation to vaccinate, indicating the importance of HCP's encouragement and education about HPV vaccine with MSM service users. MSM-targeted HPV vaccination programmes need to be developed addressing these barriers and ensuring that HPV vaccines can be assessed in alternative settings where MSM are more comfortable in discussing their same-sex experiences. Active promotion of the vaccine from doctors is likely to play a significant role in achieving optimal uptake in a timely fashion, before men are exposed to the virus.

The self-reported hepatitis A and B vaccination status suggests that high acceptability rates might represent the actual vaccination uptake in young MSM. Despite the lack of UK official guidelines on HPV vaccination for men, 3% of MSM reported having already received the HPV vaccination, but it is unknown under what circumstances the HPV vaccine was offered to these men. While hepatitis vaccination has been offered to MSM for over ten years in the UK through SHCs, only half of MSM reported being vaccinated against hepatitis B and 27% reported receiving the hepatitis A vaccine, suggesting overall poor-to-moderate uptake of

hepatitis vaccines. Although investigation of the reasons for the suboptimal uptake of hepatitis vaccination were not within the scope of this research, the hepatitis vaccination rates could be a marker of actual HPV vaccination initiation and completion. Men might have different attitudes towards HPV and hepatitis vaccines that could possibly drive their motivations, but there is a possibility that HPV vaccination could achieve similar uptake rates due to barriers rather than attitudes towards different vaccinations. Therefore, the acceptability measure per se might not be a good predictor of the potential HPV vaccine uptake. However, the measurement of acceptability enables the identification of potential barriers and attitudes towards vaccinations amongst MSM in the UK. Future studies need to explore the differences in HPV and hepatitis vaccine acceptability amongst young MSM and also identify barriers to hepatitis vaccination to develop adequate programmes capable of achieving optimal uptake required for MSM-targeted vaccinations to be cost-effective.

Several potential challenges to MSM-targeted HPV vaccination need to be considered. Sexual experience increases the likelihood of HPV infection thus the vaccine effectiveness is thought to be reduced with an increasing number of sexual partners. The results showed that the median age of sexual debut was 16 and the age of STI screening was 19, indicating a three-year gap between sexual activity and the first opportunity to receive HPV vaccination. Importantly, MSM reported that they felt comfortable discussing their sexuality at the same age increasing the chances that doctors could identify men eligible for vaccination. The sub-analysis showed that amongst men below the age of 20, there were on average seven sexual partners (median 3) and it is unknown whether such a proportion of sexual partners is sufficient to acquire HPV. Data from Australia indicated that 47% of young MSM, who reported more than four lifetime sexual partners, were already infected with anal HPV (Zou et al., 2013). King et al. (2015) also indicated that about 40% of MSM aged 18-20 years were found to have high-risk anal HPV strains. Thus, health promotion interventions need to focus on young MSM in order to maximise the chances of protection against the virus before any exposure.

6.4.2. Factors associated with HPV vaccine acceptability

The study showed that while a third of MSM heard about HPV, only a fifth had a good knowledge about the virus. These findings were consistent with previous studies reporting that the majority of MSM had poor knowledge about HPV (Tider et al., 2005; Reiter et al., 2010). The lack of knowledge about HPV is likely to influence individual motivation, as

men who are not aware about their own risk would be unlikely to obtain the vaccination (Rhodes et al., 2000; Friedman et al., 2000). More recently, Reiter et al. (2015) demonstrated that HPV awareness was positively associated with HPV vaccine acceptability and uptake, suggesting the need for a tailored educational campaign promoting the HPV vaccine to MSM. In this study, men who had a good knowledge about HPV were about twice more likely to accept the vaccine than men who had poor knowledge. Therefore, MSM must be informed about the benefits of the HPV vaccination at the beginning of sexual activity when the vaccine is most effective. Although previous studies demonstrated that HPV knowledge by itself is not sufficient to promote vaccine uptake (Brewer et al., 2007), health promotion campaigns need to encourage MSM to utilise sexual health services, so that men can receive additional motivational support.

Although several demographic variables were associated with HPV vaccine acceptability, they were not able to explain any variance in acceptability when entered into the adjusted regression model. In previous studies, demographic factors were weakly associated with HPV vaccine acceptability amongst MSM (Reiter et al., 2010; Rant et al., 2012; Reiter et al., 2015; Gerend et al., 2016). While in this study, age, ethnicity, education, the country of birth and the settlement size were weakly associated with acceptability, none of these variables was predictive of acceptability. For example, 78% of men in the age group 14-18 years and 91% in the age group 31-63 were willing to receive the vaccine, suggesting that young men might be less likely to accept the vaccine. The exact relationship between demographic factors and HPV vaccine acceptability requires further inspection in future studies, which could determine whether younger men, who were born in the UK, resident in small towns or villages and identify with non-white ethnic backgrounds are less willing to accept the HPV vaccine. These men might be less likely to access gay-oriented resources and networks, perhaps be less willing to access sexual health services, and disclose their same-sex behaviours to an HCP.

MSM sexual experiences and social participation were associated with HPV vaccine acceptability. Men that reported frequently using mobile phone dating applications were more likely to accept the HPV vaccine than men who had never used them. Several studies have shown that MSM who use geosocial-networking mobile applications, such as Grindr, are at high risk of HIV acquisition due to the higher accessibility to sexual partners (Rice et al., 2012; Young et al., 2013; Landovitz et al., 2013). Geosocial-networking applications

may provide opportunities for men to discuss their sexual health in relation to STIs, testing and prevention such as condoms or vaccinations. Men that reported using dating apps at least once a month were about 1.5 times more likely to accept the HPV vaccine than men who had never used mobile applications. Zou et al. (2016) demonstrated that men that utilise online dating applications were specifically younger, more educated, engaged in more risky sexual behaviours and were more likely to utilise sexual health services. Thus, this subpopulation of MSM might be more knowledgeable and concerned about the possibility of acquiring an STI, and in consequence more willing to be vaccinated. Other behavioural risk indicators were also related to HPV vaccine acceptability. For example, men that reported regular participation in gay venues, who had more than 50 lifetime sexual partners and frequently engaged in anal intercourse were more willing to accept the HPV vaccine. Reiter et al. (2010) and Meites et al. (2014) demonstrated that MSM who were at the beginning of their sexual activity, reporting a smaller number of sexual partners were less likely to accept the vaccine. MSM, who would benefit most from HPV vaccination, due to their limited sexual experience and the low probability of exposure to HPV, could experience more barriers to vaccination and, therefore, be less likely to be vaccinated. Consequently, the success of MSM-targeted HPV vaccination relies on high uptake of young MSM or those who begin their sexual activity with men, when the vaccine is most effective, protecting against multiple HPV strains.

Poor access to healthcare amongst MSM was associated HPV vaccine acceptability. In the univariate analysis, a history of receiving hepatitis A and B vaccinations was associated with the willingness to receive the HPV vaccine. Previous studies also reported similar correlations (Reiter et al., 2010; Rank et al., 2012), suggesting that men who have already completed three-dose hepatitis vaccination were more willing to obtain the HPV vaccine. Furthermore, men who have utilised STI testing at SHCs, reported receiving HIV test in the last six months and who were diagnosed with HIV, were more likely to accept HPV vaccination. The findings indicate that men who had never accessed SHCs, notably STI testing and hepatitis vaccination, are less likely to consider HPV vaccination. It is possible that these men consider themselves to be at lower risk of STIs, hence their motivation for accessing sexual health services might be lower. Previous studies have also shown that sexual health service utilisation, in particular regular attendance for STI screening, was associated with the willingness to accept the vaccine (Reiter et al., 2010; Meites et al., 2014;

Reiter et al., 2015). Therefore, men who do not access sexual health services, due to motivation or barriers, are less willing to consider HPV vaccination.

In addition, men who disclosed their sexual orientation to HCPs were more likely to accept the HPV vaccine. While 89% of men, who discussed same-sex sexual experiences with their doctors, expressed willingness to be vaccinated, only 73% of undisclosed men would accept vaccination. The findings are consistent with previous studies by Rank et al. (2012) and Meites et al. (2014), who showed that the openness about sexual orientation significantly predicted HPV vaccine acceptability and uptake. Therefore, the utilisation of sexual services and the ease to discuss a topic related to sexual health with HCPs strongly predict HPV vaccine acceptability. Health promotion campaigns need to outline benefits of accessing sexual health services and discussing vaccination with HCPs in relation to vaccination services. The services should be promoted as offering various preventative interventions rather than only focusing on screening, diagnosis and treatment.

In this study, psychological factors correlate with HPV vaccine acceptability. Men who were not willing to accept the HPV vaccine were less likely to perceive themselves to be at risk of HPV and related diseases as well as they thought that these diseases were less severe. This finding is consistent with previous studies on hepatitis and HPV vaccination in MSM (Rhodes et al. 2001; Das et al., 2005; Reiter et al. 2010; Lau et al., 2013). The previous qualitative study in this thesis indicated that some MSM believed that being in a monogamous relationship and using condoms could protect them against HPV. Also, a study by Nadarzynski et al. (2012) showed that women with little sexual experience were less likely to perceive themselves at risk of HPV infection. Thus, future studies need to explore the relationship between the amount of sexual experience, perceived risk and vaccination uptake. In addition, men who perceived the HPV vaccine to be less effective were less likely to accept it. Hence, it is possible that men with substantial sexual experience could also be uncertain about their need to vaccinate against HPV. Reiter et al. (2015) demonstrated that HPV vaccine initiation amongst MSM was associated with perceived effectiveness of the vaccine. MSM might be unsure if the vaccine could protect them against HPV if they learn that the vaccine is most effective before sexual debut, as it would be in gender-neutral HPV vaccination at school. It is unknown to what extent vaccination of sexually active men would reduce the effectiveness of an MSM-targeted HPV vaccination programme, but this should be discussed with an HCP during consultation while offering the vaccine.

Men who perceived more barriers to HPV vaccination and did not believe that it was beneficial for them and their partners were less likely to accept the vaccine. Most men agreed that HPV vaccination would be a good and responsible method against genital warts and anal cancer. However, men who did not believe that the HPV vaccine could protect them and that there was no need to be vaccinated were unwilling to receive the vaccine. Men might not understand the benefits of HPV vaccination if they are not aware of the virus and the disease it could cause. Similar results were found in previous studies (Wheldon et al. 2011; Gerend et al., 2016). HCPs and vaccine promotion campaigns need to emphasise the benefits of the HPV vaccine in order to increase the acceptability and uptake. At the same time, perceived barriers to HPV vaccination need to be addressed. This study showed that the perceived lack of knowledge about HPV and HPV vaccine and the absence of transparent information about the place where the vaccine could be obtained were reported as the largest barriers to HPV vaccination. About a quarter of men reported not feeling comfortable to attend an SHC and discuss sexuality with doctors. Perceived barriers was the strongest correlate of HPV vaccine acceptability, indicating that men who perceived more barriers were four time less likely to accept the vaccine. Perceived barriers reported in previous studies on HPV vaccine acceptability and uptake have mainly been related to the personal cost of the vaccine and possible side-effects (Wheldon et al., 2011; Reiter et al., 2015). Therefore, policy-makers responsible for the development of an MSM-targeted HPV vaccination programme need to consider these all barriers identified in this study and address them appropriately in order to increase uptake. Men need to be informed about alternative ways in which they can access the HPV vaccine without the need to disclose their sexual orientation to an HCP. If alternative vaccination methods are not considered, at least a quarter of MSM will not receive HPV vaccination.

In short, the analysis of factors associated with HPV vaccine acceptability indicates that MSM who are at the beginning of their sexual activity, represented by age, place of residence, social participation, access to healthcare, the disclosure of sexual orientation and various perceptions of HPV and the HPV vaccine, might be less likely to accept vaccination. This population is the most relevant in the context of an MSM-targeted HPV vaccination programme, because subsequent sexual experience increases the likelihood of acquiring HPV and reducing the effectiveness of the HPV vaccine. If HPV vaccination cannot cover these men, the overall cost-effectiveness of the programme might be compromised.

Therefore, vaccination programmes in MSM need to target men at the beginning of their sexual activity by encouraging them to utilise sexual health services. This might require a consideration of alternative settings, capable of vaccinating young men, who might be yet unsure of their sexual orientation. If this is not achieved, a half of MSM could be at substantial risk of HPV-related disease. In which case, despite its costs, a gender-neutral strategy could offer better preventative opportunities against HPV in MSM.

6.4.3. The impact of information about HPV and HPV vaccine acceptability

Information about HPV increased HPV vaccine acceptability. There has been no previous study measuring the impact of information about HPV on HPV vaccine acceptability. This study indicated that the information about HPV and the HPV vaccine significantly increases the willingness to receive the vaccine amongst MSM, although, such an increase was not sustained after four weeks. This drop in acceptability cannot be explained by the survey dropout, because the analysis of completers and non-completers showed that men who completed the follow-up questionnaire had higher levels of HPV vaccine acceptability at baseline. Hence, this decrease was not due to participants' completion. The findings suggest that MSM might benefit from information about HPV and the HPV vaccine in order to influence their motivation for obtaining the vaccine. The lack of permanence could be explained by the absence of available HPV vaccination at the time of the study. After the initial survey, MSM might have searched for places that offer the vaccine and could have learned that it was not available at that time. The lack of availability of the vaccine to MSM might have a negative impact on perceived likelihood of being vaccinated in the future. The absence of clear guidelines on HPV vaccination may discourage MSM seeking vaccination. Nevertheless, the vast majority expressed their willingness to be vaccinated if a doctor offered it, indicating that the acceptability was largely dependent on HCP's recommendation and vaccine promotion. Therefore, the hypothesis that the information about HPV and the HPV vaccine increases HPV vaccine acceptability can be accepted. However, the stability of HPV vaccine acceptability needs to be re-examined.

This study showed that information about HPV vaccine effectiveness does not influence HPV vaccine acceptability. The manipulation of information did not produce significant changes in perceived effectiveness and there was a borderline significant difference in HPV vaccine acceptability amongst these two groups. As such, informing men that the vaccine is most effective before sexual debut is unlikely to influence HPV vaccine acceptability. This

assessment needs to be explored further to understand the reasons why half of the sample believed that the vaccine would not be effective for them. Therefore, the hypothesis, that the information about the benefits of the HPV vaccine for sexually active men would increase HPV vaccine acceptability, when compared to the information about compromised HPV vaccine effectiveness, was not accepted.

This is the first study exploring the impact of messages about the HPV vaccine effectiveness on HPV vaccine acceptability. Previous study of Bonafide and Venable (2015) showed that men who received information about male-specific HPV-related diseases were more likely to accept the vaccine. As such, information that is specific and relevant to MSM is likely to affect HPV vaccine acceptability and uptake. Health promotion campaigns need to inform MSM about HPV and elaborate on the vaccine effectiveness in sexually active men. Men need to understand that the vaccine protects against four HPV types and despite the possibility of being previously infected, the vaccine is of a great benefit to their health.

6.4.4. Strengths and limitations

The study sample represents a population of young MSM who could benefit most from HPV vaccination. A third of the sample reported having less than six lifetime sexual partners and 65% were below the age of 26 years. Unlike other studies, which measured HPV vaccine acceptability in older, sexually active men (Rank et al., 2012; Giuliani et al., 2016), the characteristics of this sample are considered to be highly relevant in MSM-targeted HPV vaccination. The social media recruitment, using the Facebook advertisement services, enabled the identification of younger MSM at the beginning of their sexual activity, likely to be living in towns with less than 100,000 inhabitants. This group of MSM is considered a ‘hard-to-reach’ population, because their access to various sexual healthcare services is limited. Their motivation for obtaining the HPV vaccination is essential for the overall cost-effectiveness of MSM-targeted HPV vaccination as subsequent sexual experience could increase the likelihood of HPV infection and reduce the effectiveness of the HPV vaccine.

There are currently no national statistics of the size and characteristics of the MSM population in the UK. Although it is impossible to specify the representativeness of the sample, this study used an online recruitment method to reach young, geographically dispersed MSM, who might be less likely to be reached through study advertisements in SHCs, bars, clubs, university sites, local LGBT groups or the media. Usually, these facilities

are more common in larger towns and cities, due to their higher number of participants. Nevertheless, a study of Lorimer et al. (2016), who explored the use of social media amongst MSM below the age of 26 year, demonstrated that young MSM are a heterogeneous population, with 92% reporting the use of Facebook. Their sample of 702 young MSM from Scotland, Wales and Ireland presented similar characteristics in terms of sexual identity, education, ethnicity and employment. Thus, this study is likely to represent the population of younger MSM, who utilise digital media.

Social media advertising provides a valuable opportunity to target specific groups of MSM in relation to their age and geographical location. Although this study relied on convenience sampling method through Facebook advertisement, the study was advertised nationally and thus it represents a population based cohort. Several studies have highlighted the benefit of using social media platforms to recruit MSM (Young et al., 2013; Yuan et al., 2014). Hernandez-Romieu et al. (2010) demonstrated that there were no differences in the demographic and behavioural characteristics of MSM recruited via conventional sampling methods in various gay-oriented and those recruited via Facebook. However, this study used a specific sampling quota targeting only men who disclosed their interest in men. Hence, MSM, who were recruited to this study, were already comfortable disclosing their sexual interests publically online. There is a possibility that HPV vaccine acceptability could be different amongst younger MSM who are yet not ready to disclose any sexual orientation. Currently, there is no systematic method allowing the exploration of views in MSM that do not reveal their same-sex experiences. Despite their experiences, these men may not self-identify as gay or bisexual, or they do not wish to be associated with specific same-sex practice. Future studies on sexual health of MSM need to consider ways to gather data from men who engage in same-sex practices but who do not disclose their sexual orientation publically.

This study used a multi-item measure of HPV vaccine acceptability relevant to MSM. The scale included questions that specified behaviours needed for the vaccine course to be initiated and completed, such as the access to sexual health services and the disclosure of sexual orientation. It further enabled the understanding of potential barriers to HPV vaccination, beyond a single question about a willingness to receive the vaccine. If the study used only one item, asking MSM whether they would accept the vaccine if a doctor offers it, the finding could reveal that 89% were prepared to be vaccinated. However, it would fail

to recognise that about a quarter of MSM were unwilling to disclose their sexual orientation and about half would be unlikely to ask HCPs about the vaccine. Thus, the scale provided better understanding of HPV vaccine acceptability in MSM. There was a synergy between HPV vaccine acceptability scale items and other behavioural measures. For example, 26% of MSM reported never disclosing their sexual orientation to a HCP and similar proportion (23%) would not tell doctors about their sexual orientation in order to receive the vaccine, suggesting a consistency of measurements. However, the HPV vaccine acceptability scale only referred to doctors, instead of a larger group of HCPs such as nurses and sexual health advisers. Although the HPV vaccine acceptability could be different if the disclosure of sexual orientation to a nurse is discussed, the use of ‘doctor’ in this study was in relation to other settings, such as GP practices, pharmacies or outpatient clinics.

The survey consisted of 54 items, which examined correlates of HPV vaccine acceptability identified in the systematic review (Chapter IV) and the qualitative study (Chapter V). The design of the survey was not guided by any theoretical framework and it aimed to explore demographic, behavioural and psychological variables that were associated with HPV vaccine acceptability in previous studies. It also explored novel constructs such as the frequency of gay bar/club participation or dating app usage, the frequency of receptive anal intercourse and vaccine hesitancy. Thus, the findings of this study offer additional knowledge on previously unexplored factors associated with HPV vaccine acceptability. However, the number of items induced in this survey was limited to 55 in order to reduce the likelihood of participants’ dropout. During survey piloting, the respondents were concerned that the questionnaire was lengthy with a suggestion to limit the number of questions. As a result, constructs such as attitudes, self-efficacy, worry about HPV, perceived social norms and perceived behavioural control were not examined. In addition, several constructs, which were identified in theoretical review (Chapter II) but not included in the survey, such as cues to action, personality traits, motivation to comply or perceived importance of vaccination, also deserve investigation. It is possible that some of these variables could be associated with vaccination behaviours amongst MSM. Future research needs to investigate whether these constructs are associated with HPV vaccine acceptability and uptake.

This is the first study measuring the impact of information about HPV on HPV vaccine acceptability amongst MSM over time. The four-week follow-up period might have not be

sufficient to observe whether the change in the willingness to receive the vaccine was only a subject to the vaccine availability. A longer follow-up period is required to observe in the provision of HPV vaccination in MSM could have an effect on acceptability. So far, no other studies examined the change in HPV vaccine acceptability and it is unclear whether any possible contextual factors, such as participants reading about HPV and the HPV vaccine elsewhere, could increase or decrease it. Future studies need to consider examining the vaccine initiation and completion, as vaccination behaviours rather than motivation, and identify to what extend HPV vaccine acceptability predicts actual uptake. In addition, the information provided to participants was estimated to achieve readability of individual who are 15-year old, which exceeds the average UK readability age of 12, suggesting that MSM's comprehension of the information could be compromised. However, Williamson et al. (2010) demonstrated that most patient information leaflets in the UK have average Flesch readability around 60, indicating that readability of the information about HPV and the HPV vaccine was not substantially different from the readability of other hospital materials. Nevertheless, an information with lower readability age, which could be understood by a larger proportion of MSM, could influence HPV vaccine acceptability and other psychological variables.

The self-reported data is a subject to recall bias and social desirability. Despite the lack of official recommendations, about 3% of MSM reported being vaccinated against HPV and it was difficult to identify where these men received the HPV vaccine. It is possible that some participants incorrectly reported their previous vaccinations, whether HPB or hepatitis, and falsely estimated the age of sexual debut or the number of lifetime sexual partners. Previous qualitative study in this thesis (Chapter V) showed that some MSM have poor understanding of vaccines against STIs. They were unable to recall the circumstances in which they were offered the hepatitis vaccine. The possibility of recall bias was also reported in similar online surveys amongst MSM (Schmidt et al., 2013; Rendina et al., 2016), suggesting that the collection of retrospective data on sexual health and sexual behaviours amongst MSM may not be free of errors. However, the participants were able to select '*Prefer not to say*' or '*Don't know*' answers if they were unsure or they did not wish to disclose their response. Also, the survey was piloted amongst a number of MSM with no medical knowledge about HPV and it was assessed in terms of readability, understanding and clarity of questions.

6.5. Conclusion

While nearly all MSM would accept HPV vaccination if a doctor offered it, only half showed motivation to request it. This study indicates that men who are at the beginning of their sexual activity might be less likely to be vaccinated due to their lack of use or access to sexual health services and the inability to discuss their same-sex experiences with an HCP. Also, men who knew about the HPV, and perceived themselves at risk of HPV-related diseases were more likely to accept the vaccine. The perceptions of vaccine benefits, effectiveness and potential barriers were also associated with HPV vaccine acceptability. Therefore, health promotion needs to target younger men, who have just started to be sexually active, with messages that explain the risks of HPV infection and potential benefits of HPV vaccination. Alternative settings, such as GP practices or pharmacies, need to be considered when designing an MSM-targeted HPV vaccination programme, to allow MSM better access to HPV vaccination services and address the difficulty of discussing same-sex experiences. Despite the hepatitis B vaccine being recommended to MSM over the past ten years, only half reported receiving it, which could be treated as a marker for potential HPV vaccination uptake. Despite high acceptability, MSM continue to face significant barriers to vaccinations that substantially impede their chances of disease prevention. In relation to the data on hepatitis vaccination and the motivation for obtaining the HPV vaccine reported in this study, it is predicted that approximately 50% of young MSM would initiate HPV vaccination. Public health interventions are necessary in order to increase hepatitis and potential HPV vaccination rates in MSM.

Chapter VII – A mixed-method study on sexual healthcare professionals’ attitudes towards HPV vaccination for men who have sex with men

A part of this chapter has been published: Nadarzynski, T., Smith, H. E., Richardson, D., Ford, E., & Llewellyn, C. D. (2015). Sexual healthcare professionals’ views on HPV vaccination for men in the UK. *British Journal of Cancer*, 113(11), 1599-1601.

7.1. Background

Healthcare professionals (HCPs) are often perceived as the most trusted source of information about HPV vaccination. Their positive attitudes and encouragement influence patients’ health beliefs and the willingness to accept vaccination (please see Chapter III). While the majority of HCPs perceive HPV immunisation programmes to be highly beneficial, some are less supportive of promoting vaccination to their patients. This reluctance to vaccinate is related to various concerns, beliefs and perceptions about the form of a particular vaccination programme. HCPs’ scepticism about the harms and benefits of HPV vaccine for their patients is associated with suboptimal uptake and in consequence compromises the overall effectiveness of vaccination programmes.

7.1.1. Attitudes towards HPV vaccination programmes

Before the introduction of female HPV vaccination programmes in 2007, HCPs had positive attitudes towards HPV vaccination. Most clinicians from developed countries perceived HPV vaccination to have a significant impact on the reduction of cervical cancers and would recommend it to their female patients. For example, Tissot et al. (2007) indicated that although there were not data on long-term efficacy and safety of HPV vaccination, most HCPs were in favour of the universal vaccination for all children. However, there was concern about potential poor public understanding of HPV and believed that a provision of guidelines for paediatricians on how to respond to various parental concerns about the vaccine would increase their confidence to recommend it. Kahn et al. (2007) demonstrated that HCPs’ uncertainties about HPV vaccination efficacy, safety and potential harm were related to their decisions whether to recommend the vaccine to their patients. They believed that parental and provider reluctance to HPV vaccination, on the grounds of the perceived child’s risk of HPV, was likely to reduce uptake. Intentions to vaccinate also varied between various HCPs and these were associated with knowledge about HPV, personal and

professional characteristics, vaccine policies, views on vaccine cost and communication about HPV vaccines. Figure 18 presents a conceptual model of factors associated with intentions to recommend HPV vaccination (Kahn et al., 2017).

After the introduction of female HPV vaccination programmes, HCPs' attitudes towards the use and value of the HPV vaccine were associated with their willingness to recommend it. In their review, Hopkins and Wood (2013) showed that many clinicians, in various countries, considered financial factors, such as the personal cost of the vaccine to their patients or reimbursement, when deciding if HPV vaccination was suitable for their patients. The majority constructed attitudes towards the cost-effectiveness of various HPV vaccination programmes when forming their opinions. The reluctance of HCPs to raise issues related to sexuality, the concerns about the age of immunisation and fears that the vaccine would encourage high-risk sexual behaviours, were significantly associated with HCPs' unwillingness to offer vaccination. HCPs, who thought their patients were not at risk of HPV and who felt insufficiently informed about vaccine safety and effectiveness, were less likely to promote HPV vaccination. Unsupportive HCPs believed that the proposed female HPV vaccine programme was not safe and effective. They were unable to specify the duration of immunity and potential coverage, expressing the need for more information about the HPV vaccine to increase their confidence that HPV immunisation was harmless, nontoxic and would certainly reduce the rate of cervical cancers. Some HCPs believed that vaccination of 11-year-old girls is belated, proposing that even younger age groups should be selected, suggesting a concern about the effectiveness of vaccinating adolescents. Reluctant clinicians were unsure how to explain the sexually transmittable nature of HPV-related diseases to adolescent women and their parents. Some thought their female patients were not at risk of HPV and did not see HPV vaccination as necessary. Several HCPs expressed a need for HPV screening before they were ready to recommend the vaccine, indicating a probability of delayed immunisation due to waiting for HPV test results. Despite these concerns, HCPs acknowledged that patients relied on physician's opinion about the vaccine (Humiston et al. 2005). HCPs recognised their role in the delivery of vaccination, but were unlikely to recommend HPV vaccination if they remained concerned about vaccine effectiveness and safety.

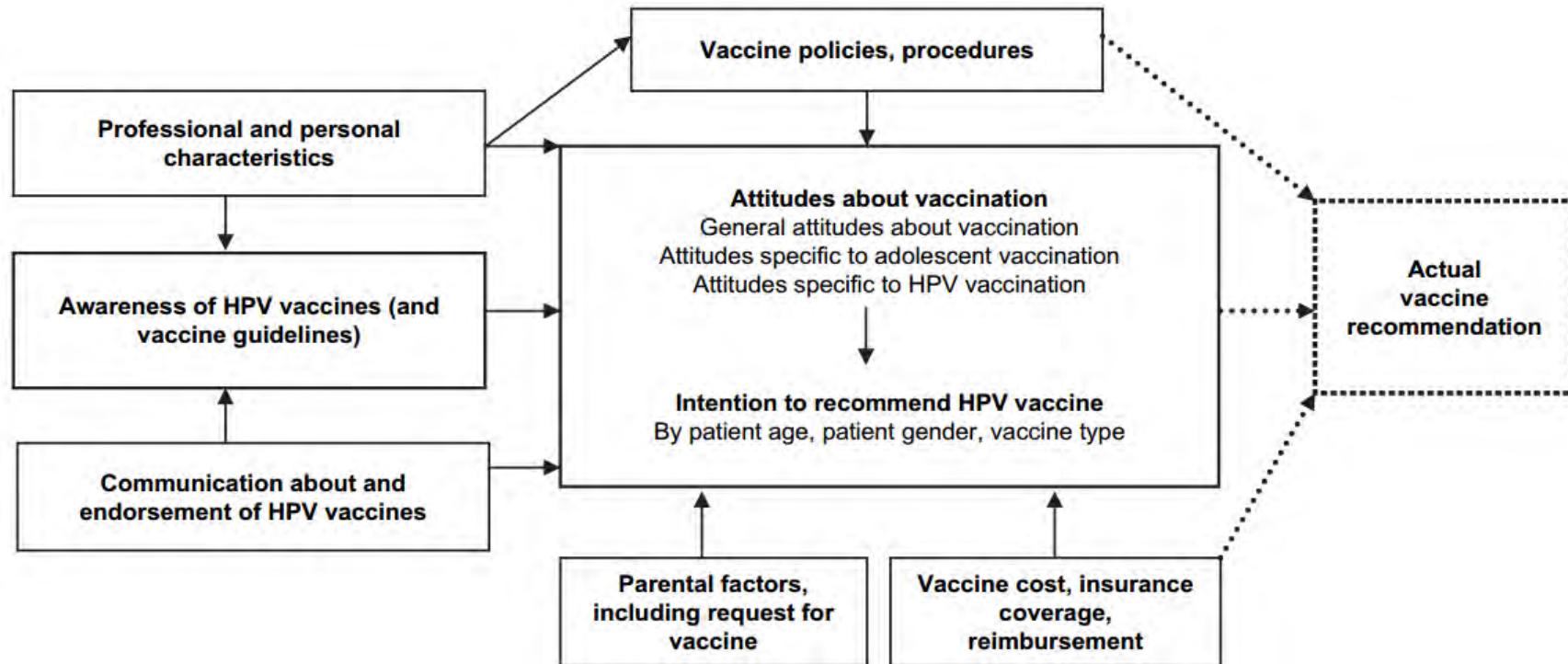


Figure 18. Conceptual model of factors associated with healthcare professionals' intentions to recommends HPV vaccination (modified from Kahn et al. 2007)

7.1.2. Attitude as a predictor of HPV vaccination

HCPs' recommendations are associated with vaccine HPV vaccination uptake. In a study of 530 women, aged 19-26, a discussion about HPV vaccination with an HCP was identified as the strongest correlate of vaccine uptake (Rosental et al., 2011). Around 98% of vaccinated women reported receiving a vaccination recommendation from their doctor. In contrast, 70% of those unvaccinated could not recall discussing HPV vaccination with any HCP. Another study of women under the age of 26 years has indicated that 53% received an HPV vaccine recommendation from an HCP and 45% of the sample completed the HPV vaccination course (Gerend et al., 2015). The study concluded that women who received the recommendation were 35 times more likely to uptake the vaccine. Although HCPs' behaviours and active encouragement were associated with female HPV vaccination uptake in the US, there is little evidence from other countries with different healthcare systems. Also, a national US survey of 431 paediatricians in 2005 reported that while 89% would recommend HPV vaccination for 16-18 year old women, only 46% would recommend it to girls in the 10-12 year age group (Daley et al., 2006). Amongst clinicians that did not support HPV vaccination, 11% reported having concerns that HPV vaccination might encourage high-risk sexual behaviours. Another US survey, conducted between 2006 and 2009, revealed that strong intentions to recommend HPV vaccination to adolescent female patients were significantly associated with HPV vaccination initiation rates (Freemster et al., 2008). Also, a survey of 1538 clinicians from the American Medical Association conducted in 2009 demonstrated that only 35% of HCPs reported "*always*" recommending HPV vaccination to their adolescent patients in the 11-12 age group, in line with the official vaccine guidelines (Vadaparampil et al., 2011). The rate of HPV vaccine recommendation has thus been found to vary and a significant proportion of HCPs appear not to be compliant with official policies on HPV vaccination.

7.1.3. Views on male HPV vaccination

Only one study examined the perspectives of HCPs on male HPV vaccination in the UK (Hopkins et al., 2009). A survey, conducted before the introduction of female HPV vaccination, indicated that while 65% of clinicians were willing to recommend HPV vaccination to men, a fifth were unsupportive of the gender-neutral approach. At the time of the study, only 38% of HCPs reported feeling adequately informed about the HPV vaccine. Interestingly, as a comparison, a half were not aware about the causal role of HPV in the development of cervical cancer, indicating a general poor knowledge about HPV amongst

HCPs. Thus, the survey shows that despite low levels of knowledge about HPV, the majority of clinicians were willing to recommend the vaccine to men. Shrikrishna et al. (2015) demonstrated that HCPs in the UK have generally positive attitudes towards vaccinations, with 68% reporting being vaccinated against flu in the preceding year. Thus, their recommendations of universal HPV vaccination might be based on their favourable views on immunisation programmes in general.

Another survey of 1,158 clinicians in the US has shown that 93% would recommend vaccination of men aged 19-26 years, but only 64% would recommend it to 11-12 year-old boys (Weiss et al., 2010). The results show that HCPs vaccine recommendation is dependent on the age of the vaccine recipient. Interestingly, approximately 75% thought male vaccination would protect more females against cervical cancer, but only 53% believed that it would protect men against genital warts and anal cancer. About 40% of participants believed that a female-only vaccination creates a “*false sense of security*” for males, but only 35% disagreed that “*HPV causes too few cancers amongst males to make it worthwhile to vaccinate them*”. About 60% thought that it was too late to vaccinate sexually active men. These studies have indicated that HCPs’ attitudes towards male vaccination are closely related to the view that gender-neutral HPV vaccination reduces women’s cancer risk. Neither of these studies explored HCPs’ attitudes towards selective vaccination of MSM.

The evidence from several US studies has demonstrated that doctor’s recommendation is a significant correlate of HPV vaccine acceptability amongst MSM. For instance, a population-based survey has shown that MSM who believed their doctor would recommend HPV vaccination, were approximately 13 times more likely to accept it (Reiter et al., 2010). Another study has reported that 80% of MSM at a sexual health clinic in New York reported doctor’s recommendation and encouragement as the key reason for accepting HPV vaccination (Thomas & Goldstone, 2011). This association has also been found in targeted hepatitis vaccinations, where doctor’s recommendations were associated with vaccination uptake, suggesting that MSM are highly receptive to HCPs’ opinions and recommendations. Their negative attitudes are likely to result in vaccination discouragement, so their concerns and opposing views need to be further understood.

7.1.4. Decision-making processes

According to the Vaccine Hesitancy Model (Dube et al., 2013), several factors are associated with HCPs' recommendations for vaccination. Clinical and epidemiological knowledge about the natural history of HPV-related diseases and prevalence of a preventable pathogen influences the perceived suitability of a vaccination programme. HCPs with poorer knowledge about the use of vaccination against some viruses, such as shingles, are less likely to vaccinate their patients. In addition, the level and standard of clinical training on vaccinations and the ability to communicate the benefits of vaccinations to the patients were associated with vaccination recommendations. HCPs who were not specifically educated about the use of particular vaccines were less likely to encourage patients to uptake them. Importantly, some HCPs might be hesitant to offer vaccinations to their patients despite epidemiological knowledge and communication skills. Personal beliefs and attitudes towards vaccinations are likely to mediate professional vaccine recommendations. There is a need for doctors' motivation to recommend vaccination and decision-making processes to be investigated in order to identify what factors, beliefs and attitudes are associated with the recommendation of HPV vaccination in MSM.

HCPs use various cognitive strategies and decision processes to form their attitudes towards vaccinations to provide better care and to improve health outcomes for their patients. Although various studies have shown that decision-making processes used by physicians and their patients are not free of bias, some mental or emotional representations have an impact on the way doctors and patients accept vaccinations (Chapman et al., 2000). For example, HCPs might not perceive that their patients are at risk of infection, evaluating outcomes about individual preferences and values. Personal beliefs, culture, the experience of other vaccinations and the availability of epidemiological information influence decision-making processes. When financial arguments are being used to evaluate a need for treatment, a preference reversal effect may occur. This is the dissonance between personal preference for a certain treatment or medical procedure and the evaluation of the financial cost of treatment. According to Chapman's perspective on cognitive biases in medical judgement, HCPs may foresee the gender-neutral HPV vaccination as appropriate, based on the concept that vaccines are of benefit to the public health. They may alter their opinion once the cost-effectiveness argument is presented. The change in perspective could result from the opportunity to review the vaccination-relevant information. However, at the time of

uncertainty and the lack of related data, HCPs may use instinct when constructing their professional recommendations.

Heuristics or intuitive medical decision-making and potential bias resulting from uncertainties and insufficient knowledge are well investigated. Hall (2002) argued that a significant number of clinicians were unaware whether their clinical knowledge was up-to-date. Therefore, intuitive decision-making processes, based on mental shortcuts and emotions are more likely to be adopted. While some sources of uncertainty about available information could be eliminated by the provision of education and training, other personal and conceptual sources of uncertainty remain. Gigerenzer and Gaissmaier (2011) showed that HCPs often use mental models of the most conventional treatments or medical procedures when judging the best healthcare options for their patients. However, the study showed that the outcome of new and less familiar procedures, not considered by HCPs, was often superior. Ofri (2009) claimed that despite the availability of statistical data that the influenza virus results in 30,000-40,000 death in the US each year, the uptake of the vaccine was still modest. However, the emergence of H1N1 influenza in 2009 lead to a strong emotional reaction, often represented by fear and worry, which influenced attitudes of HCPs towards flu vaccination. The uncertainty produced by the sudden epidemic was managed with an intuitive recommendation of vaccination, despite unknown effectiveness and safety. Several subsequent studies reported the flu vaccine to reduce the risk of influenza only by 22% (Osterholm et al., 2012). The study shows that in the time of uncertainty, HCPs have positive attitudes towards vaccinations that can override their need to review data on vaccine efficacy. Thus, intuitive ‘rule-of-thumb’, unconscious processing may be used when access to decision-relevant information is limited or when decision-making activities to reduce decision bias are restricted.

In contrast to heuristic processing, systematic decision-making is associated with less bias in medical judgement. Systematic, analytical and conscious processing is adopted when a decision maker thoroughly evaluates the details of the decision-relevant information and attends pertinent decision-making activities to construct judgements about a particular treatment. The research shows that although heuristic processing may result in satisfactory decisions being made at the time, it is more probable that these decisions are wrong when systematic processing is employed (Payne and Bettman, 2004). Although systematic

processing is time-consuming and requires substantial cognitive effort, it may guide more accurate decision-making and, therefore, is considered superior to the heuristic process.

There is a need to identify whether HCPs would recommend HPV vaccination to MSM because the lack of support for the vaccination programme could result in sub-optimal uptake. Studying opinions and views of HCPs when forming their recommendations and attitudes towards HPV vaccination for men would enhance the understanding of potential barriers to the introduction of the MSM-targeted HPV vaccination. The exploration of opinions and views could identify what components of decision-making processes are the most relevant when HCPs develop their vaccination recommendations. It is hypothesised that a significant number of HCPs would express uncertainty about MSM-targeted HPV vaccination.

7.1.5. Study aims

The study objective was to examine the attitudes of sexual HCPs towards the introduction of MSM-targeted HPV vaccination in the UK. The aims of the study were:

Aim 1: To identify the level of support for potential MSM-targeted HPV vaccination amongst HCPs working in sexual health clinics

Aim 2: To identify barriers to the potential introduction of MSM-targeted HPV vaccination in the UK amongst HCPs

Aim 3: To identify facilitators to the potential introduction of MSM-targeted HPV vaccination in the UK amongst HCPs

7.2. Methods

7.2.1. Design

In 2013, there were no official recommendations for male HPV vaccination in the UK. Several sexual health services, such as Chester genitourinary medicine clinic started to offer HPV vaccine to their male service users (Countess of Chester Hospital “HPV infection and men” leaflet, 2013), but the scale of ‘off-label’ vaccination of men throughout the UK was unknown. Therefore, this research was designed to conduct a service evaluation of male HPV vaccination practices amongst sexual health workers using an online survey format. The respondents were also offered an opportunity to participate in a qualitative follow-up, using telephone interviews, for further in-depth exploration of the views about male HPV vaccination.

Mixed-methods designs have been gaining recognition because they offer different epistemological perspectives when evaluating complex and novel health services (Creswell et al., 2013). The combination of two methodologically dissimilar approaches allows for the exploration of ideas that generate new knowledge on a particular subject, but also enables the analysis of trends in a definite population and individual contexts. Quantitative tool, such as a survey, facilitates a cross-sectional investigation of magnitudes and frequencies on a larger scale to generate conclusions that could be representative of the studied population. Quantitative analysis is an explorative tool that can facilitate the identification of trends and tendencies. Qualitative research, such as an in-depth interview, offers the opportunity to study the meaning and understanding of constructs and perspectives. Qualitative analysis is an explorative tool, which focuses on the identification of novel findings or ideas not previously captured by the broader quantitative approach (Johnson et al., 2004). The mixed-methods design offers the advantages of both methodological approaches focusing on general tendencies and individual detail when answering a research question.

For example, mixed methodologies might show the attitudes towards HPV vaccination for MSM presented by HCPs, but they also might offer insight into specific decision-making processes when revealing opinions and forming recommendations. This could further facilitate the understanding of existent processes but also the formation of new hypotheses and research questions. However, poorly designed and conducted mixed-methods studies with a dominant qualitative or quantitative component may interfere with the interpretation of results. Therefore, a coherent strategy for the integration of these two methods needs to be considered (Creswell et al., 2013). For example, the analysis of focus groups or interviews is likely to influence the development of the survey measurements, and vice versa. Thus, the implementation of mixed-methods approach requires careful consideration of its individual components.

This study implemented a mixed-method design to measure the proportion of HCPs in favour of the universal male HPV vaccination as well as the MSM-targeted HPV vaccination catch-up programme. In parallel, decision-making processes associated with recommendations for HPV vaccination for these two strategies were assessed. The online survey, as the quantitative component, was developed to evaluate attitudes of HCPs towards both targeted and the universal HPV vaccination strategies. The respondents had an opportunity to take

part in the follow-up semi-structured telephone interviews during which their attitudes, opinions and perspectives were explored in more depth. The order, role and the purpose of each component are likely to influence the results and possible discussions of findings.

7.2.2. Ethical approval

The online survey was carried out as part of a service evaluation to optimise advice about the proportion of sexual healthcare professionals involved in HPV vaccination of men, so an ethical review was not required. The telephone interviews were approved by the Brighton and Sussex Medical School Research Governance and Ethics Committee (Reference number: 13/164/LLE; Appendix L)

7.2.3. Participants

This study was designed to recruit HCPs working within the National Health Service (NHS) at genitourinary medicine clinics (GUM) and contraception and sexual health clinics (CASH). The relevant professionals were: consultants, doctors in training, nurses and health advisors, as these specialists would potentially be responsible for the implementation of the MSM-targeted HPV vaccination. The JCVI considered a targeted HPV vaccination in MSM to be delivered through sexual health clinics. These settings were selected due to the existing infrastructure for MSM and ongoing, targeted Hepatitis A and B vaccination.

Inclusion criteria

- HCPs working in sexual health settings (i.e. doctors, nurses, health advisors)

Exclusion criteria

- Professionals working in sexual health settings but not directly involved in patient's healthcare (e.g. receptionists, laboratory staff or pharmacists)
- HCPs from settings not primarily focussed on sexual health (e.g. General Practitioners, Urologist, Gynaecologist)
- HCPs working outside the United Kingdom

7.2.4. Procedure

Development of the online survey

An online or web-based survey method was selected as it offers several advantages over paper questionnaires. Online surveys have lower costs and result in relatively higher response rates and quality than pen-and-paper mailed or faxed questionnaires (Cobanoglu et al., 2001). Online surveys are shown to be more secure, flexible, time efficient and less receptive to data entry omissions. Also, online surveys allow for targeted sampling methods when a specific selection of respondents is required. However, online surveys could result in low response rate if potential respondents perceive it as ‘junk mail’ or are given unclear answering instructions. When compared to paper-based questionnaires, online surveys have been shown to offer similar results in terms of analysed factors and constructs (Dillman, 2011).

This online survey used services provided by www.esurv.org to collect data. This tool has been used by leading educational institutions and has been commonly utilised and promoted in the field of medicine, psychology and public health (Schleyer & Forrest, 2000). Sexual healthcare professionals from various geographical locations were contacted in order to have a wide and geographically representative sample. Additionally, errors and data entry mistakes were reduced as data were entered directly onto a database by the participant.

The survey questionnaire was developed based on previous studies on attitudes towards female HPV vaccination and an expert opinion from several sexual health workers (Section 7.2.5). The majority of identified statements from previous research were not suitable because of limited relevance to the MSM-targeted HPV vaccination. Because there was no previous research examining HCPs’ attitudes towards the MSM-targeted HPV vaccination in particular, six survey items were adopted to reflect its relevance. In addition, four sexual health doctors from two clinics (the Claude Nicol Centre in Brighton and the Patrick Clements Centre in London) and two health psychologists from the University College London and Brighton and Sussex Medical School were consulted to explore any potential attitudes that might be related to HPV vaccine recommendations.

The survey was then piloted amongst five sexual health workers from the Claude Nicol Centre. These professionals were asked to comment on the comprehensibility of the entire questionnaire and the clarity of the attitudinal statements. After piloting, the survey layout

and fonts were changed to increase legibility. One statement “HPV causes too few cancers among HIV-positive MSM to make it worthwhile to offer vaccination” was added to highlight the need for a specific targeted HPV vaccination in people with HIV. The previous geographical health authority divisions in England were replaced by the more recent Public Health England divisions (Department of Health, 2012). It was also recommended omitting the question about the sexual orientation of respondents due to its irrelevance to the subject. The pilot respondents recommended distributing the study invitation via personalised email to increase survey responses, because HCPs were more likely to respond to tailored emails than a generic study advert. Dillman et al. (2014) demonstrated that personalised surveys facilitate rapport between researchers and respondents resulting in lower attrition rates.

Survey distribution

Three methods of survey distribution were used to recruit HCPs: tailored invitation emails, a newsletter and a snowball sampling method. In May 2014, Public Health England resources were searched to identify a list of sexual health clinics in England, Wales, Scotland and Northern Ireland. The search produced a list of 222 sexual health clinics (Appendix M). Websites of each clinic were inspected for names and email addresses of consultants, nurses and health advisors potentially eligible to take part in the study. In addition, online pages of relevant organisations (i.e. the British Association for Sexual Health and HIV and the British HIV Association) were also reviewed to identify any relevant sexual health workers. As a result, 320 personal email addresses of HCPs in the UK were identified.

In June 2014, these addresses were used to send a study invitation (Appendix N) directly to a Brighton-based sexual health consultant, who was also the clinical advisor to my PhD and a member of the research team. This approach was to reduce the perception of a ‘junk email’ and to yield higher response rates while increasing its importance and clinical relevance.

In July and August 2014, permissions from three professional organisations were gained to distribute the survey advert using newsletters and bulletins for their members. These organisations were: the British Association of Sexual Health and HIV (BASHH), the Society of Sexual Health Advisors (SSAH) and the National HIV Nurses Association (NHIVNA). Each organisation included a link to the online survey in one of their newsletters.

In addition, within the invitation email, newsletter adverts and in the questionnaire introduction, respondents were asked to distribute the survey to co-workers in their departments. This snowball sampling recruitment method was set up to encourage more sexual health workers to take part in the study. The data collection terminated in October 2014.

Follow-up telephone interviews

At the end of the survey, the respondents were invited to take part in a follow-up 20-minute long telephone interview about the MSM-targeted HPV vaccination and to leave their contact details (name, telephone number or email address), if they wished to take part. Survey respondents who agreed to participate were sent an information sheet about the study (Appendix O) and a consent form (Appendix P). The information sheet informed participants about their confidentiality, their right to withdraw without giving a reason and possible publications of findings. The initial sampling strategy aimed to recruit a representative proportion of survey respondents regarding gender, professional role and attitudes towards HPV vaccination for MSM.

The potential interviewees were asked to return the signed consent form via email, post or fax. All interviews were conducted via telephone from a quiet office at Brighton and Sussex Medical School to reduce any background distractions. No incentives were offered for participation. The discussions were recorded and transcribed verbatim. Any information that could result in the identification of participants was removed. Participants' email addresses and audio-recordings were stored on a password-protected computer at Brighton and Sussex Medical School, accessed only by the main researcher. All consent forms were stored in a locked cabinet at Brighton and Sussex Medical School.

7.2.5. Instruments

The survey, which contained eight questions, was displayed on a single webpage to reduce participants' time spent changing pages and to avoid server time-outs (Appendix R).

Demographic and clinical features

The demographic questions asked about respondents' gender (i.e. male, female, transgender), professional role (i.e. consultant, doctor in training, nurse, health advisor, other) and the location of their sexual health service in accordance with the current Public

Health divisions (i.e. London; Anglia and Essex; East Midlands; South Midlands and Herts; West Midlands; Cheshire and Merseyside; Cumbria and Lancashire; Greater Manchester; North East; Yorkshire and the Humber; Avon, Gloucestershire and Wiltshire; Devon, Cornwall and Somerset; Kent, Surrey and Sussex; Themes Valley; Wessex; North Ireland; Scotland; and Wales). Respondents were asked about the year of their qualification and the estimated proportion of their service users identifying as MSM (i.e. below 10%, or between 10-30%, 31-50%, 51-70%, 71-100%). HCPs, whose patient population was estimated to be at least 50% of self-declared MSM, were considered to work in settings highly relevant for targeted HPV vaccination. One question asked participants whether they had ever been involved in HPV vaccination of any men, with four possible responses ‘Yes – heterosexual men’, ‘yes – men who have sex with men’, ‘No’, and ‘Not sure’. This question aimed to estimate the proportion of sexual healthcare professionals that had already used “off-label” vaccination for men.

Attitudes towards male HPV vaccination

Table 15 lists the 18 attitudinal statements with the sources from which the items were adopted. The respondents were asked to indicate to what extent they agreed or disagreed with these statements using a Likert scale with five possible options: ‘Strongly disagree’, ‘Disagree’, ‘Neither agree nor disagree’, ‘Agree’ and ‘Strongly agree’.

These statements aimed to measure seven distinct paradigms. The first three items ‘a’, ‘b’ and ‘c’ measured the willingness of sexual healthcare professionals to recommend the universal male and the MSM-targeted HPV vaccination programmes. Also, the perceived willingness to recommend the MSM-targeted HPV vaccination was assessed. The statements ‘d’ and ‘e’ examined the perception of ‘herd immunity’ from female HPV vaccination and its benefit to heterosexual men and for MSM separately. According to previous research of female HPV vaccination, a perception of women being at low risk of HPV infection is one of the main barriers to vaccination recommendations. Another three statements ‘f’, ‘g’ and ‘h’ assessed the perceived value of HPV vaccination for heterosexual men, HIV-negative MSM and HIV-positive MSM in relation to the probability of HPV-related cancers in these populations. Three statements ‘i’, ‘j’ and ‘k’ measured the perceived HPV vaccine acceptability amongst MSM, perceived benefit of men being encouraged to utilise sexual health services and a perceived risk compensation following the introduction of the MSM-targeted HPV vaccination. The item ‘l’ assessed whether HCPs agreed that patients should

pay for the HPV vaccine and ‘m’ whether their eligibility should be based on individual assessment while attending an SHC. The statement ‘n’ examined whether HPV vaccine should be offered in alternative settings such as general practices or pharmacies. The item ‘o’ explored whether HCPs believed it was too late to vaccinate sexually active MSM. The statement ‘p’ assessed the perceived need of HCPs to introduce an age cap when introducing HPV vaccination for MSM. Two items ‘q’ and ‘r’ assessed the perceived capabilities of HCPs to offer HPV vaccine to MSM. The statements explored perceived knowledge about the use of HPV vaccine for MSM and perceived level of skills to identify MSM that would benefit from HPV vaccination. These items were constructed, based on previous research in female HPV vaccination.

Telephone interview - topic guide

Semi-structured telephone interviews used eight questions to guide the discussion about the introduction of the MSM-targeted HPV vaccination programme (Table 16). They were developed based on the available literature indicating that poor self-identification as gay or bisexual, limited access to vaccination services and the uncertainty over whether HPV vaccines may be effective in sexually active men, were perceived to be common barriers (Lawton et al., 2013). This study sought to confirm the existence of these concerns amongst sexual healthcare professionals and explore any other possible challenges and barriers to the introduction of HPV vaccination for MSM not covered by the questionnaire.

The interviews started with an open question about the participants’ perspective on the best vaccination strategy to protect MSM against HPV. It followed a question about the proposed MSM-targeted HPV vaccination programme considered by the JCVI. The participants had a chance to justify their views on different vaccination strategies and outline any possible concerns. The researcher explored these attitudes in more depth to understand the decision-making processes when constructing a recommendation for a certain vaccination strategy. Three consecutive questions refocused the participants on the feasibility of the MSM-targeted HPV vaccination programme in the UK. The perceptions of the most suitable settings were explored to identify potential healthcare and third sector services that could potentially be involved in vaccination for MSM. The ways to identify young MSM and encourage them to engage with sexual health services were examined. Any perceived barriers and facilitators to the introduction of the MSM-targeted HPV vaccination programme were examined. The participants were prompted to report any factors that could

Table 15. Attitudes towards male HPV vaccination

Item	Attitudinal Statement*	Source
	Vaccination programme recommendation	
a)	I would recommend HPV vaccination of all men, regardless of their sexual orientation	Hopkins et al. (2009)
b)	I would recommend targeting MSM to be vaccinated against HPV	
c)	Other healthcare professionals would not recommend HPV vaccination to MSM	Developed for the study Hopkins et al. (2013)
	Perceived population at risk	
d)	Vaccinating females against HPV will reduce HPV-related cancers in heterosexual men	
e)	Vaccinating females against HPV will reduce HPV-related cancers in men who have sex with men (MSM)	
	Perceived value	Weiss et al. (2010)
f)	HPV causes too few cancers among heterosexual men to make it worthwhile to offer vaccination	
g)	HPV causes too few cancers among MSM to make it worthwhile to offer vaccination	
h)	HPV causes too few cancers among HIV-positive MSM to make it worthwhile to offer vaccination	
	Perceived health behaviours	Developed for the study
i)	The majority of MSM would be willing to receive the HPV vaccine	
j)	HPV vaccination would encourage MSM to engage with sexual health services	
k)	Vaccinating MSM could increase the likelihood of unsafe sex	
	Perceived delivery modes	Developed for the study
l)	The patient should cover the vaccine cost	
m)	Targeted HPV vaccination should be based on individual assessment of each MSM attending sexual health clinic	
n)	HPV vaccination should be offered to MSM in alternative settings such as GP practices or pharmacies	
	Perceived expediency	Developed for the study
o)	All MSM, regardless of their age, should be offered HPV vaccination	
p)	It is too late to vaccinate against HPV if MSM are already sexually active	Weiss et al. (2010)
	Perceived capabilities	Developed for the study
q)	I have the skills to identify MSM that would benefit from the HPV vaccine	
r)	I feel sufficiently informed about the HPV vaccination for MSM	

*Response: Likert – 5 items (strongly disagree - strongly agree)

impede or enable the HPV vaccination. In the end, the participants were reminded of any potential impact on cost-effectiveness analysis and were asked to provide their perspective on the value of the MSM-targeted HPV vaccination and the universal male HPV vaccination of school-aged boys.

Table 16. Topic guide for telephone interviews

No.	Telephone interview questions
1	What vaccination strategy would you recommend to protect MSM against HPV?
2	Assuming that targeted HPV vaccination for MSM is going to be recommended, what are the best settings for targeted HPV vaccination for MSM?
3	How can we identify young MSM?
4	How can we encourage young MSM to use sexual health services?
5	What incentivises MSM to access sexual health services?
6	What sort of factors, recommendations or training would facilitate the introduction of targeted HPV vaccination for MSM?
7	What might be potential barriers to vaccinating MSM?
8	Keeping in mind the cost of HPV vaccination, what sort of information would help you to decide whether targeted or universal, school-based strategy is more suitable?

7.2.6. Data analysis

Quantitative data analysis

All statistical calculations were performed in SPSS version 20. Descriptive statistical tests were used for attitudinal and demographic data to represent the distribution of scores.

Two-tailed Spearman's rank correlation coefficient tests were performed on all attitudinal variables (18 statements) to identify the level of association between each attitudinal statement. The 0.05 p-value was divided by 18 to give a 0.002 probability, this was to reduce the risk of type II errors.

Ordinal regressions were conducted to measure the relationship between each attitudinal statement and gender, year of qualification, geographic location, estimate of service users who are MSM and their vaccination practices. Assumptions of ordinal regression in regards to multicollinearity were examined using the tolerance test and the estimation of the Variance Inflation Factor (VIF). A VIF value exceeding 2.5 indicates multicollinearity between independent variables and distorting the fitness of ordinal regression model (O'brien, 2007) and variables with VIF above 2.5 should not be entered into multivariate regression analysis.

Qualitative data analysis

The telephone interview data were examined using thematic analysis. Each transcript was read several times to achieve a thorough understanding of the provided information and opinions. Each transcript was processed in full to extract codes and passages of text that could be grouped to form a coherent theme. The text was extracted from a Microsoft Word document and placed in a Microsoft Excel table. The process of coding was repeated several times to reflect interpretations of participants' perceptions and their understanding of hypothetical the MSM-targeted HPV vaccination. Quotations were grouped according to their thematic similarities. All codes were then categorised into themes and sub-themes to reflect patterns of specific meanings across participants. Themes were grouped to form a cluster of meanings within a single domain or a construct.

A second independent researcher, Mr Alex Pollard, reviewed the output supported by the qualitative data to cross-validate the results. Any inconsistencies and ambiguities were discussed to achieve the final version of the results reflecting themes and sub-themes.

7.3. Results I – online survey

7.3.1. Preliminary analysis

There was a lack of multicollinearity between demographic variables. In all possible variable combinations the VIF did not exceed 2.5. Hence, the assumptions for ordinal regression were met.

7.3.2. Sample characteristics – online survey

A total of 325 sexual healthcare professionals completed the questionnaire. Table 17 presents the sample characteristics. The mean year of gaining clinical qualification was 1993 (SD)=9.7, range: 1971-2013. Seventy percent of the sample were females and 46% were doctors (either consultants or doctors in training). Although respondents came mainly from the South East of England, the sample was geographically dispersed. Seventy-five percent of participants practised in sexual health clinics where it was perceived that more than 10% of service users were MSM. Fourteen percent of respondents reported already vaccinating men against HPV (11% vaccinating MSM) without official guidelines or recommendations.

It was impossible to calculate a response rate due to the inability to estimate denominator (i.e. the number of sexual healthcare workers receiving the study invitation. However,

Table 17. Characteristics of the sample in the quantitative (online survey) study on healthcare professionals' views on male HPV vaccination in the UK

Demographic variable	Number of cases (%)
Total	325
Gender	
Male	96 (30)
Female	227 (70)
Missing value	2 (<1)
Professional role	
Consultant	115 (36)
Doctor in training	34 (10)
Nurse	84 (26)
Health advisor	48 (15)
Other (e.g. GP, health worker)	44 (13)
Geographical location	
London	103 (32)
Anglia & Essex	9 (3)
East Midlands	12 (4)
South Midlands and Herts	1 (<1)
West Midlands	12 (4)
Cheshire & Merseyside	5 (2)
Cumbria & Lancashire	7 (2)
Greater Manchester	20 (6)
North East	6 (2)
Yorkshire & the Humber	30 (10)
Avon, Gloucestershire & Wiltshire	5 (2)
Devon, Cornwall & Somerset	6 (2)
Kent, Surrey & Sussex	41 (12)
Thames Valley	12 (4)
Wessex	25 (8)
Northern Ireland	8 (3)
Scotland	9 (3)
Wales	2 (<1)
Missing value	12 (4)
Estimate of service users who are MSM	
Below 10%	72 (22)
Between 10% and 30%	159 (50)
Between 30% and 50%	55 (17)
Between 50% and 100%	26 (8)
Missing value	12 (3)
Ever involved in HPV vaccination of men	
Yes – heterosexual men	8 (3)
Yes – men who have sex with men	34 (11)
No	275 (84)
Not sure	2 (<1)
Missing value	6 (2)

according to the census of consultant physicians prepared by the Royal College of Physicians, there was a total of 416 genitourinary medicine and HIV specialist working in the NHS within the United Kingdom (Royal College of Physicians, 2015). Because the sample included 115 consultants, there was an estimated response rate of 27% for consultants working in sexual health services.

7.3.3. Attitudes towards male HPV vaccination

Table 18 presents the extent of agreement amongst sexual healthcare professionals with each attitudinal statement. While 84% expressed willingness to recommend the universal male HPV vaccination programme, 8% disagreed with this strategy. Sixty-five percent were willing to recommend the MSM-targeted HPV vaccination and 18% showed no support for a targeted programme. Fifty-four percent recommended both gender and targeted vaccination strategies at the same time and less than 1% were against any form of male HPV vaccination. Forty-five percent of participants were unsure whether other healthcare professionals would agree to recommend the HPV vaccine to MSM. About 84% agreed that the female HPV vaccination programme protected heterosexual men against HPV-related cancers and 65% thought it offered limited protection to MSM. Seventy-one percent disagreed that HPV causes too few cancers amongst heterosexual men to make it worthwhile to offer vaccination. When asked about the MSM population, only 3% thought that HPV vaccination is not worthwhile in MSM. These results indicate that the majority perceived both the universal male HPV vaccination and the MSM-targeted vaccination programmes as valuable and advisable.

HCPs expressed their attitudes towards the MSM-targeted HPV vaccination. Seventy-five percent believed MSM would be willing to receive HPV vaccination. Also, 60% thought that HPV vaccination would encourage MSM to engage with sexual health clinics, and 5% thought that vaccinating MSM could increase the likelihood of unsafe sex. While 51% agreed that all MSM, regardless of their age, should be offered HPV vaccination, 25% were against a programme with no age restrictions. Fifty-nine thought that it was not too late to offer HPV vaccine if MSM are already sexually active, although 17% perceived the vaccine to be less effective in sexually active men. Seventy-eight percent disagreed that the patient should cover the vaccine cost and 56% thought that the MSM-targeted HPV vaccination should not be based on individual assessment of each man attending the clinic.

Table 18. Attitudes towards male HPV vaccination amongst sexual healthcare professionals

Statement	Agree (%)	Neutral (%)	Disagree (%)
Vaccination programme recommendation			
I would recommend HPV vaccination of all men, regardless of their sexual orientation	271 (84)	26 (8)	25 (8)
I would recommend targeting MSM to be vaccinated against HPV	207 (65)	60 (18)	53 (17)
Other healthcare professionals would not recommend HPV vaccination to MSM	81 (25)	149 (45)	94 (30)
Perceived population at risk			
Vaccinating females against HPV will reduce HPV-related cancers in heterosexual men	271 (84)	38 (11)	15 (5)
Vaccinating females against HPV will reduce HPV-related cancers in MSM	47 (15)	66 (20)	210 (65)
Perceived value			
HPV causes too few cancers among heterosexual men to make it worthwhile to offer vaccination	27 (8)	66 (21)	230 (71)
HPV causes too few cancers among MSM to make it worthwhile to offer vaccination	7 (3)	27 (8)	285 (89)
HPV causes too few cancers among HIV-positive MSM to make it worthwhile to offer vaccination	8 (3)	22 (7)	290 (90)
Perceived health behaviours			
The majority of MSM would be willing to receive the HPV vaccine	238 (75)	75 (23)	7 (2)
HPV vaccination would encourage MSM to engage with sexual health services	190 (60)	97 (30)	30 (10)
Vaccinating MSM could increase the likelihood of unsafe sex	14 (5)	41 (13)	266 (82)
Perceived delivery modes			
The patient should cover the vaccine cost	18 (6)	52 (16)	252 (78)
Targeted HPV vaccination should be based on individual assessment of each MSM	85 (26)	57 (18)	179 (56)
HPV vaccination should be offered to MSM in alternative settings (e.g. GP practice or pharmacy)	239 (74)	49 (15)	34 (11)
Perceived expediency			
All MSM, regardless of their age, should be offered HPV vaccination	162 (51)	80 (25)	77 (24)
It is too late to vaccinate against HPV if MSM are already sexually active	56 (17)	77 (24)	189 (59)
Perceived capabilities			
I have the skills to identify MSM that would benefit from the HPV vaccine	155 (49)	95 (29)	72 (22)
I feel sufficiently informed about the HPV vaccination for MSM	143 (44)	76 (24)	105 (2)

Seventy-four percent agreed that HPV vaccination for MSM should be offered in alternative settings such as GP practices or pharmacies. While 49% of respondents agreed to have the skills to identify MSM for HPV vaccine, 44% reported feeling sufficiently informed about the HPV vaccination for MSM.

7.3.4. The relationship between attitudinal statements and demographic variables

Table 19 presents the results of the ordinal regressions. There were no significant differences in the recommendation of the MSM-targeted HPV vaccination by any demographic variable. HCPs that largely serve the heterosexual population and those that have gained clinical qualification more recently were more likely to recommend the universal male HPV vaccination. In comparison to male participants, females were more likely to agree that vaccinating women against HPV would reduce cancers in heterosexual men, but they were also more likely to agree that vaccination of heterosexual men is worthwhile. In comparison to consultants, nurses were less likely to disagree that HPV vaccination for HPV-positive men is worthwhile. While both nurses and health advisors were more likely to agree that all MSM should be offered HPV vaccination, nurses also thought that the MSM-targeted HPV vaccination should be based on individual assessment. Both female participants and those in a nursing role were less likely to agree that the majority of MSM would be willing to receive the HPV vaccine. Participants who have already been vaccinating men against HPV were more likely to disagree that female vaccination reduces cancers in MSM, that HPV vaccination for MSM is not worthwhile, and that it is too late to vaccinate sexually active MSM. They were also more likely to agree that HPV vaccination should be offered to MSM in alternative settings. Those already involved in vaccination perceived themselves to have the knowledge and the skills that would allow them to offer HPV vaccine to MSM, but nurses and those who completed their clinical training less recently were more likely to report insufficient knowledge about the HPV vaccination and MSM.

Table 19. Attitudes towards male HPV vaccination and related odds ratios in the ordinal regression analysis

Demographic characteristics and correlated statements	Coefficient	Odds ratio (95% CI)	S.E.	Wald	p-value
Sex (Ref: Male)					
Female					
Vaccinating females against HPV will reduce HPV-related cancers in heterosexual men	0.53	1.69 (1.05-2.73)	0.24	4.82	0.028
HPV causes too few cancers among heterosexual men to make it worthwhile to offer vaccination	-0.83	0.43 (0.27-0.68)	0.23	13.0	0.001
The majority of MSM would be willing to receive the HPV vaccine	-0.66	0.51 (0.32-0.81)	0.23	8.06	0.005
Professional role (Ref: Consultant)					
Nurse					
HPV causes too few cancers among HIV-positive MSM to make it worthwhile to offer vaccination	0.79	2.22 (1.28-3.89)	0.28	7.59	0.006
The majority of MSM would be willing to receive the HPV vaccine	-0.85	0.42 (0.24-0.70)	0.27	9.55	0.002
All MSM, regardless of their age, should be offered HPV vaccination	0.72	2.05 (1.21-3.38)	0.26	7.52	0.006
Targeted HPV vaccination should be based on individual assessment	1.22	3.32 (1.96-5.65)	0.27	1.02	0.001
I feel sufficiently informed about the HPV vaccination for MSM	-0.82	0.44 (0.25-0.72)	0.26	9.74	0.002
Dr in training					
I would recommend HPV vaccination of all men, regardless of their sexual orientation	-1.04	0.35 (0.17-0.70)	0.36	8.10	0.004
Health advisor					
All MSM, regardless of their age, should be offered HPV vaccination	0.79	2.15 (1.12-3.85)	0.32	6.18	0.013
Proportion of service users who are MSM (Ref: Between 50-100%)					
Below 10%					
I would recommend HPV vaccination of all men, regardless of their sexual orientation	0.94	2.55 (1.08-6.04)	0.43	4.62	0.031
Ever involved in HPV vaccination of men (Ref: No)					
Yes					
Vaccinating females against HPV will reduce HPV-related cancers in men who have sex with men	-0.92	0.39 (0.20-0.70)	0.31	8.65	0.003
HPV causes too few cancers among MSM to make it worthwhile to offer vaccination	-1.06	0.34 (0.16-0.68)	0.36	8.29	0.004
HPV causes too few cancers among HIV-positive MSM to make it worthwhile to offer vaccination	-1.35	0.25 (0.11-0.59)	0.43	9.38	0.002
It is too late to vaccinate against HPV if MSM are already sexually active	-1.19	0.30 (0.16-0.57)	0.35	13.5	0.001
I have the skills to identify MSM that would benefit from the HPV vaccine	0.67	1.90 (1.66-3.44)	0.30	4.85	0.028
HPV vaccination should be offered to MSM in alternative settings such as GP practices	0.80	2.22 (1.10-3.70)	0.32	6.26	0.012
I feel sufficiently informed about the HPV vaccination for MSM	2.14	8.49 (4.05-15.1)	0.34	39.1	0.001
Year of qualification (Con.)					
HPV causes too few cancers among heterosexual men to make it worthwhile to offer vaccination	0.26	1.29 (1.03-1.64)	0.12	4.98	0.026
I would recommend HPV vaccination of all men, regardless of their sexual orientation	-0.04	0.96 (0.93-0.98)	0.12	12.8	0.001
I feel sufficiently informed about the HPV vaccination for MSM	-0.03	0.96 (0.94-0.98)	0.01	9.68	0.002

*Ref – reference category for ordinal regression

7.3.5. The correlation between attitudinal statements

Table 20 presents statistically significant correlation coefficients between each attitudinal statement. The respondents who agreed that it is worthwhile to vaccinate HPV-positive MSM were more likely to perceive that female HPV vaccination reduces HPV-related cancers in heterosexual men, but not MSM. As expected, there was a strong correlation between the opinions about the value of vaccination programmes in heterosexual men, HIV-negative MSM and HIV-positive MSM.

Several attitudes were associated with the willingness to recommend the MSM-targeted HPV vaccination. The recommendation was positively correlated with the perception that female HPV vaccination reduces HPV-related cancers in heterosexual men, that vaccination of MSM is worthwhile and that the majority of MSM would be willing to receive the HPV vaccine. The recommendation was also positively correlated with the attitude that HPV vaccine would encourage MSM to engage with sexual health services and negatively associated with the belief that it is too late to vaccinate sexually active men. These correlations indicate that the participants who believed that MSM are at risk of HPV-related diseases and perceived the MSM-targeted HPV vaccination to be beneficial were more likely to be supportive of the targeted strategy.

Several statements were additionally associated with the willingness to recommend the universal male HPV vaccination. This recommendation was positively associated with the belief that the vaccination of heterosexual men is worthwhile and that all MSM, regardless of their age should be offered the HPV vaccine. The recommendation was also negatively associated with the attitudes that MSM should cover the vaccine cost and that HPV vaccination should be based on individual assessment. There was a positive association between the recommendations of both the MSM-targeted and the universal HPV vaccination programmes, suggesting that HCPs recognise the susceptibility of MSM and may regard the universal male HPV vaccination to be capable of protecting MSM.

Table 20. The correlation between attitudinal statements on male HPV vaccination

Statement	Statement number															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Vaccinating females against HPV will reduce HPV-related cancers in heterosexual																
2. Vaccinating females against HPV will reduce HPV-related cancers in MSM																
3. HPV causes too few cancers among heterosexual men to make it worthwhile																
4. HPV causes too few cancers among MSM to make it worthwhile to offer vaccination	.20	.56														
5. HPV causes too few cancers among HIV-positive MSM to make it worthwhile	-.18	.24	.38	.78												
6. I would recommend HPV vaccination of all men, regardless of their sexual orientation																
7. I would recommend targeting MSM to be vaccinated against HPV	.24															
8. The majority of MSM would be willing to receive the HPV vaccine																
9. It is too late to vaccinate against HPV if MSM are already sexually active	.22	.27	.28	-.21	-.21	-.18										
10. HPV vaccination would encourage MSM to engage with sexual health services																
11. Vaccinating MSM could increase the likelihood of unsafe sex																
12. All MSM, regardless of their age, should be offered HPV vaccination	-.20	-.19	-.23	.37	.24	.19	-.34	.24								
13. The patient should cover the vaccine cost	.21	.19	.34	.33	-.30											
14. Targeted HPV vaccination should be based on individual assessment of each MSM																
15. I have the skills to identify MSM that would benefit from the HPV vaccine																
16. HPV vaccination should be offered to MSM in alternative settings																
17. Other healthcare professionals would not recommend HPV vaccination to MSM																
18. I feel sufficiently informed about the HPV vaccination for MSM	-.25	-.18	-.31	-.33	.30	.23	.35	-.25	.15	-.22	.20	-.23	-.20	.40	.20	

Spearman's coefficients with multi-comparison correction p<0.002

7.4. Results II – telephone interviews

7.4.1. Sample characteristics – telephone interviews

Out of 325 survey respondents, 51 expressed an initial willingness to take part in a telephone interview by providing their contact details. In total, 19 survey respondents participated in the qualitative follow-up (1 declined and 31 did not respond to the invitation).

The sample consisted of 11 males and 8 females (13 doctors, 3 nurses and 3 health advisors) (Table 21). Precisely 42% percent of interviewees were from London and South East of England and 36% were serving in clinics with a largely heterosexual population, where less than 10% of service users were MSM. The average year of gaining clinical qualification was 1993. Also, 31% interviewees reported already vaccinating men against HPV. The analysis of the survey responses from the qualitative sample showed that 83% would recommend male HPV vaccination and 66% would recommend targeting MSM. In addition, 47% reported having the skills to identify MSM that would benefit from HPV vaccination and 68% reported having sufficient knowledge about the use of HPV vaccine for MSM. The views of the sample reflected the attitudes of the online survey respondents.

7.4.2. Emergent themes

Table 22 presents four major themes emerged from the analysis of the transcripts: 1) Decision-making processes; 2) Uncertainties about the MSM-targeted HPV vaccination; 3) Barriers to MSM-targeted HPV vaccination; and 4) Facilitators of MSM targeted HPV vaccination. There were no apparent differences in views associated with participants' characteristics such as gender, professional role or the number of years since gaining a clinical qualification.

Table 21. Characteristics of the sample in the qualitative study (telephone interviews) on healthcare professionals' views on male HPV vaccination in the UK

ID	Gender	Role	Proportion of service users identified as MSM	Ever vaccinated men against HPV	Recommend gender-neutral HPV vaccination	Recommend targeting MSM
1	Male	Consultant	Below 10%	Yes - MSM	Agree	Agree
2	Female	Health advisor	Between 10% and 30%	Yes - MSM	Strongly agree	Agree
3	Male	Nurse	Below 10%	No	Strongly agree	Strongly agree
4	Female	Health advisor	Between 10% and 30%	No	Disagree	Strongly agree
5	Female	Health advisor	Below 10%	No	Strongly agree	Strongly agree
6	Female	Dr in training	Between 10% and 30%	No	Strongly agree	Strongly agree
7	Female	Consultant	Below 10%	No	Strongly agree	Strongly agree
8	Female	Consultant	Below 10%	Yes - MSM	Strongly agree	Agree
9	Male	Consultant	Below 10%	Yes - heterosexual men	Strongly agree	Strongly agree
10	Male	Consultant	Between 30% and 50%	No	Agree	Agree
11	Male	Consultant	Missing	Missing	Missing	Missing
12	Female	Consultant	Between 10% and 30%	No	Strongly agree	Disagree
13	Male	Health advisor	Between 30% and 50%	Yes - heterosexual men	Strongly agree	Disagree
14	Male	Consultant	Between 10% and 30%	Yes - heterosexual men	Strongly agree	Neutral
15	Male	Nurse	Below 10%	No	Strongly disagree	Neutral
16	Male	Consultant	Between 10% and 30%	No	Strongly agree	Disagree
17	Male	Consultant	Between 10% and 30%	Yes - heterosexual men	Strongly agree	Strongly agree
18	Male	Nurse	Between 30% and 50%	No	Strongly agree	Strongly agree
19	Female	Consultant	Between 50% and 70%	No	Strongly disagree	Strongly disagree

Table 22. Themes and sub-themes identified from telephone interviews

Theme	Sub-theme	Example of an issue
1. Decision-making processes	Intuitive process	Feelings, beliefs and attitudes Ethical views Familiar vaccination programmes BASHH guidelines Cost-effectiveness analysis
	Deliberative process	
2. Uncertainties about the MSM-targeted HPV vaccination	Vaccination funding	Centrally vs locally funded programmes
	Selection criteria	Lack of clarity on age restrictions HIV status restrictions Previous history of genital warts Based on sexual experience School vaccination of MSM GP-based vaccination Sexual health settings
	Healthcare settings	
3. Barriers to targeted HPV vaccination for MSM	Lack of support	Political support Public support Attitudes of HCPs Geographical restrictions Self-identification Identification by HCPs Delay in disclosure Lack of awareness about HPV Lack of awareness about the vaccine Vaccine refusal
	Access to healthcare	
	Identification of MSM	
	Disclosure of sexual orientation	
	HPV awareness	
	Motivation to vaccinate	The lack of desire to be vaccinated Hepatitis vaccine completion rates Migration between clinics
	Completion rates	
	Skills and knowledge	The lack of knowledge amongst HCPs The lack of skills to deliver vaccination Rebranding of the vaccine
	Negative public views	Negative attitudes of heterosexual men
4. Facilitators of targeted HPV vaccination for MSM	Official guidelines	BASHH guidelines STIF training Social media campaigns Third sector campaigns Message framing
	Awareness campaigns	
	Integrated clinical procedures	Integrated settings HPV and Hepatitis vaccines together

7.4.2.1. Decision-making processes when recommending vaccination strategy

HCPs presented a range of views on the need and value of male HPV vaccination when constructing their recommendations. There was a consensus that MSM are at risk of HPV infection and should have access to the HPV vaccine through either schools or sexual health clinics. However, most participants considered gender-neutral HPV vaccination and MSM-targeted HPV vaccination as mutually exclusive strategies, believing that health authorities should select either universal male vaccination or a selective programme specifically for

MSM. HCPs were discussing each strategy within the UK socio-political context where female HPV vaccination programme at school has achieved a high uptake.

“Obviously these vaccinations were first used as a public health measures for young women, so you’ve got to be vaccinating all males, it’s potentially difficult because of cost from a public health point of view. And the burden of disease in men is much lower, targeting populations with HIV and cases of men who have sex with men may obviously be difficult from a public health approach, point of view and we have difficulties reaching these people anyway.” (#4 Female, Health advisor)

Two decision-making processes were identified. These processes differ in relation to the justification used when constricting professional views on best practice to protect MSM against HPV-related diseases. When deliberating the two vaccination strategies, HCPs justified their recommendations with personal beliefs and attitudes as well as scientific evidence.

Intuitive decision-making process

The intuitive decision-making process was mainly associated with heuristics, ethical views, feelings and beliefs rather than the value of scientific evidence. The participants referred to their emotional states, moral principles and the comparison with female HPV vaccination or overseas gender-neutral HPV vaccination programmes.

In general, participants reported having limited knowledge about the use of HPV vaccines for MSM. Although MSM were perceived to be at high risk of HPV-related diseases, most professionals thought men were also at equal risk of cancers to women. These beliefs primarily guided the recommendation of gender-neutral vaccination over a targeted HPV vaccination for MSM. The majority of HCPs described a hypothetical HPV vaccination for MSM using comparisons with female HPV vaccination programme where adolescent girls are selected at school. Because of a large degree of uncertainty about the effectiveness of targeted vaccination and its delivery, the gender-neutral strategy was perceived as superior. It was believed that gender-neutral vaccination was more effective and the professionals were unable to identify what age groups of MSM would be targeted. Comparisons with

female HPV vaccination were made, which assumed that most females would be infected with HPV soon after they become sexually active. Some perceived that sexually active MSM might ‘*miss the boat*’ due to their exposure to HPV which makes the vaccination ineffective. However, none of the participants were able to refer to any scientific evidence to support their views.

“I think there are factors like the younger the better, or the fewer past sexual partners the better in some respects because there’s always that concern perhaps about whether people are already infected and then, I have to say its knowledge gap for me I don’t know what the effect of the vaccine is on somebody already infected with the HPV serotype so or genotype so, I don’t know about that.” (#7, Female Consultant)

Some HCPs perceived the targeted HPV vaccination for MSM as unethical, inequitable and unfair. Gender-neutral strategy was perceived morally justifiable and impartial. There was a concern that a targeted approach would not be able to protect all MSM and would fail to care for heterosexual men at risk of HPV-related diseases. Therefore, ethical values influenced the recommendation of gender-neutral vaccination strategy.

“The only sensible answer to these dilemmas is a gender-neutral vaccination strategy in schools that give 2 doses of vaccines to all 12 to 13-year-old girls and boys. Anything else is discriminatory, inequitable, less effective and difficult to explain.” (#14, Male Consultant)

“It will be inequitable if we just target young MSM. Because young heterosexual men could easily say “you are discriminating against us. You are favouring gay men this is not right”. (13#, Male Health advisor)

Several participants reported a dissonance between their personal beliefs and available data. A few HCPs emphasised their feelings that gender-neutral HPV vaccination should be recommended. The universal HPV vaccination was perceived as the best public health measure that ought to be available to both genders. Although the need for MSM vaccination

was commonly mentioned, the primary focus was on protecting all men regardless of their sexual orientation

“I know what my gut reaction is and I know what the data is and they are different. My gut reaction is to vaccinate everybody.” (#12, Female Consultant)

“I think it should be all men. I feel that really, really strongly. You know in the same way we’re vaccinating all women. (...) I think everyone school-aged should get vaccinated” (#16, Male Consultant)

The participants referred to ongoing HPV vaccination programmes available for women and men in Australia and the US. They used models of existing gender-neutral vaccination programmes in different socio-political contexts to justify their opinions. For example, six participants argued that male HPV vaccination should be similar to the universal school-based HPV vaccination programme for adolescent girls and that vaccination of older MSM would be ineffective. Three participants believed that gender-neutral HPV vaccination in the UK ought to mirror the Australian HPV vaccination programme for all adolescents at school.

“I think there is very good evidence that if you vaccinate the boys like they do in Australia that it is much better for the community as a whole; for the population as a whole regardless of sexuality.” (#12, Female, Consultant)

“Well, like the programme in women, you should only vaccinate young gay men. There is no point in vaccinating anyone over the age of 19, 18, I imagine. You’d miss the boat.” (#19, Female, Consultant)

Three participants recalled targeted hepatitis vaccination for MSM at sexual health clinics to suggest that the MSM-targeted HPV vaccination would be feasible. The perceptions of existent hepatitis B vaccination programmes influenced the way HCPs considered the feasibility of MSM-targeted HPV vaccination.

“It would be feasible to do so because we know that you’re an MSM in the same way that we offer vaccination against hepatitis B. The only time we don’t vaccinate for hepatitis B is if somebody’s already got core immunity. Regardless of how many partners they have, how often they have sex, you know what kind of sex they have, you know we just offer it across the board because people’s sexual history up to that point doesn’t necessarily tell you about what’s going to happen after that point.” (#5, Female, Health advisor)

Deliberative decision-making process

Several participants referred to the lack of adequate scientific literature, evidence and data that would allow the construction of an opinion whether to vaccinate MSM or all adolescent men. These professionals recognised that the knowledge about HPV vaccination and MSM was insufficient to make a fully informed decision about the best HPV vaccination strategies. All expressed a need for more evidence on the effectiveness, feasibility and safety of MSM-targeted HPV vaccination.

“We need data on the prevalence of high-risk HPV, frequency of warts in MSM, the number of visits and repeat treatment. Most of them don’t do anoscopy so I suppose to know the prevalence of anal dysplasia and anal cancer. All that information is useful when people try to decide when vaccines are going to benefit their patients.” (#19, Female Consultant)

The participants adopting this systematic approach reported that an expert opinion, epidemiological data and feasibility assessments were necessary to form their decisions about the need and effectiveness of a hypothetical MSM-targeted HPV vaccination programme. One participant expressed concern that despite the lack of evidence on the effectiveness of HPV vaccination in HIV-positive men, many healthcare professionals assume that it is effective and believe that male HPV vaccination was “the right thing to do”. The main sources of knowledge, when recommending an HPV vaccination strategy, were cost-effectiveness analyses and the British Association for Sexual Health and HIV (BASHH) national guidelines. One participant stressed not having any ethical views whether MSM-targeted HPV vaccination was appropriate but agreed to be guided by what is found to be

cost-effective, suggesting a separation of scientific evidence and ethical considerations. The participants who adopted the evidence-based processing were more likely to recognise the importance of scientific evidence and were less willing to offer any recommendation of male HPV vaccination, until appropriate evidence is available.

“I think you have to have some data. I don’t think I’ve heard any data yet so I go back to; you see the problem with all of this is: number one, who are you going to vaccinate for it to be effective?” (#15, Male Nurse)

“I don’t have a particular attitude one way or another really, I’d be guided by what is found to be cost-effective and if it’s thought to be efficacious. I don’t have any ethical, particular ethical view on it. I think if we have an intervention to prevent it and we’re able to use it I think we should.” (#8, Female Consultant)

7.4.2.2. Uncertainties about the MSM-targeted HPV vaccination

There were several uncertainties and concerns about the introduction of the MSM-targeted HPV vaccination. These were mainly related to the programme funding, selection criteria, potential programme effectiveness and the most appropriate delivery modes.

HPV vaccination funding

The inability to identify a source of funding for the MSM-targeted HPV vaccination programme was noted by several professionals. The interviewed HCPs were unable to identify how such a programme would be funded and some expressed concerns that the lack of budget was an important obstacle to the implementation of the programme. The participants were not certain if the intervention would be funded centrally or via local authorities. Four participants believed that the Department of Health would not be supportive of funding the MSM-targeted HPV vaccination. One remarked that because it is more profitable for the pharmaceutical company producing HPV vaccinations to introduce the gender-neutral HPV vaccination, the funding of the MSM-targeted HPV vaccination will not be perceived as an economical solution.

“The biggest challenge is funding. The Department of Health will resist funding such a programme. The second biggest challenge is

the company themselves. MSD may not reduce the price of the vaccine enough to make it attractive. (...) The company may feel if they reduce the price and allow targeted vaccination to happen, well then the pressure to bring in national gender neutral vaccination will ease up and they may be shooting themselves in the foot.” (#14, Male Consultant)

Selection criteria

The participants had various views on which groups of MSM should receive HPV vaccine and they had doubts whether a targeted programme would be effective. There was a perception that the youngest MSM would be the most likely to benefit from HPV vaccination and that the effectiveness of the vaccine would be compromised in sexually active men, especially older MSM with substantial sexual experience. Five participants believed the vaccine is not effective in sexually active MSM and it should never be recommended. One participant argued that it is challenging to target men when they become sexually active because men often experiment with their sexuality, often engaging in both same-sex and opposite-sex sexual behaviours. While several participants proposed various age groups for targeted vaccination ranging mainly from 11 to 26, other suggested vaccination of HIV-positive MSM or men without a prior history of genital warts. Four participants recommended vaccinating all service users that ever engaged in same-sex sexual behaviours.

“I don’t know where I’d put the age cut off but logically there’s no point in vaccinating someone who’s already had 25 sexual partners. I don’t know where the cut off would be in terms of how many sexual partners and what age. But I wouldn’t bother vaccinating a 70-year-old for example.” (#2, Female Health advisor)

“Do they know anything about the effectiveness of the vaccine in people who have already got the virus? Do they know about immunity and HIV positive men? I mean it’s, you know, missing the boat then isn’t it?” (#12, Female Consultant)

Two HCPs were also concerned the there is no HPV diagnostic tool that would help to specify if any of MSM patients had been exposed to HPV. Several HCPs wanted to know if

the vaccine was safe for all MSM and if it definitely prevented HPV-related diseases in sexually active adults. There was a concern that if there is a need to treat vaccinated MSM for genital warts, the programme would not be perceived as credible. One participant questioned the effectiveness of HPV vaccine in HPV-positive men and the possibility of more rapid immunogenicity decay in this population. The majority of the sample thought that it was difficult to define which group of MSM have not yet been exposed to HPV and thus most proposed selection criteria would be unsatisfactory.

“Because we can’t check that someone’s naïve to HPV at the moment, then we might be vaccinating people who don’t really need it because they’ve already been exposed to most of the strains of HPV or you know, I suppose we could be hitting it lucky and getting those that are naïve but we’ve got no way of telling that exactly.” (#19, Female Consultant)

Healthcare settings for the MSM-targeted vaccination

While most of the interviewed sexual healthcare professions agreed that sexual health clinics would be suitable for the delivery of the MSM-targeted HPV vaccination, some believed that a multi-settings system approach is needed. As sexual health clinics already offer the hepatitis vaccination to MSM, it was believed that these settings could be utilised to offer HPV vaccination. It was perceived that MSM feel more comfortable discussing their sexual behaviours in an SHC than a general practice. The existent non-judgemental screening services encourages men to disclose their sexual orientation as well as allow MSM, who do not identify as gay or bisexual to receive recommended healthcare. Several HCPs believed that general practices are not suitable for targeted vaccination due to limited relevance to sexual health and the discomfort of men in discussing their sexuality.

“Because a lot of young gay men go to clinics for sexual health screening. And even in the modern world I suspect they prefer that sort of setting rather than having to go to a primary care service where you know, they are easy ident, you know they would have to be very open about being gay and seeking HPV vaccination if you were targeting.” (#12, Female Health advisor)

“In the sexual health clinic we identify MSM through good sexual history taking so not a problem, therefore. I think in primary care I’ve probably said what I wanted to say which is we know a sizeable proportion of MSM do not disclose to their GPs or practice nurse’s that they are MSM so that is a problem.” (#18, Male nurse)

However, some participants argued that an integrated, multi-settings approach involving sexual health clinics, general practices, community-based facilities, third sector charities and various outreach programmes would be needed to achieve the optimal uptake. It was believed that a targeted HPV vaccination programme needs to be expanded beyond SHCs to reach MSM that do not access sexual health services.

“Yeah, I think the most important thing is actually to take a system-wide approach. I realise it isn’t just down to one agency its part of a whole network of, that starts off with education in schools, health promotion, at the far end you know, the final result is the actual vaccine delivery, making sure it’s widely available in easy to access location so that would be, you know, location so, so that might be GPs, not all GPs but you know GPs who are delivering sexual health services, outreach settings, all those kind of other things, it’s really, it’s really about looking at that whole system, from the beginning, how do you get the message across, packaging the whole thing to do with general wellbeing going right up to the delivery of the final product, the vaccination.” (#10, Male Consultant)

7.4.2.3. Perceived barriers to a targeted HPV vaccination for MSM programme

The participants perceived that it would be challenging to estimate the success of MSM-targeted HPV vaccination because MSM are a hard-to-reach population and the exact number of this group is unknown. The participants reported various institutional, patient-level and practitioner-level obstacles such as insufficient support for MSM-targeted programme, inadequate MSM motivation to access vaccination services and negative public views on the lack of vaccination for all men.

Lack of support for MSM-targeted HPV vaccination

Most participants believed that in comparison to the gender-neutral vaccination strategy, the MSM-targeted HPV vaccination would receive relatively weaker backing. The lack of support from politicians, health professionals and the public was perceived as an important challenge influencing the provision of vaccination services for MSM. One consultant believed that several lobby groups steered the parliamentary discussion about vaccination strategies to favour the gender-neutral HPV vaccination over the MSM-targeted HPV vaccination programme. Five participants expressed their direct objection with the MSM-targeted HPV vaccination, believing that the gender-neutral strategy would help to achieve greater protection for unvaccinated women and direct protection for men, indicating the lack of support for the MSM-targeted approach. In addition, one consultant was against spending NHS resources on any male HPV vaccination programme, either targeted or universal, arguing that the proportion of HPV-related disease is too low in men to justify any additional vaccination programmes. About a half of the sample expressed concerns that the female-only HPV vaccination is unfair and produced inequalities in health between men and women, suggesting that the MSM-targeted HPV vaccination would leave heterosexual men at risk of cancers and should not be commissioned.

“I think there needs to be political support. Once you have political and that’s kind of public health support, you get financial support.” (#1, Male Consultant)

“I am in favour if it is the only show in town but if you were asking me what I really really want, I don’t want gender specific. I don’t want a sexual orientation-specific programme; I want a gender neutral one. But I want different things and I wonder I, my surmise is that most of those who don’t agree with it feel that we should be pushing for, this is just a strategic interim step and that to give in to an interim step is to see the promised land of a gender neutral programme received onto the horizon for another year or two.”
(#14, Male Consultant)

“I feel bad for those who are left out. I really fundamentally object to it.” (#12 Female Nurse)

Access to healthcare

The access and the willingness to attend sexual health services were perceived as one of the main barriers to the MSM-targeted HPV vaccination. Five healthcare professionals perceived the uptake of HPV vaccination to be substantially lower in men who do not regularly utilise sexual health settings. It was suggested that men from rural areas might be less likely to access vaccination if it is only available through sexual health clinics. Over half of participants thought that younger MSM, who would most benefit from HPV vaccination, are less likely to visit sexual health settings because of the associated beliefs that sexual health clinics are mainly for treatment and screening rather than preventative vaccinations. While several participants suggested the development of highly specialised clinics for MSM, one participant highlighted that some of her MSM service users would not access clinics for ‘young gay men’ due to discomfort and embarrassment.

“ (...) there’s rural versus urban challenges isn’t there. So you would anticipate it’s more difficult to vaccinate people who live in more rural areas, whether or not they identify as MSM as opposed to being in an urban centre like Brighton or Manchester or London. And so that is challenging because it’s again offering differential care to people on the basis of where they live.” (#15, Male Nurse)

“Some of them tell me they would not go to Dean Street, for example because they wouldn’t want to walk in the door, but they’ll come and sit in my clinic or our clinic and sit amongst all of the teenage men and women.” (#8, Female Consultant)

Self-identification

The participants argued that although some men engage in regular sexual practices with other men they might still not be able to identify themselves as potential recipients of HPV vaccination. Eight HCPs argued that a small proportion of their MSM service users identify as heterosexual and they believed that some MSM might refuse HPV vaccination if it was only given to gay men. Several participants also mentioned that some MSM would not be willing to receive the HPV vaccine if it was branded as a “*gay vaccine*” delivered at clinics for gay men, as they do not wish to be associated with the gay culture. In addition, the participants argued that asking adolescent boys about their sexual orientation is not feasible

and acceptable when identifying MSM. Therefore, the MSM-targeted HPV vaccination is unlikely to capture MSM that identify as heterosexual.

“Because, you know, like I said there are these men that come to my clinic and are willingly already told me they wouldn’t go somewhere like Dean St [a specialist sexual health clinic for gay men] because they don’t want to be identified as a gay man.” (#7, Female Consultant)

“So those are the things I think are going to be, so logistics of getting through to everybody who needs to get it. Because people sometimes they don’t realise they’re men who have sex with men until much later and can’t admit it.” (#15, Male Nurse)

“And in the same way, I just worry that the boat has already sailed for many men by the time they identify as MSM or are aware of a vaccination or the need for vaccination. They may already be infected when they could have had a preventative vaccine at an earlier age.” (#2, Female Health advisor)

Disclosure of sexual orientation

It was perceived that men who are not comfortable or willing to discuss their same-sex sexual behaviours with their doctors will be unlikely to be offered HPV vaccination. Several HCPs were also concerned about the delay in sexual orientation disclosure suggesting that it takes several months or even years for men to feel comfortable enough to discuss their sexuality openly. It was argued that younger men might not have skills or motivation to reveal their same-sex practices at the early stage of their sexual career. There was a concern that the delay in sexual orientation disclosure could compromise the effectiveness of HPV vaccination if these men acquire HPV before they are ready to receive the vaccination.

“Of some men won’t identify, in a way are you saying that vaccinating all men, because in which case then that sorts out that problem but I do think if we aim it at gay men, then we only, the only men who get vaccinated are those who have the confidence to say they’re gay.” (#18, Male nurse)

“Possibly because it would depend on how and where it was going to be offered. If it were going to be offered through GPs, I know from talking to patients who are gay and have, also men who have sex with men and professional colleagues that work in this field that many men are reluctant to disclose their sexuality or their sexual activity to their GP” (#16, Male Consultant)

HPV awareness

One of the most commonly reported barriers to HPV vaccination was the lack of awareness about HPV and HPV vaccination amongst MSM. Several HCPs argued that young MSM unaware of HPV would be unlikely to visit SHCs and request HPV vaccination. There was a concern that unless there is a large national educational campaign, many men would not be sufficiently informed about HPV before they become exposed to HPV. One participant argued that despite the last two decades of vaccinating MSM against hepatitis and national awareness campaigns there are still men that present at the clinic without being aware of the hepatitis vaccine. There was also a concern that some men might have insufficient information about HPV and they could misunderstand the need for vaccination.

I think probably split it down into the getting people to know about it. Even nowadays hepatitis B vaccine has been around for decades and you have gay men coming into clinic who have never heard about [it] until you tell them about it.” (#6, Female Dr in training)

“Most people even very well educated, very empowered gay men you start talking to them about HPV and they’re like “oh I’ve heard about that but I’m not quite sure what that is”. (#8, Female Consultant)

Motivation to vaccinate

There was a concern that some men might be unwilling to receive HPV vaccine. It was argued that negative views on vaccinations, vaccination fatigue, being afraid of needles could be associated with vaccination refusal. One participant indicated that MSM might present with low desire to be vaccinated. These reluctances to receive HPV vaccination

could influence the uptake rates and compromise the effectiveness of the MSM-targeted vaccination programme.

“I think the same challenges that we have with offering any vaccination which is some people won’t want to take it up, some people will say they’ll think about it and come back and they won’t” (#15, Male Nurse)

“In general I would hope that nobody would refuse it but obviously each patient is an individual and you may come across some who are, don’t believe in vaccinations, or who don’t like needles in any circumstances. So obviously they’ll be odd occasions when there might be somebody like that who’s got a particular reason for refusing a vaccination of any kind.” (#16, Male Consultant)

Conversion of vaccine initiation to completion

Five participants identified moderate vaccination completion rates amongst MSM as a barrier. Once considering motivation to initiate HPV vaccination, some HCPs were concerned that a substantial number of MSM do not return for their second and third vaccine dose. It was unclear whether these men go to different clinics for the remaining dose or were physically unable to return to complete their vaccination series. It was noted that some MSM access several SHCs, hence it is difficult to estimate the actual completion rates.

“There are lots of men who don’t get their full course of hepatitis B vaccinations because they go to different clinics, because they only go once etc., so it can be difficult to do that.” (#11, Male Consultant)

“So if you say, will we be able to ensure that every single MSM, who walks through our door, gets the vaccine, I’ll tell you what we can do is definitely initially a very high proportion will get the vaccine, the first dose. Where you will struggle is the second dose and again” (#18, Male Nurse)

Health professionals' knowledge and skills

Several participants were concerned about the level of knowledge about the use of HPV vaccine for MSM amongst HCPs. Some HCPs do not consider vaccination a priority in comparison to screening and STI diagnosis. Hence, the participants were concerned to what extent HCPs would be engaged to offer HPV vaccination to MSM. Two participants believed that some SHCs could lack the capacity to store vaccinations and that a large proportion of sexual health nurses and health advisors would not be able to identify groups of MSM that could receive the vaccine. While some participants believed that only young men should be vaccinated other thoughts that HIV-positive MSM are at highest risk of cancers and need the vaccination in the first place. There was a concern that in the absence of transparent national guidelines a significant number of SHCs would be reluctant to offer the HPV vaccine.

“And clinician barriers or service barriers would be unawareness in the doctors, clinicians or the nurses giving the injections and being unaware of it, unaware of the importance of it and unaware of whom to give it to, which target groups to give it to. And I suppose if you were targeting a group, for example, was HIV positive MSM, you could target HIV doctors, for example, to raise awareness.” (#7, Female Consultant)

“So challenges would be that sexual health clinics are quite busy anyway so you would need extra capacity in, you know, terms of offering the vaccination. Obviously it’s not really a challenge but there would be a logistical problem of having to train all the staff but that’s the case with any new vaccination programme whereas I know this isn’t part of your study but if you were just to vaccinate boys as well as girls than there is already the infrastructure in place to vaccinate school children.” (#12, Female Consultant)

Negative public views

Several HCPs were concerned about the reaction of the general public on the introduction of HPV vaccination for gay men. There was a belief that the general public might not recognise the necessity of vaccination for MSM and actively oppose this strategy. Three participants were worried that the selection of gay men for vaccination will result in the change of

immunisation status from “*anti-cancer*” to “*anti-sexually transmitted infection*” and, as a result, it could be branded as a “*sex vaccine*”. One participant believed that if the introduction of MSM-targeted HPV vaccination does not enhance men’s knowledge about sexually transmitted infections, some men might misunderstand its purpose and engage in risky sexual behaviours. Additionally, some participants were concerned that heterosexual men might also want to be vaccinated against HPV and feel that targeting MSM is unfair and unjust, which in the longer term could lead to disruptions in SHCs. One healthcare professional thought that some heterosexual men might pretend to be gay to be vaccinated.

“... if you sell a vaccine, in inverted commas as a preventing sexually transmitted infections it then causes some community-wide discombobulation as people get upset that they’re been given a sex vaccine or various other terms that people are trying to introduce the vaccine as.” (#12, Female Consultant)

“The public may start to perceive Gardasil as a gay men’s sex vaccine. Well there will be a lot of publicity about vaccinating young gay men against HPV and at the moment there is no negative publicity about the vaccine because they talk about cervical cancer protection and that’s all nicely, nicely but if you start selecting out young gay men to vaccine, the vaccine will get a reputation for being a vaccine for promiscuous young gay men. And that might damage the uptake of the vaccine in young women.” (#5, Female Health Advisor)

“... if you were thinking perhaps along the lines of any anticipated backlash that, from men who wouldn’t come under this targeted category perhaps you know saying “why can’t I have it, women have it, gay men or men who are having sex with men have it. Why can’t I as a straight man have it?”. I don’t know whether that’s what you’re thinking but most probably the main problem would be identifying the men who would be entitled to have it.” (#16, Male Consultant)

7.4.2.4. Facilitators to the introduction of MSM-targeted HPV vaccination

Several initiatives to facilitate the introduction of MSM-targeted HPV vaccination were identified. These were mainly the development of official guidelines, awareness campaigns, public engagement programmes and integrated clinical procedures.

Official guidelines

Almost all interviewed HCPs expressed a need for authorised guidelines on the use of HPV vaccination in men, which would clearly specify the subjects of the targeted intervention. Education of clinicians and sexual health workers via specialised training sessions (e.g. as part of the British Association of Sexual Health and HIV Sexually Transmitted Infection Foundation course) was perceived to be essential to the success of the targeted vaccination programme, because the lack of training could reduce the confidence of HCPs to promote the vaccine to their service users. Several participants expressed their need for the development of the formal British Association of Sexual Health and HIV (BASHH) recommendations due to the reliance of HCPs on these guidelines in their everyday practice.

“Most GUM and sexual health clinics will refer to the BASHH guidelines so that's why it's really important to get that into BASHH. (#19, Female Consultant)

“And the get that incorporated in STIF training and then you need local champions to roll it out in BASHH regional to educate. You have got a central person feeds out and then they feed to more people. Educate the GUM people first and ask them to educate their patch and GPs. (#7, Female Consultant)

Awareness campaigns and public engagement

Eight participants agreed that there was a need for a national education campaign about the availability of HPV vaccination to MSM for the programme to be effective. They suggested implementing TV and gay-specific press advertisement and the coverage on social media and mobile phone application used to facilitate MSM networking, notably Grindr. These online resources were recommended because of the belief that they could attract the attention of MSM that do not identify as gay or bisexual as well as those with limited access to the gay-oriented press. The participants suggested the involvement of the third sector such as

charities, LGBT groups and youth projects to facilitate the awareness campaigns. It was also recommended to incorporate HPV vaccination for MSM in the sex and relationship education curriculum at school, so that young men could learn about their risk of HPV at an early age. Finally, HCPs indicated that any health education messages need to be informative, positive and non-judgemental. It was noted that framing the message about the HPV vaccine reducing the risk of genital warts would have a bigger impact than if the message focused only on cancer.

“There could be a national campaign, I mean that could be quite expensive, but you need to raise awareness of the importance and the problems of not having the vaccine or anal cancer but you could spin in the fact that it also protects against warts.” (#3, Male Nurse)

“I mean there’s the usual stuff like for men who have sex with men accessing so, potentially dating apps such as Gaydar, Grinder, Scruff whatever of those [apps] you choose to access. You could ask them about targeted advertising campaign there, social media.” (#1, Male Consultant)

“I think the only way to do it is to engage with community services so people who are positive, Terence Higgins Trust or a third party organisation like Positive East or Terence Higgins Trust, people who come forward to sexual health treatment. Another way could be youth groups or youth support groups for young MSM which are very prevalent in London and the bigger cities, to educate around sexual health and HPV vaccination and other aspects of sexual health or just HPV of course” (#3, Male Nurse)

Integrated clinical procedures

Most participants perceived the male HPV vaccination as part of a comprehensive healthcare package for MSM. The development of a vaccination schedule that would allow the combination of both HPV and hepatitis vaccines would encourage MSM to utilise sexual health clinics. Vaccination and other educational programmes such as free condoms, sexual health advice screening and psychological support were perceived be a part of a broad health

promotion initiative. Several participants emphasised the importance of a thorough and non-judgemental process of gathering information about sexual behaviours from all service users to recognise men potentially eligible for vaccinations. Also, it was noted that across various healthcare setting, unprejudiced doctor-patient communication styles need to create opportunities for MSM to discuss sexual behaviours and receive vaccine recommendations. One participant suggested incentivising general practitioners to collect the sexual history of their patients to enhance the identification of MSM, who might not utilise sexual health services. It was also suggested implementing text reminder services to complete vaccination series and to offer a catch-up vaccination for non-regular attendees.

“It should be tied up with a package on health promotion as I say.

It makes absolute sense if you’re going to do HPV vaccine in this group to do hepatitis B vaccine as well.” (#1, Male Consultant)

“You could train GPs to take better sexual histories, to actually ask all new registrants about sexual behaviour and identify MSM in their new registrants and then offer those interventions.” (#7, Female Consultant)

7.5. Discussion

This is the first study to examine the attitudes of HCPs towards MSM-targeted HPV vaccination. Despite the lack of policy on HPV vaccination for men in the UK, 14% of sexual HCPs reported involvement in ‘off-label’ HPV vaccination of their male service users, indicating an urgent need for guidelines to standardise practices across the country. Nearly all expressed concerns over MSM being at risk of HPV-related diseases and the vast majority perceived a need for an effective vaccination programme that could reduce HPV prevalence in this population. While two thirds of HCPs would endorse an MSM-targeted approach, the majority would recommend a universal HPV immunisation programme. HCPs were largely supportive of adding men to the ongoing, school-based, female-oriented HPV vaccination in the UK. They believed that the universal and targeted vaccination strategies were mutually exclusive. The universal vaccination approach was perceived superior to the MSM-targeted approach in terms of potential reach, effectiveness and equity. HCPs did not consider the need for an MSM-targeted HPV vaccination programme alongside universal male vaccination and the targeted strategy was thought to be ‘the second best’ option.

7.5.1. The level of support for potential MSM-targeted HPV vaccination

This study aimed to establish the baseline level of support for MSM-targeted HPV vaccination in the UK. Although 65% of HCPs agreed to recommend the targeted approach, 17% were against it and there were no specific characteristics of those in opposition. This finding is particularly concerning because it indicates that a fifth of HCPs may be unwilling to offer the HPV vaccine to MSM. This could potentially contribute to suboptimal uptake and in consequence compromises effectiveness of MSM-targeted HPV vaccination. Doctor's recommendation is one of the strongest correlates of HPV vaccination (Reiter et al., 2015) and it is essential that HCPs remain supportive of current vaccination policies.

The variation in support for MSM-targeted HPV vaccination can be explained by the variation in the levels of knowledge about the HPV vaccine and MSM. More than half of HCPs reported insufficient knowledge and skills to offer HPV vaccination. HCPs who felt informed about the use of HPV vaccine in MSM were eight times more likely to vaccinate their male patients. A previous study of HCPs' attitudes towards HPV vaccination in the UK found that the knowledge about the HPV vaccine was positively correlated with the willingness to recommend it to younger women (Hopkins et al. 2009). Clinicians, who thought their knowledge about HPV was inadequate, were less likely to endorse female HPV vaccination, demonstrating the relationship between the level of medical knowledge and professional recommendations. A survey on MMR vaccination in Germany showed that HCPs' knowledge about the MMR vaccine was related to their positive attitudes and their active participation in offering the vaccine to patients (Betsch et al., 2014). HCPs who had poor knowledge about the MMR vaccine reported concerns, negative attitudes, misconceptions and hesitancy in offering vaccination. Also, Dube et al. (2013) argued that the lack of medical and epidemiological knowledge affects decision-making processes associated with HCPs' willingness to promote vaccinations. A study of 92 HCPs in the USA assessed the knowledge of vaccination need for HIV-positive MSM (Blackwell 2016). It showed that 90% were unable to identify which vaccinations were necessary in the care of their patients. HCPs' knowledge was associated with familiarity of current vaccination guidelines, practice specialisation and the location of the practice, indicating a need for specific education for HCPs on vaccinations for MSM. HCPs in this study perceived the lack of knowledge and guidelines as a major barrier for HPV vaccination in the UK. They argued that the development of transparent HPV vaccination guidelines was essential so HCPs knew

which MSM to target for vaccination. Therefore, the lack of relevant information and training about the use of HPV vaccination in MSM is likely to undermine confidence in the provision of MSM-targeted HPV vaccination.

The paucity of evidence on the effectiveness of MSM-targeted HPV vaccination and the perception that a universal approach would be more effective against HPV were associated with the lack of willingness to recommend an MSM-targeted strategy. Most HCPs were uncertain about the characteristics of MSM and a potential healthcare setting to offer HPV vaccination. Despite weakened support for a targeted programme, only 3% believed that HPV-related burden in MSM was insufficient to offer HPV vaccination, indicating that nearly all HCPs perceived a need to vaccinate MSM. However, the majority thought that HPV vaccination was ineffective in sexually active men. Hopkins et al. (2009) indicated that the majority of HCPs in the UK were concerned that vaccination of older children might be less effective. Weiss et al. (2010) also showed over 80% of HCPs in the USA believed that HPV vaccination was not effective in sexually active men. These studies indicate that HCPs perceive sexual experience as a significant barrier to the effectiveness of HPV vaccination and oppose HPV vaccination of sexually active individuals. Although most HCPs thought MSM-targeted HPV vaccination would be feasible, they insisted on the recommendation of gender-neutral vaccination, as it was perceived to be more capable of protecting MSM before they are exposed to the virus. Therefore, the results indicate that HCPs were not against HPV vaccination in MSM, but they compared targeted and universal vaccination strategies in relation to potential effectiveness and reach. School-based HPV vaccination was thought to be the most effective strategy for MSM before they are infected with HPV. In the absence of evidence on potential effectiveness of MSM-targeted HPV vaccination, HCPs are in favour of the universal approach to protect MSM.

The HCPs' dilemmas between targeted and universal vaccination approaches are complex and not necessarily based on available scientific evidence. Their beliefs about financial and ethical values are associated with the level of support for MSM-targeted HPV vaccination. Despite the lack of evidence on cost-effectiveness, most HCPs perceived both targeted and universal HPV vaccination programmes to be worthwhile. HCPs had difficulties in comparing MSM-targeted and universal vaccinations in terms of their value and costs. Weiss et al. (2010) showed that most clinicians in the USA perceived men to be at similar risk of HPV infection to women and the majority considered universal male HPV vaccination to be

worthwhile and valuable. Humiston et al. (2005) demonstrated that HCPs views on vaccination cost-effectiveness varied and they influenced the decisions whether to recommend the vaccine to their patients. Also, Hopkins et al. (2009) demonstrated a strong support for male HPV vaccination in the UK, demonstrating favourable attitudes towards gender-neutral HPV vaccination amongst HCPs since the introduction of female HPV vaccination in 2008. Therefore, the enthusiasm for universal vaccination and the belief in its value are likely to undermine the support for MSM-targeted vaccination. In addition, a study on decision-making processes in relation to the allocation of healthcare resources in the UK found that HCPs were not only guided by information about potential cost-effectiveness of targeted services but also about equity and access to these services (Ratcliffe et al., 2009). It highlighted the importance of ethical and moral perspectives in medical decision-making. Thus, HCPs perceived universal vaccination to be more equitable and justifiable than any targeted approach and they perceived a strong demand for gender-neutral approach, regardless of sexual orientation. HCPs' positive perspectives on cost-effectiveness and equity of universal HPV vaccination are likely to weaken the support for MSM-targeted HPV vaccination.

It is necessary that there is investment in the construction of clear advice, guidelines and education for HCPs about the use of HPV vaccine in MSM to ensure equitable distribution of vaccination services, so that all men at risk of HPV are offered vaccination. When HPV vaccination guidelines are not available, there are disparities in opinions and concerns about the effectiveness, access and equity of various vaccination approaches amongst HCPs (Hopkins and Wood, 2013; Vidaparampil et al., 2014). Tissot et al. (2007) indicated that despite HCPs' concerns about the lack of data on the safety and efficacy of HPV vaccination, most believed that universal rather than a targeted strategy should be recommended. Betsch and Wicker (2014) argued that knowledge, personal attitudes and misconceptions alongside official recommendations guide HCPs' decisions whether to offer vaccinations. Hence, policy-makers need to acknowledge HCPs' concerns and address them accordingly to facilitate positive attitudes towards the recommended vaccination strategy. Loewenson et al (1994) reported that some HCPs show reluctance to adopt new vaccination guidelines. In their study, 67% of HCPs, who believed that hepatitis B vaccination should only be offered to high-risk individuals, were not supportive of new guidelines recommending universal infant vaccination. This was largely due to HCPs' beliefs that their patients were not at risk of hepatitis B. Therefore, in order to increase support for MSM-targeted HPV vaccination,

HCPs need to be provided with vaccination guidelines for men in the UK, a training on the use and value of HPV vaccination in MSM and education on communication skills to maximise the identification of MSM potentially eligible for vaccination.

7.5.2. Barriers and facilitators to MSM-targeted HPV vaccination

HCPs perceived several barriers to the implementation of MSM-targeted HPV vaccination in the UK. They believed that the impact of targeted vaccination was likely to be compromised because not all MSM are willing to visit SHCs, disclose their sexual orientation to HCPs or identify as gay or bisexual. At present, there is no robust estimate of the size of the MSM population in the UK, which is likely to be an important challenge when assessing the coverage of HPV vaccination. Mercer et al. (2004) reported that only 35% of MSM utilised sexual health services in the UK, indicating that MSM-targeted vaccination delivered only through SHCs is unlikely to reach the majority of eligible men. Deblonde et al. (2010) showed that poor healthcare utilisation and the inability to discuss sexual orientation with an HCP were associated with a lower uptake of STI screening amongst MSM. The previous study from this thesis (Chapter VI) indicated that poor utilisation of SHCs and the lack of disclosure of sexual orientations correlated with HPV vaccine acceptability. Sexual health interventions are successful when they reach those that are most susceptible to infections. Therefore, concerns about the compromised uptake due to poor access, self-identification and self-disclosure are highly relevant for HPV vaccination in MSM. The considerations of methods to reduce barriers are important for the success of MSM-targeted HPV vaccination.

An integration of healthcare services to increase uptake and expand coverage was recommended. HCPs suggested MSM-targeted HPV vaccination to be delivered through various healthcare setting, notably SHCs, general practice and pharmacies. The majority believed that HPV vaccination needed to be offered as part of a comprehensive health intervention, which provides hepatitis A-B vaccination, health education and advice, free condoms and screening services. Van den Berg et al. (2014) demonstrated that the integration of HPV vaccination and HIV testing services for young MSM in Rhode Island, USA was highly acceptable, with 98% receiving the vaccine. A systematic review of 34 interventions to increase HPV vaccination coverage demonstrated that the implementation of vaccination services in combined healthcare and community settings showed the highest effects on coverage (Smulian et al., 2016). Also, Wheeler et al. (2008) reported that the co-

administered HPV and hepatitis B vaccines were well-tolerated and did not interfere with the immune response, suggesting that these two vaccines could be given at the same time. Therefore, future studies need to explore whether HPV vaccination offered in multiple healthcare and community settings could increase the coverage and encourage MSM that do not wish to disclose their sexual orientation to HCPs to accept the vaccine. It is important to assess whether an offer of a bundle of HPV and hepatitis A-B vaccinations, STI screening and pre-exposure or post-exposure prophylaxis against HIV would encourage MSM who are at the beginning of their sexual activity to utilise sexual health services.

Several barriers such as low levels of knowledge about HPV, the lack of motivation or specific fatigue in obtaining the vaccine and complete the vaccination series were also noted. HCPs believed that MSM that did not know about HPV-related diseases would be less likely to disclose their interests in HPV vaccination. Some were concerned that a significant proportion would not be willing to be vaccinated or would not complete the vaccine schedule. Yee and Rhodes (2001) showed that poor awareness of the hepatitis vaccination and the lack of motivation to complete the vaccination course were previously related to low completion rates amongst MSM. Hence, these concerns need to be addressed in order to develop effective motivational interventions to maximise the impact of MSM-targeted HPV vaccination.

HCPs expressed a need for national health campaigns about HPV vaccination for MSM, which utilise social media such as Facebook, poster advertising and messages. They suggested that the messages about HPV vaccination would be most effective if they focus on prevention of genital warts, as this would be the most relevant to younger MSM. A systematic review of 19 randomised controlled trials on the use of digital media in sexual health promotion demonstrated that these interventions were effective for knowledge acquisition and health education (Bailey et al., 2015). Because awareness and knowledge are associated with HPV vaccine acceptability, future studies need to examine whether digital health promotion delivered through social media and relevant mobile applications could be used to educate MSM about HPV and encourage to request HPV vaccination.

The lack of political and public support for MSM-targeted HPV vaccination was also seen as a challenge. HCPs thought that most politicians, HCPs and lobby groups would oppose the targeted approach in favour of universal vaccination. They were also concerned about

the sexualisation of the HPV vaccine, which was mainly associated with its anti-cancer properties. HCPs were concerned about the impact of MSM-targeted HPV vaccination on uptake rates amongst females if the vaccine was being branded for ‘gay and bisexual men’. There are several reports of anti-HPV vaccination demonstrations and rallies, indicating distrust and doubt in effectiveness and safety of the HPV vaccine (Ramanathan et al., 2010; Rondy et al, 2010; Kata, 2012). The lack of public support in Japan, after a news report describing adverse side-effects of the HPV vaccine, resulted in the suspension of governmental recommendations and consequently deferral of HPV vaccination (Morimoto et al., 2015). Therefore, concerns that there was insufficient demand for MSM-targeted HPV vaccination are pertinent. There is a need for an open debate about the use of HPV vaccination for men in regards to epidemiological and cost-effectiveness evidence. Politicians, HCPs and interest groups might require justification for cost-effectiveness analysis to understand decision-making processes when recommending MSM-targeted HPV vaccination.

7.5.3. Strengths and limitations

This is the first study to examine the practice and support for MSM-targeted HPV vaccination, outlining baseline acceptability for this strategy. It reports perceived barriers and facilitators to the introduction of hypothetical MSM-targeted HPV vaccination in the UK that could guide the development of similar vaccination programmes overseas. The analysis of decision-making processes enhances the understanding of factors related to the construction of professional recommendations to various vaccination approaches. The study utilised a mixed-methods design to comprehend the breadth and depth of attitudes towards make HPV vaccination. Some survey questions may have been understood differently, as the introduction lacked a clear explanation that it was to measure the levels of support for MSM-targeted HPV vaccination. This was to explore perspectives on both universal and targeted vaccination strategies. However, the lack of clarity was not described in comments at the end of the survey. The follow-up interviews enabled me to clarify the survey findings and to conclude that the observed differences in support for the two vaccination strategies were mainly due to beliefs that they would not be commissioned simultaneously.

It was difficult to precisely estimate the response rate. However, a study on attitudes of sexual HCPs towards pre-exposure prophylaxis against HIV in the UK, which used comparable recruitment methods, achieved a similar sample size of 328 (Desai et al., 2015).

Although the sample size is geographically diverse, the study would benefit from the perspective of general practitioners or pharmacists likely to be involved in MSM-targeted HPV vaccination. Their opinions would enable broader understanding of potential barriers in various healthcare and community settings. An investigation of support for MSM-targeted HPV vaccination amongst general practitioners, which was not within the scope of this thesis, would help to determine whether this strategy could be extended beyond SHCs. There is also a possibility of bias by self-selection, if only HCPs with a particular interest in HPV vaccination took part in the study. This could result in the polarisation of views on male HPV vaccination and misrepresent clinicians with neutral perspectives on HPV vaccination. However, our robust recruitment method were to ensure the neutrality of the survey and telephone interviews, so that a large number of clinicians could express their attitudes towards male HPV vaccination without any particular focus on targeted HPV vaccination. Hence, the participants were asked separately about their recommendations of gender-neutral and targeted vaccination strategy to reduce the interdependence of these two programmes.

The study would also benefit from a knowledge measurement on HPV vaccination to indicate to what extent the examined attitudes were associated with knowledge about the use of the HPV vaccine in MSM. Although the self-reported knowledge and skills may indicate this gap, these answers were subjective and subject to response bias. Future studies need to develop and incorporate an assessment of HCPs' knowledge of vaccination procedures, targeted populations and vaccine schedules to identify the influence of knowledge on the willingness to vaccinate MSM patients. The study was conducted in 2014 before the release of JCVI statement describing the cost-effectiveness of MSM-targeted HPV vaccination in the UK. Future studies need to assess how information about cost-effectiveness of various targeted services affects decision-making processes and attitudes. It is essential to measure whether JCVI's recommendations increase support for MSM-targeted HPV vaccination. HCPs' attitudes need to be monitored over time to ensure they remain favourable and supportive of the current policies. A longitudinal perspective to measure any changes in attitudes towards male HPV vaccination and specifically the MSM-targeted approach would help to understand the influence of educational programmes and guidelines on HCPs' recommendations. .

The online questionnaire would benefit from additional measurements. The study did not examine under what circumstances 14% of the participants decided to vaccinate men. Additional data on vaccine recipients' characteristics such as age, number of sexual partners or location would enable the understanding of the vaccination uptake prior to any official guidelines. When considering the MSM-targeted HPV vaccination, additional questions could ask about the preferences of what age groups of MSM should be targeted for vaccination. Also, further questions could investigate if HCPs are willing to target other high-risk groups such as HIV-positive or immunocompromised individuals or men with recurrent HPV infection. A measure of vaccine hesitancy could be implemented to identify HCPs negative views on vaccination in general. Similarly, a hypothetical measure of the willingness to vaccinate their adolescent son or daughter against HPV could indicate their attitudes towards HPV vaccination.

7.6. Conclusion

Although HCPs would support MSM-targeted HPV vaccination, the majority believe that the universal approach would be the more effective against HPV. A number of barriers and facilitators have been identified to develop vaccination programmes capable of achieving optimal uptake. Clear advice, guidelines and education are urgently needed to standardise HPV vaccination practices and ensure equitable distribution of health promotion services. HCPs' attitudes and recommendations need to be monitored to identify any potential changes that could impede the implementation of MSM-targeted HPV vaccination.

Chapter VIII – Discussion

In the absence of a gender-neutral HPV vaccination programme in the UK, an MSM-targeted programme could offer valuable preventative opportunities against HPV-related genital warts and cancers. The evaluation of acceptability and feasibility enables the identification of potential barriers to the implementation of an MSM-targeted HPV vaccination programme. Acceptability studies provide evidence about the proportion of MSM, who might be unlikely to receive the vaccine and require a consideration of alternative vaccination approaches. They also enable the recognition of the overall demand, interest and motivation in obtaining the HPV vaccine. Factors associated with the acceptability of HPV vaccination are likely to be related to vaccine initiation and completion because MSM who are categorically unwilling to receive the vaccine, would be unlikely to initiate vaccination. Hence, the assessment of HPV vaccine acceptability in MSM was to identify barriers and inform the development of policies and strategies that aim to maximise the uptake and increase the overall effectiveness of the targeted vaccination programme against HPV-related diseases.

Between 2012 and 2015, the Joint Committee on Vaccination and Immunisation (JCVI) considered several parameters when evaluating the potential cost-effectiveness of MSM-targeted HPV vaccination. These were mainly related to vaccine efficacy in men, HPV and HIV prevalence in MSM, HPV-related cancer incidence and survival rates in MSM, the estimation of the quality of life loss as well as the duration and cost of treatment of HPV-related diseases (Kirby, 2015). A large proportion of these parameters were estimated using data collected outside the UK, notably in the USA and Australia. These countries have different healthcare systems and composition of sexual health services for MSM, which are likely to affect the rates of HPV and HIV infections and the incidence of anal cancer. Several studies conducted in North America indicated that most MSM were willing to accept the HPV vaccine. However, these studies identified factors, such as having health insurance or covering the personal cost of the vaccine, which were not relevant to potential MSM-targeted HPV vaccination in the UK (Reiter et al., 2010; Gilbert et al., 2011). Within the current structure of the National Health Service (NHS), which is publicly funded and free at the point of access, HPV vaccination would be considered free of charge to all eligible MSM. Hence, in order to maximise the precision and validity of the cost-effectiveness analysis,

JCVI needs to rely on data from MSM in the UK, whose opinions and concerns are most relevant and applicable. The interim statement from JCVI, published in November 2014, highlighted the need for the evaluation of HPV vaccine acceptability amongst MSM in the UK (Joint Committee on Vaccination and Immunisation, 2014). The cost-effectiveness modelling, produced by Public Health England, assumed 100% acceptability, uptake and completion of a three-dose vaccination schedule in MSM attending GUM clinics. JCVI acknowledged the lack of data on HPV vaccine acceptability in MSM and invited stakeholders to comment on their assumptions. It was recognised that different acceptability parameters were likely to affect the overall cost-effectiveness of MSM-targeted HPV vaccination.

To date, only one study attempted to estimate HPV vaccine acceptability amongst MSM in the UK. King et al. (2015) demonstrated that 83% of MSM were willing to accept the three-dose HPV vaccine. Only 4% of MSM in that sample were against HPV vaccination, but their reasons for the reluctance were not explored further. The study used a convenience sampling of sexually active men recruited from an SHC in London. About 75% of men were above the age of 25 years and 66% reported having more than 30-lifetime sexual health partners. Various HPV types were detected in over 72% of MSM in that sample, suggesting that the majority of these men had substantial sexual experience and were mostly exposed to the virus. Also, over half of the men were not born in the UK. HPV vaccine acceptability needs to be examined in men with little sexual experience who can benefit most from the HPV vaccine. Men, who access SHC in the major cities such as London, are unlikely to represent the population of MSM. Therefore, the objective of this thesis was to explore HPV vaccine acceptability in a sample of young, geographically dispersed MSM, who were at the beginning of their sexual activity. Also, the research in this thesis aimed to identify potential barriers and facilitators to the introduction of MSM-targeted HPV vaccination in the UK.

These objectives were addressed in two reviews and three studies. The first review attempted to identify theoretical constructs used in previous studies on hepatitis vaccination acceptability and uptake in MSM. The second review identified correlates of HPV vaccine acceptability amongst MSM. The first empirical study investigated beliefs about HPV and attitudes towards HPV vaccination amongst MSM in the UK. The study explored potential barriers and facilitators to the introduction of MSM-targeted HPV vaccination. The second study, which used quantitative methods, investigated the proportion of MSM willing to

accept the HPV vaccine and examined correlates of HPV vaccine acceptability in a sample of young MSM. The final mixed-methods study assessed the levels of support for MSM-targeted HPV vaccination amongst sexual HCPs in the UK. It also investigated perceived barriers and facilitators to MSM-targeted HPV vaccination. The findings from two reviews informed the development of the three studies. The results of the qualitative study with MSM contributed to the development of the online survey on HPV vaccine acceptability in young MSM.

8.1. Summary of findings

Four specific aims were set to achieve the thesis objective and attempt to answer the following research question: "***Is a targeted HPV vaccination programme in men who have sex with men feasible and acceptable in the United Kingdom?***". Aim 1 was addressed in two reviews and reported in Chapter III and IV. Aims 2 to 4 were addressed consecutively and reported in Chapters V, VI and VII.

8.1.1. Aim 1: To assess the factors associated with vaccination behaviours in the context of hepatitis and HPV vaccinations by reviewing the literature

The two reviews (Chapter III and IV) synthesised the scientific literature of vaccination behaviours of MSM. Due to a lack of a transparent and sensitive theoretical framework, which could inform the development of studies on HPV vaccination in MSM, I attempted to develop a map of theoretical constructs and statistically significant correlates of vaccine behaviours amongst MSM. The findings demonstrated significant disparities between different measures of vaccine acceptability and uptake in MSM. For example, vaccine acceptability was operationalised as ‘the willingness to receive the vaccine’, ‘an intention to be vaccinated in the next six months’ or ‘self-reported vaccination status’. The majority of studies described discrete vaccine behaviours and failed to distinguish between the motivation for vaccine initiation and vaccine completion. Allen et al. (2010), who reviewed 79 studies on HPV vaccine acceptability, demonstrated significant disparities between acceptability measures. They concluded that most acceptability measurements were not based on any theoretical framework, had not used consistent construct labelling and were not validated. Allen’s review highlighted that the lack of a standardised vaccine acceptability measurement may prevent researchers and practitioners to develop effective vaccination programmes. Therefore, the discrepancy in hepatitis and HPV vaccine acceptability measures encouraged me to construct an HPV vaccine acceptability measurement that

acknowledged the specific behavioural challenges faced by MSM and distinguish between vaccine initiation and completion.

The review of methodological designs, used in studies on hepatitis and HPV vaccinations, allowed me to design a research programme capable of identifying factors related to vaccine acceptability in MSM. All reviewed studies were observational and used convenience sampling, failing to focus on younger MSM, who were at the beginning of their sexual activity. None of the reviewed studies examined the impact of information about HPV and the HPV vaccine on HPV vaccine acceptability. Also, none of the studies examined whether HPV vaccine acceptability was static or variable over time. Thus, there was a need for geographically dispersed, population-based research, which could utilise nation-wide methodological approaches to collect data from a sample of young MSM. An examination of any effect of tailored message framing over time was required to inform the development of health promotion interventions.

The two reviews enabled the identification of patterns associated with vaccine acceptability and uptake. They allowed me to estimate knowledge, potential vaccine acceptability and identify particular perceptions related to vaccination behaviours. The findings demonstrated distinct similarities between hepatitis and HPV vaccinations, which facilitated a thorough understanding of behavioural patterns associated with vaccinations in MSM. The combination of demographic, behavioural and psychological factors illustrated that MSM at the beginning of their sexual activity, represented by their age, sexual experience and access to sexual health services, might be less likely to utilise specific services for MSM and thus be less motivated to obtain the vaccine. Men who are less concerned about their sexual health needs, represented by their poor knowledge about STIs, negative attitudes towards vaccinations and infrequent access to sexual health services such as STI screening, might also be less likely to seek vaccinations. Also, some men with substantial concerns about their sexual health and motivation for vaccination may face individual barriers such as the lack of time to undergo vaccinations or insufficient knowledge about vaccination procedures. The reviews also outline that the engagement with sexual health services and interactions with HCPs that enable open discussion about sexual health matters may improve MSM knowledge about STIs and increase their motivation for obtaining the vaccination. Men who have better access to LGBT-related information and resources tend to be more motivated to utilise sexual health services and vaccinations. Thus, the findings indicate that sexual and

social experiences, health-related knowledge and engagement with relevant health services influence MSM motivation for vaccination.

The findings of the two reviews are consistent with previous reviews on MSM and non-MSM populations. The results of the scoping review (Chapter III) were similar to the systematic review of factors associated with hepatitis B vaccination amongst MSM published in October 2015 by a group of researchers from the Netherlands (Vet et al., 2015). The review, which identified 18 studies, outlined socio-demographic characteristics, behavioural and socio-cognitive factors, and healthcare access as correlates of hepatitis B vaccination uptake. It concluded that specific potentially modifiable psychological factors such as risk perceptions, characteristics related to sexual identity and access to vaccination services were strongly associated with hepatitis B vaccination status. Thus, the findings of my scoping review are shown to be reliable.

My second review, conducted at the beginning of 2013, attempted to examine studies on beliefs about HPV and perceptions of the HPV vaccine amongst MSM. It was the first systematic review on HPV vaccine acceptability in MSM, which included 16 studies in total. The findings are consistent with a meta-analysis of HPV vaccine acceptability in men, published in June 2013 (Newman et al., 2013), which only included six studies on MSM. The results showed that socio-demographic characteristics such as education, employment and ethnicity, perceptions of HPV and the HPV vaccine, vaccine endorsement, and HPV knowledge were associated with HPV vaccine acceptability. Also, a systematic review of HPV vaccine acceptability amongst women, published in 2007 (Brewer et al., 2007), identified HPV knowledge, HPV and vaccine-related perceptions, doctor's recommendations and several socio-demographic variables to be correlated with HPV vaccine acceptability. The majority of determinants of HPV vaccine acceptability in heterosexual men and women are similar to those in MSM. However, factors related to sexuality, such as the amount of sexual experience, access to sexual health services and the openness about same-sex experiences seem to play a significant role in MSM vaccination in particular. Thus, while some factors are universally associated with vaccine acceptability across various populations, the review enabled the identification of specific correlates relevant in any MSM-targeted vaccination programme.

The systematic review informed the development of MSM-targeted vaccination programmes. It was sent to JCVI during their stakeholder consultation on proposed MSM-targeted HPV vaccination in the UK to justify lower than estimated HPV vaccine acceptability, uptake and completion rates. The review was also cited in the synthesis of the evidence from the Quebec Immunization Committee when deciding whether to recommend MSM-targeted HPV vaccination in the province of Quebec, Canada. The review was updated in March 2016 and identified eight additional studies on HPV vaccine acceptability and uptake. Four of the newly identified articles measure correlates of HPV vaccine uptake as opposed to acceptability per se and no other associations were identified, indicating that the determinants of HPV vaccine acceptability are likely to be similar for HPV vaccine uptake. Hence, the updated review could be used to inform the development of health promotion approaches that aim to increase HPV vaccination coverage in MSM.

8.1.2. Aim 2: To establish beliefs about HPV and attitudes towards HPV vaccination amongst MSM in the UK

My qualitative and quantitative studies in MSM, presented in Chapters V and VI, demonstrated that MSM were either not aware or had little knowledge about HPV and related diseases. While two-thirds of MSM knew very little about HPV, a fifth showed good understanding. Younger MSM were more aware of HPV, but they associated the infection with female genital diseases, notably cervical cancer. Most men were not aware that HPV was associated with anal cancer and genital warts. In the absence of gender-neutral HPV vaccination and public debate on HPV risk for men, MSM construct beliefs in relation to existing female-oriented HPV vaccination programmes at school. In the USA, the predominant female-oriented education about HPV infection was associated with negative parental attitudes towards HPV vaccination of their sons, suggesting that gender-specific health education influences the beliefs about HPV and the perceptions of HPV vaccine eligibility (Perez et al., 2015). Thus, HPV-related health education in the UK, which has primarily focused on preventing cervical cancers since the introduction of HPV vaccination programme in 2008 and the lack of information about HPV-related diseases in men, is likely to influence MSM's knowledge and beliefs about HPV.

The participants were given five pieces of information about HPV, HPV-related disease and the HPV vaccine to explore their beliefs and perceptions. The results showed that in the absence of adequate knowledge about HPV, MSM compare the virus to other better-known

STIs in terms of symptoms, prevalence, potential risks and treatment options. The information that HPV is common and does not result in any health problems in men was not related to any significant concerns amongst MSM. Most men are unable to estimate how common HPV is and how it can be transmitted. Although MSM were aware of genital warts, they struggled to understand the link between genital warts and HPV. MSM expressed anxiety over visually distinct symptoms of genital warts and about half reported concern and worry about developing warts in the future. Most men were not aware that HPV infection could result in cancer and that MSM were at higher risk of anal cancer. Cancers, in general, were perceived as potentially severe and the information caused concern and worry. While some men reported feeling at risk of HPV and related diseases, others thought they were unlikely to develop any genital warts or cancers due to HPV. The provided information altered participants' perceptions of risk and evoked concern as well as anxiety. Some qualitative studies on beliefs about HPV in women had shown comparable results. McCaffery et al. (2006) demonstrated that women who received a positive HPV test result reported feeling stigmatised about an STI, distressed and anxious that HPV could lead to cancer and most had difficulties in understanding how HPV infection may influence their lives. Waller et al. (2005) reported that women, who were informed about HPV during cervical cancer screening were unaware about the virus, reported feeling shocked about the link between cervical cancer and sex, and some had difficulties in integrating the information about HPV in their cognitive representation of cervical cancer. Therefore, the reactions of MSM after learning about HPV are similar to the reactions of women before the introduction of HPV vaccination.

The study also illustrated that despite poor knowledge about individual vaccines against STIs, MSM had positive attitudes towards vaccinations. Although men had difficulties recalling the circumstances of their hepatitis vaccination, more than half were aware that it was offered at a sexual health clinic alongside STI screening. In general, MSM expressed positive attitudes towards immunisation programmes, but they reported modest motivation for actually obtaining the vaccinations. Initially, some MSM felt that the HPV vaccine was only relevant for women against cervical cancer. After reading the information about HPV and the HPV vaccine, all men expressed their willingness to receive the vaccine. MSM wanted to know where and how they could obtain the vaccine. Several barriers such as the lack of sufficient knowledge about the vaccine, concerns about potential side effects and restricted availability were identified. Some men expressed distrust and dislike of

vaccinations or felt ‘fatigued’ accessing healthcare services that offer vaccinations. Most men were worried that the vaccine would be ineffective in sexually active men. Hence, the majority were in favour of gender-neutral HPV vaccination at schools due to concerns that they had already acquired HPV because of their sexual experience. Previous studies showed that although adult women lacked sufficient knowledge about vaccines, such as for measles, polio and HPV, they believed that vaccinations, in general, provide defence against communicable diseases (Francis et al., 2011). Mortensen (2010) indicated that the knowledge about HPV amongst young adult women in Denmark was poor and they expressed significant concerns over the HPV vaccine effectiveness after sexual debut. Thus, the levels of knowledge about HPV and the HPV vaccine and concerns about side effects, safety or vaccine effectiveness amongst MSM are comparable to those in women when adult HPV vaccination was considered. Regardless of gender and sexual orientations, adults are not sufficiently informed about HPV and related diseases, but they may be able to recognise benefits of HPV vaccination.

Specific barriers to immunisation, related to sexual identity, sexual experience and social networking, were identified. MSM reported that ambivalent identification as gay or bisexual and unwillingness to discuss same-sex experiences to HCPs might impede HPV vaccination. Men were concerned about potential stigmatisation from targeted HPV vaccination that was only aimed at gay and bisexual men. One participant, in particular, was concerned that the availability of the vaccine to women and gay men could undermine his masculinity and potentially create negative stereotypes. Some participants felt overwhelmed with the amount of information about STI risk to MSM and thought the information about HPV-related cancers may not be acknowledged. While the majority of MSM perceived SHCs to be the most suitable settings for HPV vaccination, some men argued that general practitioners should also offer the vaccine because some MSM do not access SHCs. A systematic review of 17 qualitative studies on MSM attitudes towards HIV testing showed that MSM were concerned about anti-gay prejudice and recommended removing the obligation to disclose sexual orientation (Lorenc et al., 2011). Matclafe et al. (2015) showed that the level of sexual orientation disclosure is higher in specialist SHCs than general practices. MSM are more likely to discuss their sexuality if they believe it is relevant to their health and that their confidentiality would be protected. Therefore, the identified barriers apply to most sexual health services for MSM, whether STI screening or vaccinations. The amount of sexual

experience and the openness about sexual orientation are likely to be associated with the readiness to utilise sexual health services.

The results of the quantitative study further demonstrated that MSM perceptions of HPV and the HPV vaccine varied. Over half of MSM perceived genital warts to have a little or moderate impact on health and 94% saw anal and oral cancers to be extremely severe. About 19% thought they were at risk of developing genital warts and 16% perceived themselves at risk of genital or anal cancer. While the majority of MSM considered anal cancer as a serious disease, they did not consider HPV to be a threat. These findings are consistent with previous studies amongst MSM, reviewed in Chapter IV, indicating that most MSM are not concerned about HPV per se.

Although most MSM perceived the HPV vaccine as beneficial, the majority reported multiple barriers to HPV vaccination. Men believed that the vaccine would protect both their own and their partners' health and reduce the risk of genital warts and anal cancer. Over 81% would recommend the HPV vaccine to their gay and bisexual friends. However, the lack of knowledge about the HPV vaccine and places that offer it as well as the belief that a doctor would not recommend the vaccine to gay and bisexual men, were perceived as significant obstacles. Interestingly, regardless of the manipulated information about HPV vaccine effectiveness in the study (Chapter VI), only half of MSM believed that the vaccine would be effective for them. Therefore, as presented in the qualitative study, MSM have positive attitudes towards the HPV vaccine, even if their knowledge is insufficient. A large proportion was unsure whether the vaccine is effective for sexually active men. Potential embarrassment from discussing sexual health with HCPs and the lack of doctor's recommendation or encouragement to vaccinate against HPV were amongst the most common barriers, emphasising the importance of doctor-patient communication and effective health education.

8.1.3. Aim 3: To examine HPV vaccine acceptability and identify associated behavioural and psychological factors

The results of the quantitative study, reported in Chapter VI, showed that over a half of MSM would ask their doctors about HPV vaccination and 89% would accept the vaccine if their doctor offered it. The results demonstrated a gap between active vaccination seeking behaviour, such as a visit to SHC to request the HPV vaccine, and passive vaccine

acceptability, such as the compliance with doctor's recommendation to uptake the vaccine during a consultation initially unrelated to vaccination. Thus, although HPV vaccine is highly acceptable amongst MSM, their desire to obtain the vaccine is moderate. Also, the HPV vaccine acceptability scale showed that 15% would not visit an SHC and 23% would not tell a doctor about same-sex experiences in order to receive the vaccine. Despite high acceptability, a quarter of MSM reported significant barriers related to the utilisation of sexual health services that may impede MSM-targeted HPV vaccination. Further analysis showed that the frequency of using dating mobile applications, the disclosure of sexual orientation to an HCP, the utilisation of services in SHCs, HIV status and HPV knowledge were associated with HPV vaccine acceptability. Thus, limited connection with sexual networks and community, limited capacity to utilise sexual health services as a self-declared MSM and insufficient knowledge about HPV is correlated with weaker HPV vaccine acceptability in MSM.

The findings are consistent with previous studies. The results are similar to King et al. (2015) estimation of HPV vaccine acceptability amongst MSM attending a London-based SHC, indicating that 83% would be willing to be vaccinated. Despite the substantial differences in the sample composition about geographical location, age and the amount of sexual experience, the two studies demonstrate that only 4% of MSM would certainly be unwilling to accept the HPV vaccine and about 10% are unsure. Studies on HPV vaccine acceptability amongst MSM, which were conducted in the last four years in the USA and Italy, have also shown acceptability rates above 80% (Zou et al., 2014; Cummings et al., 2015; Giuliani et al. 2016). Thus, these studies estimate that below a fifth of MSM show reluctance or hesitancy towards the HPV vaccine and they would benefit from additional advice or individual health education about HPV and the HPV vaccine.

HPV vaccine acceptability is associated with perceptions of HPV and the HPV vaccine. Men who felt more susceptible to HPV and perceived the infection caused serious diseases were more likely to accept the vaccine. MSM, who reported multiple barriers to HPV vaccination and did not believe that the vaccine was effective, were less likely to accept it. Also, men who thought that the HPV vaccine was beneficial, protective and useful were more willing to receive the vaccine. Previous studies, reported in the systematic review conducted in this doctoral thesis (Chapter IV) as well as two systematic reviews on factors associated with vaccine acceptability in men (Newman et al, 2013) and MSM (Vet et al., 2015), have

demonstrated that a set of assumptions, opinions, perspectives and beliefs about the HPV vaccine are likely to influence individual willingness to accept it.

This was the first study that estimated the impact of information about HPV on beliefs and perceptions amongst MSM. The information about HPV was associated with a temporal increase in HPV vaccine acceptability. The decrease in HPV vaccine acceptability at the follow-up could be related to other factors such as participants' research of available information about the HPV vaccine and discussions with their friends or HCPs. The information about compromised HPV vaccine effectiveness was associated with an increase in perceived barriers and it was not associated with HPV vaccine acceptability. A systematic review of 33 studies on educational and messaging interventions, conducted before the HPV vaccine was licenced in the USA, showed significant changes in HPV vaccine acceptability (Fu et al., 2014). There was weak evidence demonstrating that information about HPV did increase acceptability, but most of these changes were not stable over time. Therefore, information about HPV and HPV vaccine may only produce a temporal effect on HPV vaccine acceptability.

8.1.4. Aim 4: To examine the level of support for targeted HPV vaccination programme in MSM amongst healthcare professionals in the UK

The two reviews and both empirical studies, reported in this thesis, concluded that doctors' recommendation to vaccinate is one of the strongest correlates of vaccine acceptability amongst MSM. Hence, the examination of attitudes towards MSM-targeted HPV vaccination amongst HCPs would help to identify the proportion of sexual health workers that are hesitant to encourage their MSM patients to be vaccinated. The results of the mixed-method study, reported in Chapter VI, demonstrated that most HCPs would prefer a gender-neutral HPV vaccination strategy over an MSM-targeted approach. Although 11% have already been involved in HPV vaccination of MSM, about two-thirds either disagreed or were unsure about an MSM-targeted HPV vaccination. As such, combining 65% support amongst HCPs and 83% HPV vaccine acceptability amongst MSM, the potential uptake of the HPV vaccine could be as low as 54%, assuming that all MSM that accept the vaccine would access sexual health and vaccination services. Thus, the suboptimal support for HPV vaccination in MSM would have significant consequences and may substantially compromise the overall cost-effectiveness of an MSM-targeted HPV vaccination programme.

Further analysis of attitudes showed that most HCPs believed MSM-targeted HPV vaccination would be feasible but they were concerned about its effectiveness and equity. HCPs compared targeted vaccination to the gender-neutral strategy and existing MSM-targeted hepatitis vaccination. Although they believed that HPV vaccination could utilise the infrastructure of the ongoing hepatitis vaccination, they perceived that school-based universal vaccination of adolescent boys would be more efficient against HPV-related diseases in MSM. Some HCPs had difficulty understanding the purpose of cost-effectiveness evidence and in the absence of guidelines for HPV vaccination in men, HCPs justified their opinion by what they perceived to be most effective and equitable. Similar compromised levels of support and concerns about HPV vaccine effectiveness, safety and suitability in sexually active women were also reported before the introduction of female-oriented HPV vaccination in various countries (Hopkins and Wood, 2013). A qualitative study of HCPs informational needs about the HPV vaccine showed that only half of HCPs were aware of different HPV vaccine types. The majority felt that their knowledge about vaccine efficacy, side effects and cost was insufficient (Kasting et al., 2016). Alexander et al. (2015) demonstrated a model of HCPs decision-making about HPV vaccination in men, showing that the sexual nature of the HPV infection, the novelty of vaccination approach and the lack of official mandate for vaccination act as barriers to the recommendation. HCPs base their opinions or their personal assessment of risk and benefits for their patients, perspectives of other HCPs and official vaccination guidelines. Therefore, the observed levels of hesitancy towards a novel vaccination strategy are expected and likely to be modifiable by the provision of cost-effectiveness evidence, specific HPV vaccination guidelines in men and specialist training.

8.2. Strengths and limitations

In their interim statement on the modelling and cost-effectiveness of HPV vaccination for MSM in the UK (The Joint Committee on Vaccination and Immunisation, 2014), JCVI assumed 100% uptake and completion rates. The research reported in this thesis shows that while 83% of MSM would be willing to accept the vaccine, over a quarter would experience significant barriers to the access to SHCs and the disclosure of sexual orientation, with only half expressing motivation to seek the vaccine themselves. Also, a self-reported measure of hepatitis vaccination uptake indicates that over 40% either did not receive the hepatitis B vaccine or were unsure. As such, with the support levels of 65% amongst HCPs and

substantial barriers to vaccination amongst young MSM, an estimate of 50% (+/- 10%) vaccine initiation rate would be justifiable. This evidence is likely to affect cost-effectiveness modelling and affect its overall output if no additional health promotion interventions are implemented. However, this conclusion may be inappropriate if the research in this thesis used inadequate methodologies. Specific limitations of each study are described in previous chapters. Below are strengths and limitations of the thesis in the broader context.

8.2.1. Theoretical approach

Throughout my thesis, I have adopted a pragmatic epistemological approach, which implies that theories and findings are to achieve research goals to answer the specific research question. Unlike other approaches, such as constructivism or rationalism, the final justification for what is valid knowledge is represented by the goals the knowledge is able to support (Kirsh and Maglie, 1994). Thus, a strength of this thesis is the systematic examination of theoretical constructs, rather than a selection of an existing theory, to examine possible factors associated with HPV vaccine acceptability. As a result, the approach allowed the construction of a model of barriers and facilitators to vaccination for men who have sex with men, presented in section 8.3.1. This approach allowed me to consider various behavioural and psychological variables, such as sexual experience, which may not be identifiable by any one specific theoretical framework commonly used in health psychology. The use of both qualitative and quantitative methods facilitated the identification of constructs relevant for MSM-targeted HPV vaccination. As such, the systematic ‘bottom-up’ approach of studying theoretical constructs, rather than a ‘top-down’ approach that uses a pre-defined model, is advantageous in terms of specificity, sensitivity and theoretical validity. As a result of the systematic review of studies on HPV vaccine acceptability in MSM (Chapter IV) and the qualitative study (Chapter V), I was then able to test selected variables in a geographically dispersed sample that is likely to represent a population of young MSM.

8.2.2. Study design

The three studies, reported in this thesis, were designed specifically to explore views on barriers and facilitators of potential MSM-targeted HPV vaccination. Roth (1987) argued that the incorporation of a pluralist approach enhances scientific methods and the interpretation of human behaviours. In line with the pragmatic epistemological stance, a diversity of methodological approaches facilitates a better understanding of complex

behavioural systems. The pluralism was represented in the selection of two groups of participants, notably MSM and HCPs, who are most relevant to the success of this vaccination strategy. The study of perspectives from an MSM population by itself would not allow the identification of specific HCPs barriers such as the lack of support for MSM-targeted HPV vaccination or a belief that this the vaccination could lead to unsafe sexual practices. The first study (Chapter V) used a qualitative approach to explore the range and depth of opinions about HPV vaccinations. It used both interviews and focus groups to reduce the possibility of bias due to the interaction with the researcher and allow MSM to exchange their perspectives. The second study (Chapter VI) used a quantitative approach, utilising a quasi-experimental design, where participants were randomised to two conditions and assessed at three time points. Although participants were manipulated to read different information about HPV vaccine effectiveness, the addition of a control group in which men were not shown any information about HPV and the HPV vaccine would have enabled more precision in the assessment of the effect of the two pieces of information. However, the baseline measurement was set to assess HPV vaccine acceptability without any influence of the information. The third study (Chapter VII) also used methodological pluralism incorporating survey and telephone interviews when examining HCPs' views on HPV vaccination for MSM. The triangulation of methodological approaches increased my ability to validate the findings and conclusions.

There are considerable methodological weaknesses in relation to the messages used to inform participants about HPV and the HPV vaccine. Although the messages in the qualitative study (Chapter V) were adopted from the leaflet "HPV and Men", developed by the Centre for Disease Control and Prevention (2013), the participant did not have a full view of the leaflet. Instead, there were five short messages, which lead to a relative risk estimation indicating that MSM 'are about 17 times more likely to develop anal cancer than men who only have sex with women'. The presentation of the absolute risk, for instance as an incidence rate of 5 per 100,000 HIV-negative MSM, could influence MSM perceptions of HPV and affect HPV vaccine acceptability. Malenka et al. (1993) demonstrated that patients' preferences for treatment or medication choice can be influenced by 'framing' of disease risk in absolute or relative risk. While 15% of patients chose medication following information about the absolute risk of a serious illness, 57% chose medication when the same information was presented in relative terms. Thus, the perceptions of anal cancer amongst MSM and the need for HPV vaccine are likely to be different if the absolute description was

provided. The findings show that the information about the relative risk of anal cancer increases in acceptability and could be used in health promotion about the HPV vaccine for MSM.

The information about the effectiveness of HPV vaccine, manipulated in the quantitative study (Chapter VI) lacked precision. It remains unknown to what extent sexual experience reduced the effectiveness of the HPV vaccine. Some men previously exposed to HPV might not seroconvert for all strains covered in the vaccine and men who have experienced genital warts in the past would still benefit from the HPV vaccine against oncogenic strains. This rationale was not communicated to participants and most MSM could have considered HPV vaccine effectiveness in term of female HPV vaccination before sexual debut. The results showed that perceived HPV vaccine effectiveness was associated with HPV vaccine acceptability and therefore, there is a need to investigate the reasons why men considered the vaccine less effective. Also, the information about the benefit of the HPV vaccine for sexually active men informed participants that some doctors recommend the vaccine to their gay and bisexual patients. Perceived doctor recommendation has been consistently shown to be a predictor of HPV vaccine acceptability and this added piece of information might have a significant impact on beliefs and perceptions amongst MSM. There was a weak, borderline significant, difference in the impact of the two pieces of manipulated information on HPV vaccine acceptability. Thus, there is inconclusive evidence about the impact of HPV vaccine effectiveness on HPV vaccine acceptability. It is possible that the additional sentence '*Some doctors at sexual health clinics recommend this vaccine to their gay and bisexual patients.*', which was also added to the information about the benefits of the HPV vaccine in sexually active men could substantially decrease perceived barriers to HPV vaccination. However, the current study design and analysis are unable to clarify which components of the information provided (whether about HPV vaccine effectiveness or additional doctor's recommendation) had affected HPV-vaccine related perceptions. Previous studies that manipulated information about HPV also showed that tailored message framed for specific populations, such as adolescent women or college men, is likely to result in different HPV vaccine acceptability (Nadarzynski et al., 2012; Bonafide, 2015; Dempsey and Zimet, 2015). Therefore, future studies need to examine the impact of individual pieces of information about the compromised HPV vaccine effectiveness, benefits against oncogenic strains and doctor's recommendation on HPV vaccine acceptability and uptake.

The results of the mixed-methods study (Chapter VII) indicate that HCPs knowledge about HPV varied. At the time of the survey, the participants did not have any access to cost-effectiveness analysis or guidelines on targeted MSM-targeted HPV vaccination in the UK. Some reported insufficient medical and epidemiological knowledge about the prevalence of HPV and the incidence of HPV-related diseases in MSM. Hence, the study design would benefit from a standardised summary about HPV, HPV vaccine and MSM. Such information could influence HCPs' perceptions and provide better insight into their views of the need for HPV vaccination in MSM. A measure of HPV knowledge, incorporated in the online survey, would enable a better understanding of attitudes towards targeted vaccination. However, a self-reported measure of HPV knowledge illustrated that half of participant did not feel sufficiently informed about the HPV vaccine for MSM. Hence, future studies need to incorporate specific HPV knowledge scale and inform HCPs about the use and value of the HPV vaccine in MSM before conducting interviews.

8.2.3. Participants

The selection of participants and recruitment methods are likely to affect the overall results and conclusions reported in this doctoral thesis. It is essential that the samples used in this research represent overall trends in views and perspectives of MSM and HCPs in the UK so that the findings could be generalised to these populations. There is a chance that recruited MSM and HCPs may not have represented the views of the majority, in which case the validity of the conclusions would be compromised.

It is difficult to estimate the size of the MSM population in the UK in order to speculate on any potential vaccination uptake or coverage. There are no official statistics of the number of MSM living in the UK or the MSM proportion potentially eligible for HPV vaccination. Several estimates, reported in section 1.8, suggest that between 1.1% and 2.4% of the population are self-declared MSM, but these conclusions were drawn from studies that used convenience sampling. The inability to estimate the exact proportion and characteristics of MSM will remain an important challenge in MSM-targeted HPV vaccination, because there is little knowledge about the proportion of MSM who do not disclose any information related to their same-sex experiences. Prah et al. (2016) compared MSM that took part in a population-based third National Survey of Sexual Attitudes and Lifestyles (Natsal-3) with MSM of similar age from three convenience surveys. They showed that MSM in convenience surveys were younger, better educated, more likely to identify as gay and had

higher number of sexual partners. Also, they were more likely to report engaging in unprotected anal intercourse, being diagnosed with gonorrhea and utilising HIV testing. As such, the representativeness of the samples in this thesis could be only discussed in relation to other samples of MSM reported in various studies.

The qualitative study used specific sampling in relation to participants' age and HIV status to establish views on HPV and HPV vaccination. Such sampling was set because younger MSM at the beginning of their sexual activity and those who have acquired HIV would be most relevant in MSM-targeted HPV vaccination. As such, the average age of participants was 25 years and one focus group consisted of HIV positive men. However, the men were recruited from Brighton and Hove, which is historically known to attract sexual minorities wishing to express their sexual identities and desires (Brown et al., 2011). The city has been named "Britain's number one gay resort" due to local communities and services, which embrace sexual diversity. An official estimate of LGBT residents in Brighton and Hove is around 11-15%, which is significantly higher than the national average (Brown et al., 2008). Eighty-seven percent of MSM in the sample had already disclosed their sexual orientation to HCPs, which is higher than in other studies conducted on MSM estimating it at 40% (King et al. 2015; Metcalfe et al., 2015). However, the majority of participants in the qualitative study were not aware of HPV and the HPV vaccine, despite the access to various health-related resources in Brighton and Hove. Therefore, their reactions to novel information about HPV are likely to represent general perspectives and experiences of HPV-related diseases amongst MSM in the UK.

The quantitative study, which used UK-wide Facebook advertisement services, is likely to represent the population of young MSM that utilise digital media. The Facebook advertisement was set to show the study advert to men who publically disclosed in their profile that they were interested in other men. This information was used as an indicator of sexual interest, attraction or orientation. It is currently impossible to estimate the proportion of heterosexual men who disclose their interest in other men on Facebook and the proportion of MSM who do not wish to disclose their sexual orientation online. As such, there is a possibility of self-selection bias, if only men who feel comfortable in disclosing their sexual orientation took part in the survey. However, with the large popularity of Facebook, Lorimer et al. (2015) argued that over 90% of MSM aged 18-25 years are frequent Facebook users. Also, men can develop multiple Facebook accounts, to serve different purposes such as to

access sexual networks, and might be more willing to disclose sexual orientation in their ‘unofficial and gay’ profile.

The comparison of characteristics between MSM in the sample reported in chapter VII and other studies indicate significant similarities. In my sample, 87% of men were residents in England and 8% in Scotland and 4% in Wales and also 8% identified as non-white. Also, 32% reported not receiving an HIV test and 53% received an HIV test in the last 12 months. These proportions are comparable with the sample in the EMIS study, suggesting that the composition of the sample in terms of geographical distribution, ethnicity and HIV testing is likely to represent MSM population. However, my study reported lower levels of men, who were born outside of the UK, who identify as bisexual and who were HIV-positive than the EMIS study and the online study reported by Lorimer et al. (2015). Examining other variables, such as the size of the participant city/town they resident, educational levels and the number of sexual partners, I speculate that in comparison to other surveys, the sample in this thesis had a relatively higher proportion of men who were at the beginning of their sexual activity. As a consequence, the perceptive and views of men in my study might be more relevant to an MSM-targeted HPV vaccination programme.

The mixed-methods study on views of HCPs achieved a representative sample. The sample size and composition are comparable to the study on HCPs’ views on pre-exposure prophylaxis against HIV (Desai et al., 2018). However, the study advert specified that the survey was about the value of HPV vaccination in men and there is a risk of bias if only HCPs with strong views on HPV vaccination expressed their opinion. Also, perspectives of general practitioners who could potentially be involved in HPV vaccination of MSM in primary care were not explored. Future studies that monitor the level of support for MSM-targeted HPV vaccination need to recruit HCPs from various healthcare settings and advertise the study as an assessment of views on MSM vaccination, incorporating questions about the Hepatitis A-B and HPV vaccines.

8.2.4. Reliability and validity of measures

The selection of measures, their reliability and validity, are likely to affect the results and the interpretation of findings in this thesis. All variables either were selected from relevant studies in MSM or were designed specifically for the study based on previous research. The main limitation in studies on HPV vaccination is a lack of standardised measurement that

could reliably predict the uptake rate of the HPV vaccine in MSM. The tool developed specifically for this research (Chapter VI), was based on the findings of the systematic review (Chapter IV) and the qualitative study with MSM (Chapter V). Despite achieving excellent internal consistency, the predictive ability of the measurement is yet to be established. Similarly, Cronbach's alphas were calculated for all psychological variables, indicating that all scales used in this research presented excellent internal consistency.

There is a possibility that a difficulty in recalling information amongst MSM could influence the results of research in this thesis. About a quarter of participants were unsure if they received the HPV and hepatitis A vaccines, suggesting that a significant proportion of MSM had difficulties in remembering their vaccinations status. However, due to the character of this research, it was not feasible to implement objective measurement of immunity to HPV and hepatitis as an indicator of past vaccination. Although the participants had no reason to deceive the researchers about their sexual experiences, previous studies demonstrated social desirability response bias in studies of sexual behaviours amongst MSM (Catania et al., 1990). MSM might underestimate the number of sexual partners or the frequency of sexual intercourse. However, the utilisation of online survey, where men do not have to face the researcher and could complete the questionnaire on their own devices, and the implementation of 'unsure' and 'prefer not to say' response options were to reduce the social desirability and self-reporting bias.

8.2.5. Confounding factors

Several contextual factors could have affected the design and findings of this research. At the beginning of this PhD research programme, none of the countries recommended HPV vaccination in MSM, although it was under consideration in the USA, Australia and Canada. Initially, HCPs were concerned that female HPV vaccination programme was not benefiting MSM and data were emerging that this population is at higher risk of anal cancer. Early editorials and letters to scientific journals started to emerge expressing a need for HPV vaccination programmes for MSM (Lawton et al., 2013). However, after the provision of gender-neutral HPV vaccination in Australia and the USA, several clinicians and researchers argued to replace intentions to introduce MSM-targeted HPV vaccination for more desired gender-neutral strategy (Prue, 2015; Baker, 2016), without any evidence of cost-effectiveness. This lobbying of several interest groups could have influenced opinions of HCPs, notably sexual health doctors in the UK, where MSM-targeted HPV vaccination was

initially anticipated. Thus, this change in the global approach to gender-neutral HPV vaccination could have influenced the media coverage, public opinion and professional recommendations.

The provision of parallel preventative programmes tailored to MSM in the UK could have influenced MSM and HCPs perspectives on HPV vaccination. In parallel to the research on HPV vaccination, UK health authorities have considered the introduction of pre-exposure prophylaxis against HIV (PrEP) for MSM (Jim, 2016). One tablet of Truvada per day (a standard component of antiretroviral therapy) has been shown to be effective in preventing HIV infection in high-risk MSM (McCormack et al., 2016). The consideration of PrEP for MSM in the UK could have affected the perceived importance of MSM-targeted HPV vaccination if some HCPs and policy-makers regarded these interventions as financially competing. While there has been a large interest of MSM in PrEP, comparable enthusiasm for the HPV vaccine was not noted (Frankis et al., 2016). Thus, it is possible that the desirability of HPV vaccination is inferior to PrEP resulting in changes of attitudes and perceptions since the studies were initially conducted.

8.2.6. Research and researcher effect

Conducting research on HPV vaccination could have affected participants' responses and the results. Most MSM either had never heard or had poor knowledge of HPV and the participation in research could have prompted them to consider HPV vaccination. The exposure to questions about HPV and the HPV vaccine per se might have influenced participants' beliefs and perceptions if they believed the research topic was of value worth investigating itself. The provision of information about HPV during focus groups and the online survey could have influenced participants to perceive the HPV vaccine as valuable and worthwhile. It is possible that discussions allowed participants to explore their concerns in more depth than during a routine visit to their primary care or sexual health clinic. Thus, the ecological validity of the findings could be affected by participation in the study. In the 'real life scenario', while facing an HCP, MSM might want to express other concerns or questions about the HPV infection and the vaccine. However, that would require a design of a feasibility study that would take place at an SHC involving HCPs.

It is possible that my characteristics could have affected the results reported in this thesis. Firstly, there is a chance, that as a non-native English speaker, I might not have captured the

subtle language differences in responses to my questions during focus groups of interviews, which could also be reflected in the qualitative analyses. However, the results of the analyses were validated independently by two researchers and consulted with a third researcher in cases of conflict and discrepancy. This practice was set to increase the validity of findings and reduce potential bias due to any language barrier. Secondly, my sexual orientation could have influenced my pre-existing perceptions about sexual health and vaccination services for MSM. The American Psychological Association (APA) emphasises a need to avoid a heterosexist bias in psychological research, by implementing various strategies that would recognise and validate behaviours and lifestyles of MSM (Herek et al., 1991). Throughout my research, I have incorporated appropriate sampling methods, operationalisation of variables, data collection and analysis methods that would not be contaminated by a heterosexist bias, wanting to reflect authentic views and beliefs of MSM in the UK. In addition, in their nature, qualitative analyses are subjective and my knowledge about HPV and the HPV vaccine could have influenced my analysis. For example, the results of the systematic review on HPV vaccine acceptability (Chapter IV) might have influenced the way I interpreted participants' responses. Although this is a significant risk, the results were validated independently by two researchers, whose research interest is not in HPV vaccination and therefore their analysis would not be contaminated by their pre-existing knowledge.

8.3. Implications of findings

8.3.1. Theoretical implications

The research conducted in this thesis facilitates a better understanding of vaccination behaviours amongst MSM. It identifies substantial discrepancies in the measurement of vaccine acceptability, represented by various constructs such as willingness, the self-assessed probability of obtaining the vaccination and self-reported vaccination status. Thus, there is a need for a more precise definition of vaccination behaviours.

Figure 19 outlines the proposed framework of barriers and facilitators to vaccination amongst MSM. The two reviews of studies on hepatitis and HPV vaccine acceptability and uptake showed three distinct behavioural categories, which can be divided into motivation for vaccination, vaccine initiation and vaccine completion. The motivation for vaccination refers to drives, desires, cognitive and affective representations that lead to potential vaccine uptake. It is a theoretical construct, which can be portrayed by the measures of willingness,

intentions, desires, attitudes or hesitancy. Thus, while acceptability indicates MSM willingness to comply with doctor's recommendation to vaccinate, motivation, in general, describes MSM willingness to obtain and/or accept the vaccine. Unlike adolescent vaccination at school, MSM motivation for vaccination is likely to play an important role in achieving optimal uptake. Hence, this construct requires a more precise operational definition that can illustrate the relationship between various motivational variables such as intentions and the self-assessed probability of being vaccinated. In addition, vaccine initiation and vaccine completion are two behavioural constructs that refer to the actual start and finish of vaccination series. Clear differentiation between constructs is required as not all men that are motivated would initiate vaccination and then a smaller proportion is likely to complete the prescribed course. Future studies on vaccination in MSM should clarify which of these three constructs are measured, with vaccine completion representing the most desirable outcome.

In response to the lack of a standardised measure of HPV vaccine acceptability, the research in this thesis offers a 7-item scale relevant to specific MSM-targeted vaccination programmes. It incorporated behavioural steps, such as the willingness to seek information about HPV, access sexual health services, disclose sexual orientation to an HCP and complete the 3-dose HPV vaccination course, which are necessary for successful vaccination. The scale, which has excellent internal consistency ($\alpha = 0.90$), enables the identification of MSM who despite their willingness to accept the vaccine may experience significant barriers to vaccinations. Acceptability measures, which are based on 1-item, might not adequately represent specific actions that are required for vaccine initiation. Thus, my proposed measurement of HPV vaccine acceptability for MSM is more sensitive to detect the difference between MSM who would accept the offer to be vaccinated and those who would be motivated to seek the vaccination themselves.

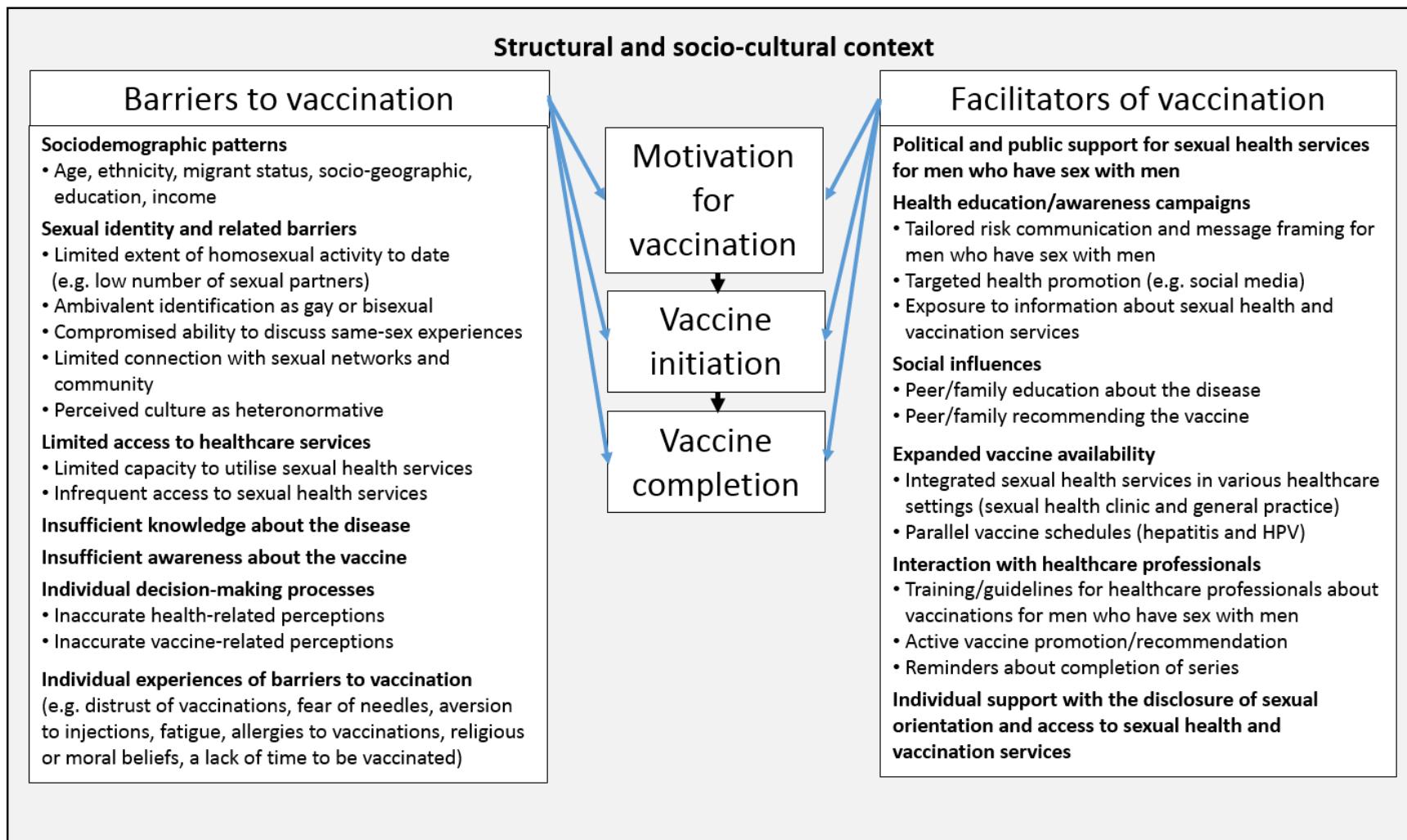


Figure 19. A model of barriers and facilitators to vaccination for men who have sex with men

The findings described in this thesis have implications for theory in behavioural medicine and health psychology. Although the overview of theoretical constructs associated with vaccination behaviours in Chapter II (the Health Belief Model; the Theory of Planned Behaviour; Vaccine Perceptions, Accountability and Adherence Model; and the Model of Vaccine Hesitancy) showed a number of important constructs, their applicability to specific MSM vaccination was poorly understood. As such, I have attempted to use ‘a bottom-up approach’ to review studies on vaccination behaviours in MSM in order to identify essential factors associated with vaccine acceptability and uptake. The results showed consistently that access to sexual health services, the disclosure of sexual orientation, HCPs’ recommendation to vaccinate, HPV knowledge and the perceptions of risk, vaccine effectiveness, benefits and barriers are associated with HPV vaccine acceptability, motivation and uptake. As such, future research needs to acknowledge the influence of these specific behavioural and psychological factors when assessing HPV vaccine uptake in MSM.

The model of barriers and facilitators to vaccination for MSM incorporates the results of research in this thesis. It proposes a set of seven specific obstacles to achieving high uptake of any vaccination for MSM. Particular sociodemographic patterns, such as younger or much older MSM or those living in rural areas, are associated with vaccine acceptability and uptake. These patterns are likely to represent a variability of experiences with sexual networks, communities and healthcare services. Same-sex experience, the construction of sexual identity and increased access to sexual networks may be positively associated with utilisation of MSM-specific sexual health services and the readiness to disclose sexual orientation to HCPs. In other words, men who are at the beginning of their sexual activity, who have difficulties accepting their sexual orientations or who perceive their environment and culture in a heteronormative fashion may be less willing to declare any interest in vaccinations for MSM. In consequence, if HCPs are unable to identify men who are eligible for vaccination due to their same-sex experiences, they would not consider offering the vaccine. Regardless of sexual identity, MSM who have limited access to sexual health services due to distance, the lack of resources to commute and specific attitudes towards particular SHCs are less likely to receive vaccinations. Knowledge about the disease and the vaccine as well as individual decision-making processes are key to HPV vaccine acceptability and uptake. If men are not aware of HPV, they will be less likely to adopt protective behaviours such as vaccination. Also, various perceptions, notably perceptions of risk, vaccine effectiveness in sexually active men and perceived barriers, are likely to

influence motivation to initiate and complete the vaccination course. Men, who do not see themselves at risk of HPV, fail to acknowledge HPV vaccine benefits and perceive multiple barriers to obtaining the vaccine would be less willing to receive it. However, individual barriers to vaccination, such as allergies, fear of needles or lack of time may also affect the ability to receive the vaccine.

My model also proposes six potential enablers to the introduction of MSM-targeted HPV vaccination (Figure 19). HCPs, who took part in telephone interviews, argued that the limited political and public support for targeted vaccination programmes are likely to impede their success. If the public perceives benefits of vaccinating MSM and considers this strategy as valuable and effective, this may encourage the public to promote the vaccine and boost acceptability and uptake rates. Health education and awareness campaigns, which tailored their messaging to specific MSM groups such as teenage MSM, HIV-positive men, are likely to increase HPV vaccine acceptability. The review of hepatitis vaccination behaviours (Chapter III) and the qualitative study with MSM (Chapter V) have suggested that increased exposure to information about sexual health may improve knowledge about STIs and influence motivation for vaccinations. It was suggested that young MSM are likely to respond to health education delivered through web-based and mobile phone applications as well as various digital media. My study recruitment (Chapter VI), which utilised Facebook advertisement, yielded responses from teenage MSM with a low number of sexual partners, who would benefit most from HPV vaccination. Thus, digital health promotion needs to be considered for this particular population. In addition, family and peer education may play a major role in HPV vaccine acceptability. Women, who have already received HPV vaccination, may provide information about the virus and encourage their MSM friends to utilise HPV vaccination. The incorporation of MSM-specific sex education at school was noted by several participants in the qualitative study. Limited access to healthcare services was reported as a major barrier to HPV vaccination, with several men expressing a wish for the vaccine to be available through primary care services. Also, three-quarters of HCPs believed that the HPV vaccine should be offered to alternative services such as GP practices and pharmacies. Hence, the expansion of HPV vaccination beyond the SHCs is likely to increase the coverage, especially amongst MSM, who are unable to access specialist sexual health services. Also, combining HPV and hepatitis vaccinations together may increase individual motivation for vaccinations. The findings showed that doctor's recommendation is a significant predictor of HPV vaccine acceptability and uptake. Thus, the provision of

guidelines for HPV vaccination in MSM and parallel investment in advice and education of HCPs would increase their support for MSM-targeted HPV vaccination. In consequence, more HCPs are likely to promote the vaccine to their MSM patients and provide reminders about completing the series. HCPs need to be mindful of particular needs of MSM in relation to confidentiality, openness and a non-discriminatory approach. Finally, in response to individual experiences of barriers, some MSM may benefit from individual support with the disclosure of sexual orientation and access to sexual health services. This support could be offered by various stakeholders such as teachers, third sector organisations for LGBT and outreach health workers.

Unlike other vaccination models, this framework is grounded in evidence within this thesis and is mostly relevant to MSM population in the UK. These barriers and facilitators depend on specific structural and socio-cultural contexts. For example, the structure of the National Health Service, the effectiveness of female-oriented HPV vaccination and the characteristics of the MSM population within each country of geographical location are likely to affect these barriers. MSM in the USA, where the HPV vaccine is recommended for men up to the age of 26 years only and is not covered by all health insurance providers, are likely to face other barriers such as the personal cost of the vaccine or the age-dependant availability. Similarly, MSM in China, where same-sex behaviours are stigmatised, may present more barriers related to sexual identity than MSM in the UK (Zou et al., 2015). Therefore, although the proposed model recognises key factors associated with vaccination behaviours in MSM that are universal, it recognises variations in historical, cultural and political contexts that affect these behaviours.

The findings reported in this thesis would have implications for any MSM-targeted prevention programmes against STIs. Although the research was conducted in the context of HPV vaccination, its results would also apply to hepatitis A-B immunization programmes. Gottlieb et al. (2016) demonstrated that future vaccines against HIV, herpes, chlamydia and gonorrhoea would most likely be targeting MSM due to their increased risk of these STIs. Hence, the proposed model of barriers and facilitators to vaccination in MSM could be utilised for vaccination programmes that use multiple vaccine types.

8.3.2. Implications for policy and practice

The results reported in this doctoral thesis could inform the development of MSM-targeted vaccination programmes. The findings show that both MSM and HCPs have insufficient knowledge about HPV and the HPV vaccine. MSM's beliefs and attitudes towards HPV vaccination are not adequate as many reported misconceptions and ambiguities regarding both their risk of HPV and vaccine effectiveness. In order to achieve optimal uptake, MSM need to be informed about HPV-related diseases and the availability of the HPV vaccine that is capable of preventing genital warts and anal cancer. Health education could utilise tailored message framing focusing on visual aspects of genital warts or higher susceptibility to anal cancer amongst HIV-positive men. Information about HPV and MSM, incorporated in the various educational intervention at school and community settings, and delivered through various digital media, is likely to increase MSM knowledge about HPV and increase HPV vaccine acceptability. Subsequently, the provision of specialist guidelines for HCPs about HPV prevention in MSM is urgently required to standardise HPV vaccination practise throughout the country. There are substantial disparities in attitudes towards vaccinations in sexual health settings but the endorsement of official HPV vaccination recommendation in the UK, for example through the development of BASHH guidelines, will standardise HPV vaccination practices. The provision of guidelines and cost-effectiveness evidence will increase support for this vaccination strategy and ensure equitable access to HPV vaccination.

The findings will also affect the design of interventions aimed at increasing uptake and coverage of HPV and hepatitis vaccination in MSM. My research shows that about a half of men had not utilised services at SHCs. The 2008 UK Gay Men's Sex Survey found that 28% of MSM had never had an HIV test (Reid et al., 2006). The findings of the EMIS survey from 2010 showed that 30% of 15,456 MSM sample in England have never tested for sexually transmitted infections (Weatherburn et al., 2013). More recent surveys in England and Scotland indicated that a fifth of MSM have never received an HIV test (Flowers et al., 2010; Bailey et al., 2008). Also, amongst men that reported receiving an HIV test, only 77% tested in GUM or sexual health clinics, and 27% used other settings or screening methods (e.g. GP surgeries, private clinics or home testing kits)(Reid et al., 2006). Therefore, targeted HPV vaccination delivered via GUM clinics alone will miss a substantial proportion of MSM who do not utilise GUM clinics. Expanding HPV vaccination to other services such as GP

practices, HIV or gay organisations and pharmacies would be needed to increase HPV vaccination uptake in this population.

My systematic review also found that a significant proportion of MSM do not reveal their sexuality to healthcare professionals and about a quarter of my participants had not disclosed their sexual orientation to HCPs. In one community-based Canadian study, 22% of MSM were not willing to disclose same-sex practices to their doctors and one Australian study showed that about 10% of MSM would not be willing to disclose their sexual orientation when the HPV vaccine was offered (Simatherai et al., 2009; Rank et al. 2012). Data from the US demonstrated that only 5% of eligible MSM aged 16-26 years received the HPV vaccination in 2011. Men who do not utilise sexual health services have never received hepatitis vaccination and do not feel comfortable discussing their sexuality are less likely to receive HPV vaccination. Therefore, MSM-targeted HPV vaccination might not be able to reach MSM that do not identify as gay or bisexual or are unwilling to discuss their sexuality openly. If doctors are unaware of their patients' same-sex sexual practices, they are less likely to offer HPV vaccine. MSM, who access various community resources, such as third sector organisations, online networking groups and commercial dating applications, need to be supported with their capability to discuss sexual health matters in professional settings. Alternatively, extending the vaccination to all men at sexual health settings could include undisclosed MSM and facilitate the reduction of HPV in high-risk men.

Despite high HPV vaccine acceptability rate, only half reported to be motivated to seek the vaccine. While 89% of MSM would be willing to accept the HPV vaccine if a doctor offered it, only 55% would be willing to ask about it. There is a substantial discrepancy between active vaccination seeking behaviours and passive compliance. The findings in this study showed that MSM who perceived more barriers to HPV vaccination and who believed it was not effective for sexually active men were less likely to accept it. In addition, self-reported hepatitis vaccination status indicated that only half of MSM received the hepatitis B vaccine. The information about HPV risk in MSM and the availability of the HPV vaccine increase HPV vaccine acceptability. Thus, interventions promoting HPV vaccination to MSM are needed to increase uptake. Health campaigns aiming to raise awareness about HPV and motivation towards HPV vaccination, possibly delivered by third sector organisations such as Terrence Higgins Trust, are likely to increase HPV vaccine acceptability and uptake in the UK.

Targeted HPV vaccination for MSM may have similar completion rates as targeted hepatitis A-B vaccination delivered through GUM clinics. The findings in the study showed that 85% of MSM would be willing to receive three injections over six months. However, self-reported measures of hepatitis B vaccination indicated that while 57% received the first dose only 49% completed the three-injection course. According to the Public Health England data (2003-2006) hepatitis B vaccination, there was 90% coverage of the first dose but only 44% completion rate of all three injections (Brown et al., 2006). Thus, a consideration of vaccination programmes, which combine schedules of HPV and Hepatitis A-B vaccines, may increase the perceived desirability of these vaccines and increase uptake. Harte et al., (2011) demonstrated that a recall, where patients were contacted via phone, for bacterial STI screening in MSM is feasible, with 68% attending screening after three months. However, Burton et al. (2013) showed that the rates of attendance for repeat STI testing following short message service (SMS) text-based reminders were not significantly different to those who did not receive reminders, suggesting that SMS-based reminders are unlikely to increase the re-attendance rate. Thus, there is a need for research into a reliable notification mechanism, in which participants could be informed, for example via text, email or a phone call, about their appointments to complete remaining vaccination doses.

8.4. Future research

The three studies in the thesis provide an overview of HPV vaccine acceptability amongst MSM, but a number of important questions remain unanswered. Characteristics and behaviours of MSM in the UK need to be established in order to have a holistic understanding of the population. A systemic review of studies that examined demographic characteristics of MSM in the UK could increase the precision of estimating the uptake of HPV vaccination or the representativeness of studies that use convenience sampling in the UK. This will allow a better understanding of MSM who do not identify as gay or bisexual, and those that do not access sexual health services. In addition, a meta-analysis of studies on hepatitis, HPV and potential HIV vaccination could enhance the knowledge on factors associated with vaccination behaviours amongst MSM. Although studies on HIV vaccination were excluded in this thesis, because they were highly hypothetical, the analysis of latent constructs in light of MSM-targeted vaccination could enhance the validity of the model of barriers and facilitators to vaccination in MSM. Future studies need to examine reasons for reduced access to sexual health services and the lack of openness about sexual orientation

amongst MSM as these two variables are correlated with HPV vaccine acceptability. Additional qualitative studies specifically with young MSM who have not utilised sexual health services and those who have not disclosed their sexual orientation would facilitate a better understanding of barriers to vaccinations. The Joint Committee on Vaccination and Immunisation has considered engaging primary care settings to offer HPV vaccination to MSM. Matcalfe et al. (2016) demonstrated that only 40% of MSM in the UK believed that staff of the general practice they were registered with, was aware of their sexual orientation. About 75% stated that the reasons why they did not disclose their sexuality were mainly due to the lack of opportunity and relevance for their healthcare. Thus, it is essential to examine whether MSM would find primary care settings such as general practice or pharmacies as suitable, acceptable and relevant for HPV vaccination as sexual health settings.

There is a need for further monitoring of HPV vaccine acceptability. The research in this thesis used HPV vaccine acceptability measure as a proxy of potential HPV uptake. However, it is important to examine if the identified correlates of HPV vaccine acceptability also predict uptake rates. Future studies need to use vaccine initiation and completions rates to determine the characteristics of MSM that may have difficulties finishing the three-dose vaccination course. The HPV vaccine acceptability requires validation in order to identify its predictive properties. In addition, the vaccination practices and attitudes of HCPs towards MSM-targeted HPV vaccination need to be monitored to determine if the introduction of guidelines increase the level of support for this intervention. If the level of support is not sufficient and HCPs are hesitant to recommend the vaccine to their MSM service users, the MSM-targeted HPV vaccination programme is unlikely to be successful. HCPs' concerns about male HPV vaccination should be reassessed after the JCVI's provision of expert opinion regarding the gender-neutral HPV vaccination in the UK. JCVI's position on gender-neutral vaccination would have an influence on the level of support for MSM-targeted HPV vaccination. Also, the attitudes of the general public regarding HPV vaccination for MSM need to be explored to investigate the impact of this strategy of female HPV vaccination. There is no data on the influence of HPV vaccination for MSM on the rates of HPV vaccination in adolescent women. There is a possibility that vaccination of MSM could either increase or decrease HPV vaccination uptake in women. Thus, this potential effect needs to be assessed in future research projects on HPV vaccination.

The results of this research would have implications for other vaccinations and sexual health services. Gottlieb et al. (2016) argued that the advancing developments of vaccines against herpes, gonorrhoea and hepatitis C could result in additional vaccination programmes for MSM. Future research should establish if the proposed model of barriers and facilitators to vaccination for MSM could be transferable to other vaccinations against STIs. Also, several components of the model could be applied more broadly to study the barriers to uptake of STI screening amongst MSM. Additional studies could investigate if similar demographic patterns, factors associated with sexual identity, restricted access to sexual health services, knowledge about STIs and decision-making processes are related to STIs screening uptake. A model of barriers to access to sexual health services amongst MSM would facilitate a better understanding of factors related to the uptake of testing and vaccination in this vulnerable population.

8.5. Final remarks

The introduction of a targeted HPV vaccination programme for MSM in the UK would face significant challenges. The majority of MSM are not aware of HPV and its role in the development of genital warts and anal cancer. Most MSM do not know about the HPV vaccine and that it could prevent HPV-related diseases. This research has shown that, despite little knowledge about HPV, MSM have positive attitudes towards vaccines against STIs and they would accept the HPV vaccine if a HCP offered it. However, the measures of self-reported hepatitis A and B vaccinations and the motivation for HPV vaccination revealed that only about a half of young MSM would ask about vaccinations. Specific demographic patterns represented by age, socio-geographic location and ethnicity are associated with HPV vaccine acceptability. MSM with narrow access to sexual networks, who were at the beginning of their sexual activity are less likely to access sexual health services and disclose their sexual orientation to HCPs. This restricted access to sexual health and vaccination services for MSM is associated with lower HPV vaccine acceptability. In addition, several psychological factors such as the perceptions of HPV risk and severity, benefits and effectiveness of the vaccine or barriers to vaccination are associated with MSM willingness to receive the vaccine. In addition, a fifth of HCPs were not supportive to recommend MSM-targeted HPV vaccination for MSM, believing that despite their high risk of HPV-related diseases, a gender-neutral strategy would be more suitable. Thus, the policy-makers responsible for the development of the targeted programme need to address these barriers in order to achieve optimal uptake.

There is a need for health education programmes that would inform MSM about the risk of HPV-related diseases and the availability of effective vaccine. Similarly, HCPs need to receive official guidelines on HPV vaccination for MSM, specifying the targeted groups, methods of delivery, cost-effectiveness and funding sources. An additional training of HPV vaccination and MSM that would enable the identification of young MSM that are most relevant to the programme is required. In order to reach young MSM, at the beginning of their sexual activity, who might have poor access to sexual health services or are unwilling to disclose their sexual orientation in SHCs, an expansion of vaccine availability to primary care settings is essential. There is also need to support MSM to utilise sexual health clinics as an ‘STI prevention centre’ rather than an ‘STI diagnosis and treatment clinic’. Young men need to be taught that SHCs could be utilised for vaccinations against hepatitis A, hepatitis B and HPV. Finally, political and public support for sexual health services for MSM, notably HPV vaccination, is needed to encourage MSM to utilise these settings, but also to receive encouragement to receive the vaccine from their family and peers.

My answer to the vital research question, specified at the start of this doctoral thesis, is that a targeted HPV vaccination programme in MSM is feasible and acceptable in the UK. It may utilise existing infrastructure for hepatitis vaccinations at SHCs. Over 80% of MSM would be willing to receive the vaccine and at least 65% of HCPs would recommend the vaccine to their MSM service users. However, without further interventions to increase uptake in MSM and the support towards MSM-targeted HPV vaccination amongst HCPs, this strategy is unlikely to archive the required coverage to be deemed cost-effective.

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Appendix A - Publication: “Sexual healthcare professionals’ views on HPV vaccination for men in the UK.”



Sexual healthcare professionals’ views on HPV vaccination for men in the UK

Tom Nadarzynski^{*1}, Helen E Smith¹, Daniel Richardson², Elizabeth Ford¹ and Carrie D Llewellyn¹

¹Brighton and Sussex Medical School, Room 323, Mayfield House, Brighton BN1 9PH, UK and ²Brighton and Sussex University NHS Trust, Claude Nicol Centre, Royal Sussex County Hospital, Eastern Road, Brighton BN2 5BE, UK

Background: Human Papillomavirus (HPV) vaccination for men could prevent anal cancers amongst men who have sex with men (MSM).

Methods: An e-survey of attitudes towards vaccination for men in the UK was conducted in July–August 2014.

Results: Among 325 sexual health professionals, 14% were already vaccinating men against HPV, 83% recommended gender-neutral HPV vaccination and 65% recommended targeting MSM. Over 50% reported having poor knowledge about the use of HPV vaccine for MSM and the skills to identify MSM likely to benefit from HPV vaccination.

Conclusions: Clear advice and guidelines on HPV vaccine use for men at sexual health clinics are required to ensure equitable opportunities for vaccination.

Although all men are susceptible to Human Papillomavirus (HPV) infection, men who have sex with men (MSM) are at higher risk of HPV-related recurrent genital warts and anal cancers (Machalek *et al.*, 2012). The reasons for this are multifactorial including, higher HPV-infection rates among MSM, lack of protection from female HPV vaccination as well higher incidence of HIV infection in MSM. HIV infection is strongly associated with persistence of HPV and HIV-infected MSM are disproportionately affected with HPV-associated anal cancer (Chow *et al.*, 2014). In the UK, the Joint Committee on Vaccination and Immunisation (JCVI) is currently evaluating both a gender-neutral HPV vaccination, including all school-aged boys, and targeted HPV vaccination catch-up programmes for high-risk men such as adult MSM to reduce the HPV-related morbidity (Joint Committee on Vaccination and Immunisation (JCVI) [England], 2014). These two strategies are not mutually exclusive and while a gender-neutral strategy would emulate the existing school-age female HPV vaccination programme, the feasibility and acceptability of a targeted HPV vaccination programme for MSM is yet to be established.

Sexual health clinics have been proposed as a potential setting to offer MSM-targeted HPV vaccination because of their existing and related functions, such as screening for sexually transmitted infections and provision of hepatitis vaccination to MSM. Consequently, there is a need to examine the views on HPV vaccination for MSM amongst sexual healthcare professionals (SHCPs) to measure

the potential support for an MSM-targeted HPV vaccination programme. Unlike gender-neutral vaccination in schools, a targeted strategy would require high acceptability rates from both MSM and vaccination providers in order to achieve optimal uptake.

In the US, where MSM below the age of 26 years are eligible for HPV vaccination, the strength of doctors' recommendation is a predictor of HPV vaccine uptake. MSM who believed their doctor would recommend HPV vaccination were ~13 times more likely to accept it (Reiter *et al.*, 2010). Similarly, 80% of MSM at a sexual health clinic reported doctor's recommendation as a reason for accepting HPV vaccination (Thomas and Goldstone, 2011). Therefore, we wished to explore the recommendations and attitudes towards HPV vaccination for men among SHCPs in the UK to assess potential acceptability and identify barriers towards HPV vaccination for MSM.

MATERIALS AND METHODS

An e-survey, containing six demographic questions and 18 attitudinal statements about the use and value of HPV vaccination in men, was conducted during July and August 2014. Participants' agreement with each attitudinal statement was measured using a five-item Likert scale ('strongly disagree' to 'strongly agree'). The statements were adapted from previous studies examining

*Correspondence: T Nadarzynski; E-mail: t.nadarzynski@bsms.ac.uk

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attitudes of health professionals towards HPV vaccination (Riedesel *et al*, 2005; Hopkins and Wood, 2013), and were further modified after piloting the survey for usability and functionality.

A search of online resources and the databases of three professional organisations (British Association of Sexual Health and HIV, Society of Sexual Health Advisors, National HIV Nurses Association) was undertaken to identify email addresses of UK-based sexual health workers (i.e., consultants, nurses, health advisors). A total of 344 addresses were identified and used to circulate an invitation to participate in the e-survey. Recipients were also asked to distribute the e-survey link to co-workers in their departments. In addition, the invitation to participate was distributed through the professional newsletters of each organisation. No incentive was offered for completion.

Descriptive statistics were used for demographic and attitudinal data. Multiple ordinal regressions tested associations between demographic and attitudinal variables (missing values did not exceed 2.5% of all responses). Two-tailed Spearman's rank tests were used to examine the relationship between attitudinal variables and the willingness to recommend gender-neutral or MSM-targeted HPV vaccination strategies.

RESULTS

A total of 325 SHCPs responded (70% females, 46% doctors – Supplementary Table A). The modal year of gaining clinical qualification was 1993 (s.d.: 9.7). Although respondents came mainly from the South East of England, the sample was geographically dispersed. About 75% practised in sexual health clinics where more than 10% of service users were MSM. Approximately 14% of respondents reported already vaccinating men against HPV without prior recommendations.

Although 84% agreed to recommend gender-neutral HPV vaccination programme, regardless of sexual orientation, 65% were supportive of MSM-targeted HPV vaccination (Table 1). Approximately 17% expressed a lack of favour towards MSM-targeted HPV vaccination strategy. The recommendation of gender-neutral programme was associated with the attitude that HPV vaccination of heterosexual men is valuable and worthwhile (Supplementary Tables B and C). SHCPs that serve a largely heterosexual population were more at 2.55 odds to recommend gender-neutral HPV vaccination (CI: 1.08–6.04). The recommendation of MSM-targeted HPV vaccination was associated with the attitude that MSM would not benefit from female HPV vaccination ($r = -0.30$, $P < 0.002$) and that targeted HPV vaccination would encourage MSM to engage with sexual health clinics ($r = 0.26$, $P < 0.002$). Most respondents were unsure whether other healthcare professionals would recommend the vaccine to MSM.

When respondents were asked to indicate their views on potential MSM-targeted HPV vaccination programmes, about 75% agreed that MSM would accept HPV vaccine, that HPV vaccination should be offered at no patient cost, and be available in alternative settings, such as GP practices or pharmacists. Approximately half of the respondents agreed that an HPV vaccination programme needs to be available to all MSM, regardless of their age, and not subject to assessment based on individual susceptibility. About 17% agreed that HPV vaccination would not be effective in sexually active MSM and 3% thought that targeted HPV vaccination could lead to unsafe sex. Interestingly, 32% reported having insufficient knowledge about the HPV vaccination for MSM and 22% reported a lack of skills to identify MSM potentially eligible for HPV vaccination.

SHCPs who were already vaccinating men against HPV were at 0.34 odds to disagree that MSM are not at risk of HPV-related cancers and that MSM-targeted HPV vaccination is worthwhile (CI: 0.20–0.70). These health professionals also perceived

Table 1. The proportion of attitudes towards HPV vaccination in men amongst sexual healthcare professionals

Statement	Strongly agree and agree	Neutral	Strongly disagree and disagree
Vaccination programme recommendation			
I would recommend HPV vaccination of all men, regardless of their sexual orientation	271 (84%)	26 (8%)	25 (8%)
I would recommend targeting MSM to be vaccinated against HPV	207 (65%)	60 (18%)	53 (17%)
Other healthcare professionals would not recommend HPV vaccination to MSM	81 (25%)	149 (45%)	94 (30%)
Perceived population at risk			
Vaccinating females against HPV will reduce HPV-related cancers in heterosexual men	271 (84%)	38 (11%)	15 (5%)
Vaccinating females against HPV will reduce HPV-related cancers in MSM	47 (15%)	66 (20%)	210 (65%)
Perceived value			
HPV causes too few cancers among heterosexual men to make it worthwhile to offer vaccination	27 (8%)	66 (21%)	230 (71%)
HPV causes too few cancers among MSM to make it worthwhile to offer vaccination	7 (3%)	27 (8%)	285 (89%)
HPV causes too few cancers among HIV-positive MSM to make it worthwhile to offer vaccination	8 (3%)	22 (7%)	290 (90%)
Perceived health behaviours			
The majority of MSM would be willing to receive the HPV vaccine	238 (75%)	75 (23%)	7 (2%)
HPV vaccination would encourage MSM to engage with sexual health services	190 (60%)	97 (30%)	30 (10%)
Vaccinating MSM could increase the likelihood of unsafe sex	14 (5%)	41 (13%)	266 (82%)
Perceived delivery modes			
The patient should cover the vaccine cost	18 (6%)	52 (16%)	252 (78%)
Targeted HPV vaccination should be based on individual assessment of each MSM attending sexual health clinic	85 (26%)	57 (18%)	179 (56%)
HPV vaccination should be offered to MSM in alternative settings such as GP practices or pharmacies	239 (74%)	49 (15%)	34 (11%)
Perceived expediency			
All MSM, regardless of their age, should be offered HPV vaccination	162 (51%)	80 (25%)	77 (24%)
It is too late to vaccinate against HPV if MSM are already sexually active	56 (17%)	77 (24%)	189 (59%)
Perceived capabilities			
I have the skills to identify MSM that would benefit from the HPV vaccine	155 (49%)	95 (29%)	72 (22%)
I feel sufficiently informed about the HPV vaccination for MSM	143 (44%)	76 (24%)	105 (32%)

Abbreviations: HPV = Human Papillomavirus; MSM = men who have sex with men.

themselves to be more knowledgeable about issues related to HPV vaccination and MSM (OR = 8.49, CI: 4.05–15.1). Compared with consultants, nurses were more likely to agree with a MSM-targeted HPV vaccination strategy based on individual assessment (OR = 3.32, CI: 1.69–5.65), despite reporting feeling uninformed about the use of HPV vaccine specifically for MSM.

DISCUSSION

Although the majority of SHCPs support gender-neutral HPV vaccination MSM-targeted HPV vaccination is moderately acceptable. SHCPs perceive a need to protect MSM against HPV-related diseases and some have already been vaccinating high-risk men, despite a lack of policy addressing HPV prevention in MSM. However, the age and the source of funding of vaccine recipients were not defined. Because a fifth of respondents were against an MSM-targeted HPV vaccination strategy, these professionals might be less supportive of offering HPV vaccination to their MSM patients if a catch-up programme was introduced. Moreover, more than half of the respondents perceived a lack of adequate knowledge and skills that would allow them to offer HPV vaccination to MSM. Professionals that have already been vaccinating men against HPV reported having sufficient knowledge about HPV vaccine and positive attitudes towards a targeted HPV vaccination strategy. Similar disparities in healthcare professionals' opinions and concerns about the effectiveness of various vaccination strategies have been reported previously (Hopkins and Wood, 2013; Vadaparampil *et al*, 2014). Thus, in the absence of clear national guidelines on HPV vaccination for men, such variation in attitudes and recommendations is not unexpected.

If MSM-targeted HPV vaccination is recommended in the UK, the motivation of SHCPs will have an important role in achieving the required uptake for an effective vaccination programme (Rosenthal *et al*, 2011). The lack of active promotion of the HPV vaccine to eligible patients, as observed in the US, could diminish uptake and undermine the potential benefits of this strategy. Therefore, it is essential that in parallel to a vaccination strategy there is investment in the production of clear advice, guidelines and education to ensure that all SHCPs offer HPV vaccination to MSM service users.

This is the first UK study to measure healthcare professionals' attitudes towards MSM-targeted HPV vaccination, and has highlighted the importance of examining the motivation of health professionals involved in vaccination delivery to monitor any impact of attitudes and recommendation on vaccine acceptability and uptake. The sample size is substantial and geographically diverse, but the study lacks the perspective of other professionals likely to be involved in targeted HPV vaccination, such as GPs or pharmacists. Due to online recruitment methods, we do not have any assessment of the response rate or the representativeness of the sample. There is also a possibility of bias by self-selection. Participants' research knowledge was not examined. SHCPs attitudes need to be monitored over time to ensure they remain favourable and supportive of the current policies. Future research should identify the barriers and enablers of potential MSM-targeted HPV vaccination and assess the levels of HPV vaccine acceptability among MSM in the UK.

In conclusion, specific national guidelines for SHCPs on the use of HPV vaccine for men in sexual health clinics are urgently needed to standardise HPV vaccination practices and ensure equitable distribution of health promoting services, so that all men at high risk of HPV are offered vaccination that reduces the risk of anal cancer.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

TN, CL, DR and HS designed the study. TN and DR were involved in the recruitment and data collection. TN and EF were involved in data analysis. All authors contributed to the drafting of the manuscript and the approval of the final version.

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Appendix B - Publication: "Human papillomavirus and vaccine-related perceptions among men who have sex with men: a systematic review."

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Review

Human papillomavirus and vaccine-related perceptions among men who have sex with men: a systematic review

Tom Nadarzynski, Helen Smith, Daniel Richardson, Christina J Jones, Carrie D Llewellyn

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Division of Public Health and Primary Care, Brighton and Sussex Medical School, Brighton, UK

Correspondence to
Tom Nadarzynski, Division of Public Health and Primary Care, Brighton and Sussex Medical School, Room 321, Mayfield House, Falmer, Brighton BN1 9PH, UK; t.nadarzynski@bsms.ac.uk

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ABSTRACT

Background Targeted human papillomavirus (HPV) vaccine could prevent HPV-related cancers and genital warts among men who have sex with men (MSM). In order to develop effective vaccination programmes for MSM, it is crucial to understand their knowledge, beliefs about HPV and attitudes towards HPV vaccine.

Methods A systematic search of 10 databases examined articles investigating HPV knowledge and HPV-related perceptions among MSM. Each paper was assessed to identify potential research directions in the context of targeted HPV vaccination for MSM.

Results We identified 16 studies that included 5185 MSM and conducted mainly in North America. Generally, participants were over 26 years old, had poor-to-moderate knowledge about HPV and were not concerned about HPV-related diseases. Over a half of MSM were willing to accept HPV vaccine, if offered. However, there was large variability in HPV vaccine acceptability, partially due to inconsistencies in methods of ascertainment but also different levels of HPV vaccine awareness.

Conclusions Despite several misconceptions and poor knowledge of HPV infection, MSM might be receptive to HPV vaccination. However, further research is needed to identify which factors contribute to potential vaccine uptake in hypothetical MSM-targeted HPV vaccination. Future studies need to target those MSM with little sexual experience, who would benefit most from HPV vaccination.

INTRODUCTION

Men who have sex with men (MSM) are at risk of sexually transmitted human papillomavirus (HPV) infection, associated with genital warts, anogenital and oropharyngeal cancers.^{1–3} Due to sexual practices such as receptive anal intercourse, MSM are at greater risk of anal cancer as a consequence of HPV infection than heterosexual men.⁴ The incidence of anal cancer among MSM has risen in the last few decades, and HIV-positive men are at the highest risk (~78 per 100 000 men), even with antiretroviral therapy.^{5,6} While effective screening programmes are being developed to reduce anal cancer morbidity, vaccination of MSM against HPV is a valuable preventive measure.

HPV vaccination reduces the risk of genital warts, and consequently, a fall in HPV-related cancers is expected.⁷ Australian data show that female HPV vaccination has resulted in a dramatic decline in genital warts among both vaccinated women and unvaccinated heterosexual men of a

similar age, demonstrating that high female vaccination coverage indirectly protects a proportion of heterosexual men through 'herd immunity'.⁸ However, such reduced infection rates have not been observed in MSM, suggesting that vaccinating women will not protect MSM against anal cancer. To reduce the incidence of cervical cancer more effectively, policymakers in the USA, Canada and Australia have recently changed eligibility criteria to include males in HPV immunisation. As such, successful male vaccination in these countries will also reduce HPV-related diseases among MSM.⁹ If affordable, high coverage of gender-neutral HPV vaccination will provide the best preventive opportunities for MSM. However, this strategy is unlikely to be implemented in countries with high coverage levels of female vaccination because of the low anticipated benefit and lack of cost-effective evidence.¹⁰ This will further increase the health inequalities documented in MSM.¹¹

MSM-targeted HPV vaccination

It is uncertain whether targeting MSM with HPV vaccination could significantly reduce the incidence of HPV-related diseases, although there is early indication that MSM-targeted vaccination in addition to routine female immunisation is likely to be cost-effective for MSM below the age of 26 and potentially therapeutic for seropositive MSM.^{12–15} In order to speculate about the feasibility of such a risk-based strategy, it is crucial to examine HPV vaccine acceptability among MSM, as low vaccine uptake will fail to reduce HPV-related diseases. When preventing cervical cancers, HPV vaccination is most effective before sexual debut, as subsequent sexual experience increases the likelihood of HPV infection. This could be problematic as disclosure of sexual orientation in MSM tends to be after sexual debut. Furthermore, factors such as lack of readiness to discuss same-sex practices with healthcare providers (HCP), difficulty in self-identifying as gay or bisexual, low awareness of HPV-related diseases and negative attitudes towards HPV vaccination might compromise the effectiveness of targeted vaccination.¹⁶ It is important to understand which factors contribute to HPV vaccine acceptability among MSM to develop effective preventive programmes. Therefore, we assessed the scientific literature to identify current levels of HPV knowledge, specific beliefs about HPV infection and attitudes towards HPV vaccination among MSM.

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Review

METHODS

In accordance with PRISMA 2009 guidelines,¹⁷ 10 electronic databases (figure 1) were systematically searched in December 2012 for studies investigating HPV knowledge, beliefs about HPV infection and attitudes towards HPV vaccine among MSM. Database search alerts were set up to identify newly published and relevant articles since the original database search. There were no geographical, time or publication-type restrictions, but only papers published in English were eligible. The references of reviewed articles were also hand-searched. Three international HPV experts and relevant search engines (eg, Google Scholar) were used to identify unpublished papers, reports and conference abstracts. Only articles reporting original quantitative primary data were included. These studies focused on MSM in relation to their sexual practices as well as self-identified homosexual/gay and bisexual men. Studies aimed at males and measuring sexual orientation but reporting low numbers of MSM participants (ie, less than 30 or 5% of the sample) were excluded. Data of heterosexual men were excluded. These criteria were established to ensure that the data included in the review were sufficient to draw valuable conclusions in the context of selective vaccination for MSM. No comparisons with heterosexual populations were made.

The lead author (TN) scanned titles and abstracts from each database and fully reviewed articles that met the inclusion criteria. Shortlisted studies were then assessed by two reviewers (TN, CJJ) working independently to extract key data. For studies that reported males in general, specific data about MSM were requested from authors to supplement the published findings.

The STROBE checklist for observational studies¹⁸ and guidance for assessing risk of bias¹⁹ were used to examine scientific quality. Two authors (TN, CJJ) assessed each study for its methodological strengths and weaknesses, generalisability of findings, use of theoretical frameworks and reliability of measures to establish scientific quality of reporting. Additionally, we comparatively examined the usefulness of data from each study in the context of hypothetical MSM-targeted HPV vaccination, taking into account the number and age of MSM participants

and generalisability of the sample to the wider population of MSM below the age of 26 years. This criterion was in line with current HPV vaccine licence regulations. Based on these evaluations, each article was characterised as having *lower*, *medium* or *higher* comparative quality (table 1).

RESULTS

Study characteristics

Five studies involving MSM participants were excluded,^{20–24} and 16 studies (table 1) met the inclusion criteria.^{25–40} All studies were conducted prior to official HPV vaccine recommendation for men in the following countries between 2005 and March 2013: the USA (8), Australia (2), Canada (1), Italy (1), Sweden (1), Puerto Rico (1), Malaysia (1) and Hong Kong (1). Nine studies targeted MSM and seven recruited males regardless of sexual orientation. A total of 5185 men, self-identified as gay/bisexual, took part in cross-sectional surveys. Most studies did not report separate data for homosexual and bisexual men, so the review reflects a general MSM population. The majority of participants were white, either in education or already holding a higher degree, and living in urban areas. Participants were aged between 16 and 71 years, three studies targeted MSM below the age of 26.^{33 36 39} Participants were mainly recruited via convenience sampling within large urban areas: gay community events and meeting points (7), sexual health clinics (4), universities (3) and population-based panels (2). Five studies applied psychological models within their design using constructs from either the Health Belief Model or Theory of Planned Behaviour.

The quality assessment classified two articles as having higher quality, five as medium and nine as lower. We selected two studies as having higher comparative quality because their methodological approach and findings could be generalised to a larger MSM population, likely to be eligible for HPV vaccination. The STROBE checklist (table 2) revealed that descriptions of the measurements' sources/reliability, potential sources of bias in design, anticipated sample size and possible generalisability were frequently omitted from the text.

Figure 1 Review of articles for inclusion in systematic review.

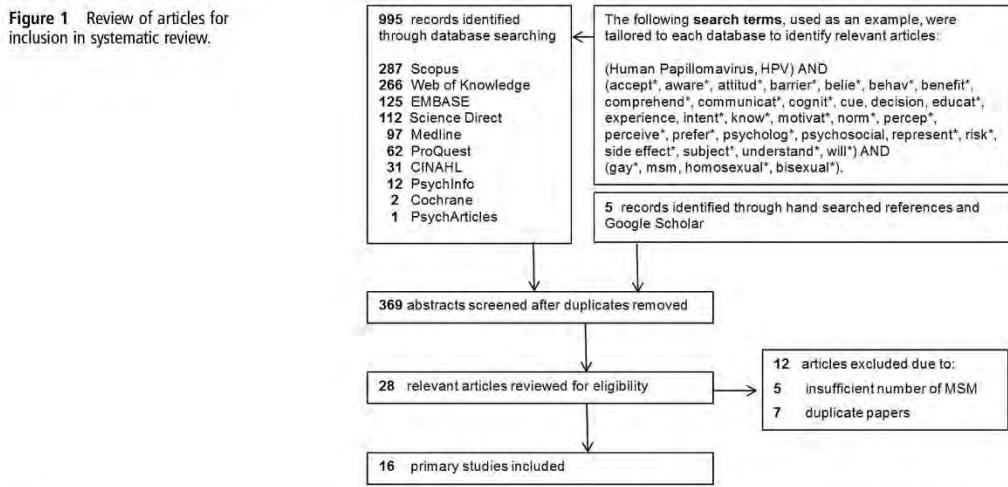


Table 1 The characteristics of 16 studies included in the review, including key variables, HPV vaccine acceptability and the overall quality

Author (year of publication)	Country	Number of MSM	Study design	Selected characteristics	Key variables	HPV vaccine acceptability	Comparative quality
Tider et al (2005) ²³	USA	1065	Questionnaire at two gay community events in New York	Mean age=26 (SD=10) 63% white European Mean age=27 (range: 16–67) 58% had high education qualification 67% in full-time employment	HPV knowledge Sexual history HPV knowledge HPV information source HPV risk factors beliefs Healthcare access	NR	Lower
Pitts et al (2007) ²⁶	Australia	384	Questionnaire at gay community event in Melbourne		Willing to pay \$A450 for HPV vaccine*	NR	Medium
Simatherai et al (2009) ²⁷	Australia	200	Questionnaire for gay/bisexual men at sexual health clinic in Melbourne	Median age=27 (range 19–71)	HPV vaccine acceptability*	47%	Lower
Reiter et al (2009) ²⁸	USA	3121	Internet-based questionnaire for males via pre-existing panel of US households	Age range 18–59 (4.5% 18–26) 81% non-Hispanic white 56% had high education qualification 94% living in urban area	HPV knowledge* Concern Perceived susceptibility Perceived severity Perceived vaccine effectiveness Perceived barriers Anticipated benefit Cue to action Sexual history	74%	Medium
Sundstrom et al (2010) ²¹	Sweden	751	Multimodal nationwide survey of 14 000 adults recruited from the Swedish Population Register	Mean age=24 (SD=3, range 18–31) 86% born in Sweden 75% had high education qualification 55% living in rural area	Willingness to get vaccinated* Willingness to get vaccinated at any cost* Willingness to pay some cost of the vaccination* HPV awareness Perceived risk Belief about vaccine Belief about benefits Willingness to pay for vaccine HPV vaccine information request Reasons to abstain from HPV vaccine Beliefs about compensating risk	79% 7% 31%	Lower
Hernandez et al (2010) ²⁹	USA	881	Questionnaire for males at university campus and general public in Hawaii	23% were under 26 years old	HPV vaccine acceptability*	75%	Lower
Thomas and Goldstone (2011) ³⁰	USA	191	Telephone and face-to-face survey at practice for HPV treatment offering 'off label' HPV vaccine for gay/bisexual men	Mean age=37 (range 22–56) 80% white 86% previously diagnosed with HPV 50% diagnosed with non-HPV STI	Paid for HPV vaccine when offered (uptake)* HPV knowledge HPV vaccine information source Perceived barriers Perceived benefits Cue to action Risk compensation	65%	Lower
Blackwell and Eden (2011) ³¹	USA	89	Questionnaire at various gay pride and gay community events	Mean age=32 (SD=13) 75% white 31% married/living with partner 67% had high education qualification	HPV knowledge HPV information source	NR	Medium
Wheldon et al (2011) ³²	USA	179	Internet-based questionnaire for gay/bisexual men through snowball sampling method via student organisations at 23 colleges and universities in southeast US	Mean age=21.6 (SD=3) 68% white 78% were in education 39% knows someone who received HPV vaccine 10% had no sexual experience	Likely to get vaccinated* HPV vaccine intentions* HPV knowledge Perceived susceptibility Perceived severity Perceived benefits	36% Mean=4.5 (SD=1.3, range 1–7)	High

Continued

Table 1 Continued

Author (year of publication)	Country	Number of MSM	Study design	Selected characteristics	Key variables	HPV vaccine acceptability	Comparative quality
Pelullo et al (2012) ²⁴	Italy	630†	Face-to-face interview at gay community venues in Naples	Mean age=26 (SD=7, range: 16–62) 89% married 89% employed 14% had high education qualification	Perceived barriers Self-efficacy Attitudes towards HPV vaccine Subjective norms Perceived behavioural control HPV vaccine acceptability* HPV knowledge	NR	Medium
Colón-López et al (2012) ²⁵	Puerto Rico	581	Questionnaire for males and females at sexual health clinic in San Juan	Mean age=38 (SD=13) 68% HIV positive	HPV vaccine willingness* HPV awareness HPV vaccine acceptability*	21%	Lower
Al-Naggar (2012) ²⁶	Malaysia	461	Questionnaire for males on university campus in Shah Alam	Mean age=21 (SD=2) 100% had not heard of HPV vaccine	Perceived susceptibility Likelihood of getting HPV vaccine* HPV vaccine awareness Sexual history	0%	Lower
Rank et al (2012) ³³	Canada	1169	Questionnaire at various gay community events in Vancouver	Median age=33 77% white 73% had high education qualification 18% HIV positive 56% have more than 5 sexual partners 26% use recreational drugs 13% diagnosed with genital warts	HPV vaccine acceptability* HPV knowledge Sexual orientation disclosure	57%	Higher
Sanchez et al (2012) ²⁴	USA	116	Questionnaire at sexual health clinic in New York City	Median age=25–28 (range 17–62) 46% married/wife, white 10% diagnosed with genital warts	HPV vaccine acceptability* HPV knowledge Perceived risk	86%	Lower
Gutierrez et al (2013) ³⁴	USA	411	Questionnaire of a community-based convenience sample in Philadelphia	Median age=18 (range 13–21) 77% African-American	HPV vaccine intentions* HPV knowledge Attitudes Subjective norms	Mean=2.6 (SD=1.2, range 1–5)	Lower
Lau et al (2013) ²⁰	Hong Kong	542	Face-to-face questionnaire at various gay venues in Hong Kong	25% were 18–25 years old 75% were 26–60 years old	Perceived behavioural control Intention to uptake HPV vaccine* Intention to pay for the vaccine* Intention to uptake free HPV vaccine* HPV knowledge Perceived susceptibility Perceived benefits Perceived barriers Perceived self-efficacy Cues to action Sexual history	20% 29% 79%	Medium

*Reference variable for HPV vaccine acceptability/intention.

†Selected number of MSM subjects taken from a larger study sample.

‡Additional data retrieved from the authors.

HPV, human papillomavirus; MSM, men who have sex with men; NR, not reported; STI, sexually transmitted infection.

Table 2 The result of the STROBE checklist assessment for reporting in observational studies

Author (year of publication)	Title and abstract	Methods										Results					Discussion						
		Background rationale		Objectives	Study design	Setting	Participants	Variables	Data sources/ measurement	Bias	Study size	Quantitative variables	Statistical methods	Participants	Descriptive data	Outcome data	Main results	Other analysis	Key results	Limitations	Interpretation	Generalisability	Funding
Tides et al (2005) ¹⁷	1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 1 2 0 0 0 0 0 0																						
Pitts et al (2007) ²³	1 1 1 0 0 0 1 0 1 0 0 0 1 1 1 1 1 1 1 1 1 1 0 0 0																						0
Simuthaler et al (2009) ²⁴	1 0 0 0 0 0 1 0 1 0 0 1 1 0 0 0 0 1 0 1 0 0 0 0 0																						0
Rutter et al (2009) ²⁵	1 1 1 1 1 1 1 1 1 1 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1																						1
Sundstrom et al (2010) ²⁶	1 1																						1
Hernandez et al (2010) ²⁷	1 1 0 1 1 1 1 1 1 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1																						1
Thomas and Gullone (2011) ²⁸	1 1																						1
Bascicelli and Ede (2011) ²⁹	1 1																						1
Wadekar et al (2011) ³⁰	1 1																						1
Pérez et al (2012) ³¹	1 1																						1
Colón-López et al (2012) ³²	1 1																						1
Al-Nagar (2012) ³³	1 1																						0
Heik et al (2012) ³⁴	1 0 0 1 1 1 1 1 1 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1																						1
Sanchez et al (2012) ³⁵	1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 1 0 0 0 0																						0
Gutiérrez et al (2013) ³⁶	1 1 1 1 0 1																						1
Liu et al (2013) ³⁷	1 1																						0
Total	16 14 17 13 12 12 14 8 3 9 10 13 14 14 14 16 7 15 11 11 5 10																						

Review

Knowledge about HPV

The majority of MSM sampled had a poor understanding of HPV and its causal role in cancer. On average, 63% (range 20–93%, 11 studies) had heard of HPV but fewer (39%; range 0–86%, five studies) were aware of HPV vaccine. Most MSM were more aware of 'a warts virus' rather than HPV per se. One study demonstrated that 63% of HPV-infected MSM reported having genital warts, but not HPV.²⁵ In a Swedish study, 20% reported hearing about HPV and 93% about condyloma.²⁹ Eight studies^{26 28 31–33 38–40} used scales to assess HPV knowledge, showing that 36–75% of MSM associated HPV with sexual activity. While half knew HPV caused genital warts, fewer associated HPV with anal (32–53%), oral (25–47%) and penile (28–31%) cancers.^{28 33 34} Between 22% and 55% recognised smoking, receptive anal intercourse, multiple sexual partners and unprotected sexual intercourse as the main risk factors for anal cancer.^{26 28 34} Half of MSM knew HPV affects both sexes, and that infection may be asymptomatic.²⁸ The most cited sources of HPV information were primary care doctors and nurses, other healthcare professionals (HCP), magazines, television adverts, family members and friends.^{28 31}

Perceptions of HPV

The majority of participants did not perceive themselves at risk of HPV or related diseases. There were greater perceptions of vulnerability to genital warts than anal cancer. Half of MSM in the Hong Kong sample had misconceptions about HPV, such as it being of low infectivity or controlled by antibiotics.⁴⁰ Most MSM in the US population-based study reported low levels of concern about developing HPV-related disease.²⁸ While 60% of New York sexual health clinic attendees considered themselves susceptible to HPV, 30% perceived a risk of anal cancer.³⁸ In contrast, three studies indicated that the majority of MSM thought HPV-related diseases such as anal cancer were severe and had a potentially damaging impact on health.^{28 33 40}

Attitudes towards HPV vaccine

Most MSM showed positive attitudes towards HPV vaccine. Two studies reported that MSM believed HPV vaccination would be good, safe, smart, easy, important and harmless.^{33 39} In general, MSM considered the HPV vaccine effective in preventing HPV-related diseases, with one study indicating lower perceived effectiveness in preventing genital warts than cancers.⁴⁰ One study showed that young MSM believed they would be generally encouraged by their family and friends to be vaccinated.³⁹ Five studies showed that MSM were concerned about high vaccine costs and possible side effects.^{28–30 33 40} Factors such as fear of needles or difficulties accessing the clinic were perceived as potential barriers to receive the vaccine.³⁰ MSM expressed concerns about HPV vaccine safety, availability, lack of approval from healthcare authorities and number of doses needed to be effective.^{28–30 40} In two studies, 78% of MSM had disclosed same-sex practices to their HCP and 93% would be willing to disclose their sexual orientation in order to be vaccinated.^{27 37} MSM would also largely regret refusing HPV vaccination if diagnosed with HPV-related cancer later in life.²⁸

HPV vaccine acceptability

Over half of MSM would accept HPV vaccination (mean=56%, median=65%, range 0–86%, 12 studies). There were no clear trends in HPV vaccine acceptability across various sampling venues, time of data collection and geographical location. To determine vaccine acceptability, four studies used *willingness to receive the vaccine*,^{28–30 37} three *willingness to pay for the vaccine*,^{27 29 40} one *likelihood of getting the HPV vaccine*,³⁶ three *intentions to be vaccinated*,^{33 39 40} and one estimated actual vaccine uptake status when it was offered 'off-label'.³¹ The results were highly heterogeneous, and there were large differences between measures. For example, surveys that measured hypothetical *intentions* to receive the vaccine as an approximation of vaccine acceptability reported lower rates than those asking about *willingness to receive HPV vaccine*.

Awareness about HPV vaccine was related to vaccine acceptability. The studies conducted in the USA reported generally higher rates of HPV awareness and also greater willingness to be vaccinated.^{28 30–31 33 38} For example, 85% of MSM from a New York sexual health clinic had heard of HPV and 86% reported willingness to receive the vaccine.³⁸ In contrast, none of the Malaysian MSM participants had previously heard of HPV and none considered themselves likely to receive it.³⁶

Studies asking about willingness to pay reported lower acceptability than studies not addressing cost. Proposed greater personal vaccination cost was also associated with lower vaccine acceptability. While 41% of MSM in the Swedish sample would accept the vaccine if free of charge, only 7% would accept it at any cost.²⁹ Similarly, participants from Hong Kong showed higher rates of intention to be vaccinated when the HPV vaccine was free compared with \$1000–2000 per shot (79% vs 29%).⁴⁰

Three studies reported no significant associations between the age of participants and vaccine acceptability, demonstrating that there was no difference in willingness to be vaccinated between younger and older MSM.^{28 33 37} One study also showed that there were no differences in HPV knowledge associated with age.²⁶

Table 3 summarises statistically significant correlates of HPV vaccine acceptability among MSM across five studies.^{28 31 33 37 40} The most frequently cited correlates of MSM HPV vaccine acceptability were HPV knowledge, perceived severity of HPV-related diseases, perceived risk of HPV-related diseases, perceived benefits of HPV vaccine and doctor's recommendation.

DISCUSSION

This review demonstrates that MSM showed insufficient knowledge of HPV-related cancers and the availability of HPV vaccine as a method of prevention. Most MSM failed to recognise HPV risk; however, anogenital cancers were generally perceived as severe. Despite little knowledge, more than half of MSM were willing to accept HPV vaccination. The observed differences in acceptability could be explained by variations in HPV awareness, specific barriers such as perceived vaccine cost, uncertainty about personal eligibility, side effects and perceptions of vaccine effectiveness. These findings are useful in the context of targeted vaccination, as little knowledge about HPV, low perceived susceptibility to HPV infection, negative attitudes towards the vaccine and lack of readiness to discuss same-sex practices with HCPs are likely to compromise the effectiveness of this preventive method. Previous studies have shown that individuals unaware of their risk and those with negative attitudes are less likely to adopt self-protective behaviours.^{41–42}

Nevertheless, for individuals unaware of HPV, attitudes such as the willingness to accept vaccination are likely to be constructed instantly rather than revealed if faced with vaccination offer. These attitudes are usually weak, unstable and most likely dependent on the environment under which the decision is made.⁴³ It is possible that unaware MSM would construct stronger HPV vaccination preferences when facing doctor's recommendation in a clinical setting rather than answering a vaccine-related questionnaire. Therefore, future studies need to

Table 3 Summary of statistically significant correlates of HPV vaccine acceptability among MSM presented in five studies

Acceptability correlates	Reference
Positive correlates	
Demographic variables	
Educational attainment—having a degree	33
>\$20 000 income	37
Behavioural correlates	
Number of lifetime sexual partners	28
Ever diagnosed with genital warts	37
Vaccinated for hepatitis A or B	37
Identified as MSM to HCP	37
Exposed to HIV-related services in the last year (peer education)	40
Watching media reports promoting HPV vaccine	40
Knowledge about HPV and HPV vaccine	31, 40
Heard of HPV	37
Psychosocial correlates	
Concern about getting HPV-related disease	28
Perceived severity of HPV-related disease	28, 33, 40
Perceived likelihood of getting HPV-related disease	28
Anticipated regret	28
Perceived effectiveness of HPV vaccine	28
Perceived benefits of HPV vaccination	33, 40
Attitudes towards HPV vaccine	33
Belief that doctor would recommend HPV vaccine	28, 40
Belief that peers would recommend HPV vaccine	40
Negative correlates	
Behavioural correlates	
Not using recreational drugs before or during sex	37
Age of first oral sex with a man	31
Unprotected anal intercourse in the last 6 months	40
Psychosocial correlates	
Perceived barriers to HPV vaccination (cost, safety)	33
Belief that HPV vaccine is a sign of promiscuity	40
Not self-identified as gay	37

HCP, healthcare providers; HPV, human papillomavirus; MSM, men who have sex with men.

assess HPV vaccine acceptability in the specific context of MSM-targeted vaccination incorporating information about the potential compromised effectiveness (due to the risk of HPV infection), settings, price, delivery methods and so on. We recommend that future acceptability measures portray scenarios, under which the hypothetical decision is going to be made, in order to increase individual understanding of the vaccination context, assess vaccine desirability and to identify the consistency of these preferences.

HPV awareness might be related to vaccine acceptability, and therefore, it is crucial to examine whether educating MSM about HPV would predict higher vaccine acceptability. Additional health promotion could also encourage younger MSM to disclose sexual orientation to enable discussion of HPV vaccine availability. Knowledge about hepatitis B vaccine and openness about sexual orientation to HCPs predicts hepatitis B vaccination.⁴⁴ UK data demonstrate a 90% uptake of hepatitis B vaccine among MSM at sexual health clinics, suggesting MSM are willing to adopt protective behaviours against sexually transmitted infections (STIs).⁴⁵ Australian data indicate that high coverage of MSM-targeted hepatitis B vaccination has contributed to increased levels of hepatitis B immunity in MSM.⁴⁶ Although this suggests that MSM-targeted vaccination

is acceptable and achievable, uncertainty exists as to what degree HPV and hepatitis B vaccination strategies can be compared across various healthcare systems and countries. Consideration should be also given to the specific additional resources needed for this strategy to succeed such as information campaigns encouraging vaccination when evaluating its practicability.

The feasibility of targeted vaccination in various settings (eg, primary care, pharmacies, specialised sexual health services, alternative settings⁴⁷) needs to be explored to identify strategies to enable a large number of MSM to accept HPV vaccination. Willingness to accept HPV vaccine at an early stage of sexual activity is likely to play an important role in establishing effectiveness of this risk-based strategy. Correspondingly, future studies need to examine HCP's attitudes towards offering HPV vaccination to their MSM patients and identify potential training requirements, as doctor's recommendation is a significant factor likely to influence the efficacy of this strategy.

Methodological issues

There is wide variation in individual study designs, methodological approaches and characteristics of MSM resulting in limited comparability of findings. There is no standardised measurement of vaccine acceptability, and researchers report *willingness, intentions or likelihood* when referring to the hypothetical openness and readiness to receive HPV vaccination. These constructs are likely to represent different psychological properties and could introduce bias when estimating vaccine desirability or uptake rates.⁴⁸ For example, participants unaware of HPV might be unable to construct *intentions* to be vaccinated, indicating restrictions of this measurement when assessing hypothetical behaviours. As such, there is a need to develop a sensitive and standardised measurement of vaccine acceptability that could be incorporated in modelling of vaccination behaviour.

The earlier studies present lower quality and the applicability of findings when estimating the feasibility of MSM-targeted HPV vaccination. While nine studies recruited MSM, seven were aimed at males in general, restricting generalisability of findings. Inability to relate the content of the questionnaire to individual circumstances might influence the validity of results. Two studies attempted to recruit MSM via population-representative sampling, whereas most studies were conducted in predominantly urban places likely to be visited by MSM (eg, gay pride, sexual health clinic). These sampling methods are likely to attract MSM with substantial sexual experience. Only three studies focused on perceptions and preferences of MSM below the age of 26 who would most benefit from vaccination against HPV. Future studies need to focus on younger MSM, as this group is most relevant for HPV vaccination. Studies used various measurements of HPV knowledge, and it was challenging to distinguish whether participants were primed with any information about HPV. Any form of priming could influence vaccine acceptability. Only five studies incorporated theoretical frameworks when examining correlates of HPV vaccine acceptability. It is important to understand how MSM perceive their own risk and whether HPV information would result in positive attitudes towards HPV vaccination. Finally, seven studies assessed sexual history and additional behavioural data enhance the understanding of whether sexual experience is associated with vaccine acceptability.

CONCLUSION

Despite poor knowledge about HPV, most MSM are receptive to HPV vaccination. Future intervention studies need to

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examine whether awareness campaigns with corresponding doctor's recommendation result in higher HPV vaccine acceptability. In order to design the most optimal MSM-targeted HPV vaccination programmes, it is essential to understand which demographic, behavioural and psychosocial factors correlate with vaccine acceptability among MSM. We recommend that future studies focus on MSM with little sexual experience, apply measures of acceptability that incorporate specific vaccination scenario, use theoretical frameworks and define predictors of HPV vaccine acceptability and uptake. It is crucial to understand factors that would enable sexual orientation disclosure of young MSM and whether offering a vaccination combination for both HPV and hepatitis B could potentially attract a larger number of MSM willing to be vaccinated. As such, in the absence of gender-neutral HPV vaccination, MSM-targeted strategies would require the implementation of sensitive techniques at an individual level to encourage a large number of MSM to discuss their HPV risk and the availability of HPV vaccine.

Key messages

- Men who have sex with men (MSM) have poor understanding of the causal role of human papillomavirus (HPV) in the development of anogenital and oral cancers.
- The majority of MSM did not consider themselves at risk of HPV.
- Men who were aware of the virus expressed greater willingness to receive the vaccine.
- The diverse HPV vaccine acceptability measures used in these studies might not indicate actual uptake rates. Future research must use validated tools, able to predict vaccination uptake.
- More research is needed to understand which factors predict HPV vaccine acceptability among MSM with little sexual experience.

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Appendix C - Response letter to the JCVI stakeholder consultation on targeted HPV vaccination for MSM in the UK



Tom Nadarzynski BSc MSc MBPsS

Doctoral Researcher

Division of Public Health & Primary Care

Brighton & Sussex Medical School

Room 323 Mayfield House,

Falmer, Brighton,

BN1 9PH, UK

Tel: 01273 641 887

email: t.nadarzynski@bsms.ac.uk

Re: Cost-effectiveness of selective HPV vaccination for MSM

Dear JCVI committee,

We welcome the interim statement on the cost-effectiveness of selective HPV vaccination at genitourinary medicine (GUM) clinics for men who have sex with men (MSM). However, there are many uncertainties when developing such an evaluation and we would like to question the assumption of 100% uptake and completion of MSM-targeted HPV vaccination. Below we outline evidence suggesting that the uptake and completion rates of MSM-targeted HPV vaccination are likely to be significantly less than 100%:

1. The size of MSM population in the UK is unknown

It is difficult to estimate the size of MSM population in the UK in order to speculate on any potential vaccination uptake or coverage. There is no precise number of MSM living in the UK or the MSM proportion potentially eligible for HPV vaccination. Therefore, we believe that any estimates of MSM-targeted vaccination uptake when developing cost-effectiveness analysis are unlikely to be precise as we currently lack measures that would enable us to define the size of the MSM population. As such, the assumption of 100% uptake at GUM clinics could only relate to the MSM that utilise these sexual health services. Even so, it is still challenging to accurately estimate the number of MSM attending GUM clinics, because some MSM migrate between sites and others do not disclose their same-sex behaviours.

Future research needs to investigate the migration between GUM clinics and its impact on the delivery of vaccination services in order to monitor the number of MSM receiving or refusing vaccination.

2. Some MSM do not utilise GUM clinics

Evidence of HIV/STI testing suggests that large numbers of MSM do not access GUM clinics. The 2008 UK Gay Men's Sex Survey found that 28% of MSM had never had an HIV test.^[1] The findings of the EMIS survey from 2010 showed that 30% of 15,456 MSM sample in England have never tested for sexually transmitted infections.^[2] More recent surveys in England and Scotland indicated that a fifth of MSM have never received an HIV test.^[3, 4] Also, amongst men that reported receiving an HIV test, only 77% tested in GUM or sexual health clinics, and 27% used other settings or screening methods (e.g. GP surgeries, private clinics or home testing kits).^[1] We believe these observations demonstrate that targeted HPV vaccination delivered via GUM clinics alone will miss a substantial proportion of MSM who do not utilise GUM clinics.

Therefore, the assumption that 100% MSM would access GUM clinics for HPV vaccination is unlikely to be accurate. Expanding HPV vaccination to other services such as GP practices, HIV or gay organisations and pharmacies would be needed to increase HPV vaccination uptake in this population. Future studies are required to formally assess where MSM not attending GUM clinics would seek HPV immunisation.

3. Some MSM do not complete series of vaccination

Targeted HPV vaccination for MSM may have a similar uptake and completion rates as targeted hepatitis A-B vaccination delivered through GUM clinics. In 2003, hepatitis B vaccination for MSM was introduced in the UK. According to the Public Health England data of 2003-2006 hepatitis B vaccination, there was 90% coverage of the first dose but only 44% completion rate of all three injections.[5] While the data from 2006 showed that 86% of attendees were positive for immunity following the first vaccine dose, these findings illustrate that many MSM either refuse or are not offered vaccination, and 100% completion is unlikely. The incidence of hepatitis B and vaccination uptake in UK MSM has not been well studied. However, research from Netherlands and Australia, which have implemented targeted hepatitis vaccination for MSM, showed that the levels of immunity in MSM are significantly lower in low-risk MSM.[6-8] It was estimated that a ten year targeted hepatitis B vaccination for MSM in Melbourne resulted in approximately 70% immunity rate. It is possible that uptake below 100% would be sufficient to reduce HPV-related diseases in MSM, but more studies are needed to estimate the herd immunity effect in this population.

In line with the hepatitis B vaccine uptake, a minority of MSM are likely to not start and/or finish the course of vaccination. We believe that expanding the HPV vaccination to MSM over the age of 40 years old would increase the coverage and further facilitate the reduction of the virus in this population. Future research needs to investigate the reasons why some MSM are not vaccinated against hepatitis and address these reasons when developing HPV vaccination.

4. Some MSM are not willing to be vaccinated against HPV

We have recently conducted a systematic review to assess the HPV vaccine acceptability amongst MSM and predict the future uptake in this population.[9] Amongst 16 studies, mainly from Northern America, 65% (range 0-86%) of MSM were willing to accept HPV vaccine. The highest rate (86%, N=116) was reported from a New York sexual health clinic, suggesting that this setting might be associated with higher potential uptake. Similarly 79% of MSM (N=542) from various gay venues in Hong Kong and 67% (N=1169) from venues in Vancouver expressed their willingness to be vaccinated. Knowledge about HPV and the availability of HPV vaccination, as well as specific health beliefs such as perceived susceptibility to anal warts or HPV-related cancers, were all associated with higher HPV vaccine acceptability. However, these studies suggest that at least 10% of MSM might be unwilling to be vaccinated.

We believe that interventions promoting HPV vaccination to MSM will be needed to increase uptake. Health campaigns aiming to increase awareness about HPV and motivation towards HPV vaccination, possibly delivered by third sector organisations such as Terrence Higgins Trust, are likely to increase HPV vaccine acceptability and uptake.

5. Some MSM do not disclose their sexuality to healthcare providers

Our systematic review also found that a significant proportion of MSM do not disclose their sexuality to healthcare professionals. In one community-based Canadian study, 22% of MSM were not willing to disclose same-sex practices to their doctors and one Australian study showed that about 10% of MSM would not be willing to disclose their sexual orientation when HPV vaccine was offered.[10,11] Data from the US demonstrated that only 5% of eligible MSM aged 16-26 received HPV vaccination in 2011.[12] Men that do not utilise sexual healthcare, have never received hepatitis vaccination, and do not feel comfortable discussing their sexuality are less likely to receive HPV vaccination. Therefore, MSM-targeted HPV vaccination might not be able to reach MSM that do not identify as gay or bisexual or are unwilling to discuss their sexuality openly.

If doctors are unaware of their patients' same-sex sexual practices they are less likely to offer HPV vaccine. We believe that extending the vaccination to all men at GUM clinics could include undisclosed MSM and facilitate the reduction of HPV in high-risk men.

6. Some healthcare providers do not actively recommend HPV vaccination

The evidence from HPV vaccination in the US has shown that the attitudes and recommendations of healthcare professionals have been associated with HPV vaccination uptake.[13-15] If some physicians are not willing to recommend HPV vaccination, their patients are less likely to receive it. We conducted an online survey of UK-based sexual healthcare professionals' (SHCPs) assessing attitudes towards HPV vaccination for men.[16] Our survey has shown that SHCPs would prefer gender-neutral HPV vaccination, inclusive of all school-aged boys, rather than MSM-targeted HPV vaccination. Interestingly, 18% of SHCPs did not agree to recommend MSM-targeted HPV vaccination. Consequently, HPV vaccination uptake should be expected to be lower in clinics where SHCPs are less likely to recommend HPV vaccine to their MSM service users. Without national guidelines on HPV vaccination, there will be a disparity in attitudes and recommendations resulting in suboptimal uptake and completion across the country.

We are currently conducting two studies examining potential barriers to MSM-targeted HPV vaccination. Firstly, we have conducted 19 interviews with SHCPs to explore their opinions about the challenges of selective HPV vaccination for MSM in the UK. The results will be available in February 2015. Additionally, we have run focus groups and interviews with MSM in the UK to identify barriers towards the potential HPV vaccination. These results will be available in May 2015. Finally, our national community-based survey will measure HPV vaccine acceptability amongst MSM and will estimate potential uptake in this group. The results will be available in September 2015. These studies will identify factors associated with HPV vaccine uptake at the very early stage of MSM-targeted HPV vaccination.

In conclusion, we believe that 100% uptake and completion of HPV vaccination amongst MSM will not be achievable due to specific barriers such as the lack of utilisation of sexual health services by some MSM; the inability to discuss sexuality with healthcare providers; low awareness about HPV and motivations to vaccinate; and low levels of HPV vaccine recommendations to MSM. Whilst it is not easy to predict the future vaccine uptake in this group without targeted research, estimates of HIV testing and hepatitis B vaccination suggest that about 20% of MSM might not have the opportunity or be willing to be vaccinated against HPV at GUM clinics.

We are happy to provide more information about our research and submit the results of our work to facilitate informed development of effective HPV vaccination for MSM in the UK.

Yours sincerely,

Tom Nadarzynski, Carrie Llewellyn, Daniel Richardson and Helen Smith

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Appendix D - Ethics approval for the qualitative study (Chapter V)

BSMS Research Governance & Ethics Committee (RGEC)
Chair: Professor Kevin Davies
Deputy Chair: Professor Bobbie Farsides
Secretary: Miss Caroline Brooks
Tel: 01273 872855 c.e.brooks@bsms.ac.uk
Applications and general enquiries: rgec@bsms.ac.uk



27/06/2014

Dr Carrie Llewellyn
Brighton and Sussex Medical School
Mayfield House
University of Brighton
Falmer
Brighton
BN1 9PH

Brighton and Sussex Medical School
Medical Teaching Building
University of Sussex
Falmer
Brighton
BN1 9PX

Dear Dr Llewellyn

Full Study Title: Qualitative research into attitudes towards disclosure of sexual orientation and the availability of vaccination among young men who have sex with men in the South-East of England.

R&D Ref No.: 14/036/LLE

I am writing to inform you that the Brighton and Sussex Medical School Research Governance and Ethics Committee (RGEC) Sub-Panel which met on **Thursday 26th June 2014** has now assessed your application and granted **Research Governance Approval** to proceed with the above named project.

This letter acknowledges that you have the necessary internal regulatory approvals.

Conditions of Approval

The approval covers the period stated in the Research Governance & Ethics Committee (RGEC) application and will be extended in line with any amendments agreed by the RGEC. Research must commence within 12 months of the issue date of this letter. Any delay beyond this may require a new review of the project resources.

Amendments

Project amendment details dated after the issue of this approval letter should be emailed to RGEC for formal approval.

Monitoring

The Medical School has a duty to ensure that all research is conducted in accordance with the University's Research Governance Code of Practice. In order to ensure compliance the department undertakes random audits. If your project is selected for audit you will be given 4 weeks notice to prepare all documentation for inspection.

It is your responsibility to inform me in the event of early termination of the project or if you fail to complete the work.

I wish you luck with your project.

Yours sincerely

A handwritten signature in black ink, appearing to read "Kevin Davies".

Professor Kevin Davies
Chair of the BSMS Research Governance and Ethics Committee

Appendix D - Study advert used in the qualitative study (Chapter V)

Does your doctor know that you have sex with men?

Would you be willing to participate in a discussion group of approximately 5 gay bi men to talk about your experience of discussing sexual health with doctors?

Brighton and Sussex Medical School is currently looking for gay and bisexual men to have a discussion about the willingness of young men to tell healthcare professionals about their sexual orientation. Also, we would like to know what young gay and bisexual men think about new vaccines against sexually transmitted infections.

As a 'Thank You' we will offer you £15 and reimburse your train/bus travel expenses (within Brighton and Hove).

Your contributions to the discussion will be anonymous and confidential.

To reserve a place in an evening discussion group at Terrence Higgins Trust (*Ship Street, Brighton*) or for more info, please contact
Tom Nadarzynski at Brighton and Sussex Medical School:
E-mail: t.nadarzynski@bsms.ac.uk or phone 01273 641 887

Tom Nadarzynski (01273) 641 887 t.nadarzynski@bsms.ac.uk							
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Appendix F - Demographic questionnaire used in the qualitative study (Chapter V)

Participant demographic questionnaire

Please fill in the questionnaire. The answers are confidential and will be anonymised.

I am (please tick):

- male transgender (male to female)
 female transgender (female to male)

My age is: _____ years

I am sexually attracted to:

- men rather not say
 women I have never had sex with a man
 both men and women I have never had sex with a woman

I have lived in Brighton/Hove area for: _____ years, _____ months

Tick here if you don't live in Brighton/Hove

How many male sexual partners have you had in your life (this includes masturbation, oral and penetrative sex)?

- none less than 5 more than 5

At what age did you have your first sexual encounter with a man: _____

Tick here if you have never had sex with a man

Have you ever disclosed to your doctor (or a nurse) that you have sex with men?

- yes no not sure not applicable

My ethnic origin is: _____

I am:

- full-time employed looking for a job on a disability support
 part-time employed a student other: _____

Appendix G - Topic schedule used in the qualitative study (Chapter V)

Principle Investigator: Tom Nadarzynski

Study title: Qualitative research into attitudes towards disclosure of sexual orientation and the availability of vaccination among young men who have sex with men in the South-East of England.

Topic schedule

The focus group and interview facilitator will be led by the responses given by each participant therefore the list below will not be exhaustive, nor will the questions necessarily be asked in a set order. The schedule presented gives an indication of the topics that will be covered and the types of questions and prompts that will be used.

1. First of all I wanted to ask you generally about your experiences of telling a doctor or nurse about having sex with other men or saying you were gay or bisexual.

1.1. What sort of experiences have you had discussing your sexual health with a GP or any other doctors or nurse? Have you ever been asked by any doctor or nurse about your sexual orientation? Would you tell your GP or sexual health doctor about being gay or bisexual? When and where did that happen for the first time?

1.2. Was it easy or difficult to talk about sexual experiences? What was good about telling a doctor about being gay or bi? At what point of their life, might gay and bisexual men feel more comfortable discussing sexuality with their doctors or nurses?

1.3. Some men decide not to tell their doctors or nurses about being gay or bi. What are the possible reasons for gay and bisexual men not wanting to talk about their sexual experiences with doctors or nurses?

2. I would like to ask you what, if anything, do you know about vaccines against sexually transmitted infections.

2.1. What do you know, if anything, about these types of vaccines?

2.2. Have you ever been offered the vaccine against Hepatitis?

3. What have you heard about Human Papillomavirus, called HPV?

Participants are read Information 1: HPV

Genital Human Papillomavirus (HPV) is a common virus and most sexually active people will have HPV at some time in their lives. HPV can infect the genital areas of men, including the skin on and around the penis or anus. Most men who get HPV never develop any symptoms or health problems.

4. How do you think you might be at risk of the HPV virus?

4.1. How serious do you think the infection would be for you?

Participants are read Information 2: HPV-related genital warts

About 1% of sexually active men have genital warts at any one time, as a result of HPV infection. There are one or more growths and they usually do not hurt.

1

< Topic Schedule 29/05/10 Version 1>

5. What do you think about genital warts?

5.1. How do you think you might be at risk of genital warts?

5.2. How serious do you think genital warts are?

Participants are read Information 3: HPV-related cancers

HPV infection in men can result in cancers of the penis, anus and back of throat, but these cancers are very rare.

6. How do you think you might be at risk of these cancers?

6.1. How concerned do you think other men of your age are about the diseases caused by HPV?

Participants are read Information 4: HPV and MSM

Gay and bisexual men (men who have sex with men) are about 17 times more likely to develop anal cancer than men who only have sex with women.

7. What do you think about the risk of anal cancer for gay and bisexual men?

7.1. How do you think you can protect yourself against HPV?

Participants are read Information 5: HPV vaccine

There is an HPV vaccine that can help protect you against the types of HPV that most commonly cause problems in men. It protects against new HPV infections; it does not cure existing HPV infections or disease (like genital warts). It is most effective when given as early as possible, ideally before you start having sex.

The vaccine is not currently available for men in the United Kingdom, but health authorities are considering whether to vaccinate gay and bisexual men in the future.

8. How would you feel about being vaccinated against HPV?

8.1. If it was available in the UK, how willing would you be to request the vaccine?

8.2. Where do you think would be the best place for young gay and bisexual men to get it?

8.3. For gay and bisexual men, what do you think might be the main difficulties and challenges in getting the vaccine?

8.3. If you knew about the vaccine, would you disclose your sexual orientation to a doctor or nurse in order to be vaccinated?

8.4. How would you feel about being offered the vaccine by a nurse or a doctor?

9. What sort of information about the HPV vaccine will help you to make your decision?

Appendix H – Ethics approval for quantitative study (Chapter VI)

BSMS Research Governance & Ethics Committee (RGEC)
Chair: Professor Kevin Davies
Deputy Chair: Professor Bobbie Farsides
Secretary: Miss Caroline Brooks
Tel: 01273 872855 c.e.brooks@bsms.ac.uk
Applications and general enquiries: rgec@bsms.ac.uk



11/06/2015

Dr Carrie Llewellyn
Brighton & Sussex Medical School
Mayfield House
University of Brighton
Falmer
Brighton
BN1 9PH
England

Brighton and Sussex Medical School
Medical Teaching Building
University of Sussex
Falmer
Brighton
BN1 9PX

Dear Dr Llewellyn

Full Study Title: Attitudes towards vaccinations against sexually transmitted infections amongst men who have sex with men in the UK

R&D Ref No. : 15/098/LLE

I am writing to inform you that the Brighton and Sussex Medical School Research Governance and Ethics Committee (RGEC) which met on **Wednesday 13th May 2015** has now assessed your application and granted **Research Governance Approval** to proceed with the above named project.

This letter acknowledges that you have the necessary internal regulatory approvals.

Conditions of Approval

The approval covers the period stated in the Research Governance & Ethics Committee (RGEC) application and will be extended in line with any amendments agreed by the RGEC. Research must commence within 12 months of the issue date of this letter. Any delay beyond this may require a new review of the project resources.

Amendments

Project amendment details dated after the issue of this approval letter should be submitted to RGEC for review and formal approval. Please submit your application for an amendment to the Committee (via rgec@bsms.ac.uk) using the 'Request for an Amendment Form'.

Monitoring

The Medical School has a duty to ensure that all research is conducted in accordance with the University's Research Governance Code of Practice. In order to ensure compliance the department undertakes random audits. If your project is selected for audit you will be given 4 weeks notice to prepare all documentation for inspection.

It is your responsibility to inform me in the event of early termination of the project or if you fail to complete the work.

I wish you luck with your project.

Yours sincerely

Professor Kevin Davies
Chair of the BSMS Research Governance and Ethics Committee

Appendix I – Study advert used in quantitative study (Chapter VI)

New vaccines against sexually transmitted infections



Would you like to be vaccinated? Fill in our survey and get £75

Brighton and Sussex Medical School has launched a confidential online survey on attitudes towards new vaccines available to men

To access to the survey click: www.surveymonkey.com/Vaccine

Appendix J – Screenshot of the Facebook advert used for recruitment in the quantitative study (Chapter VI)

Page Messages Notifications Insights Publishing Tools

TEN YEARS OF SUCCESS

GAY/BI MEN: VACCINATIONS AGAINST SEXUALLY TRANSMITTED INFECTIONS SURVEY

Vaccinations for
gay/bisexual men
Community

Add a Button Liked Message ...

Timeline About Photos Events More

Status Photo/Video Offer, Event+

Community Write something

44 likes · 0 this week

See Pages Feed Posts from Pages that you've liked as your Page

ABOUT

Calling all gay & bi men - what are your thoughts on vaccinations against sexually transmitted infections? Take part in the short 5 minute survey now.

<https://www.surveymonkey.com/s/Vax1>

Vaccinations for gay/bisexual men
Published by Tom Nadarzynski [?] · 15 July 2015 · 0

Calling ALL gay and bisexual men
Take part in the short, 5 minute survey and share your views about vaccinations against sexually transmitted diseases now for your chance to WIN a £75 gift voucher. All responses are strictly confidential.

**CALLING ALL
GAY & BI MEN**
WHAT ARE YOUR THOUGHTS
ABOUT VACCINATIONS
AGAINST SEXUALLY
TRANSMITTED INFECTIONS?
TAKE PART IN THE SHORT
SURVEY NOW FOR A CHANCE TO
WIN A £75 VOUCHER

Survey on attitudes towards vaccinations
What is the survey about? This survey takes about 15 minutes to complete. It asks about your attitudes towards vaccines against sexually transmitted infections and your sexual behaviour.
[SURVEYMONKEY.COM](#)

Appendix K – Format of survey questionnaire (Chapter VI)

What is the survey about?

This survey takes a few minutes to complete. It asks about your attitudes towards vaccines against sexually transmitted infections and your sexual behaviour. It also asks you to read a short piece of information about new vaccines available to men.

At the end of the survey we will ask you for your email address, this is because we would like to contact you again 2 weeks after you complete this survey to ask a few more questions, which should take no more than 5 minutes.

We will also enter you into a prize draw to win £75.

This study has been approved by the Brighton and Sussex Medical School Governance and Ethics Committee (Study reference number: 15/098/LLE)

Please take part if you are a man who is sexually attracted to other men.

Confidentiality and anonymity

We guarantee your anonymity. All information that is collected will be strictly confidential and used only for the purpose of this study. Participation in this research is entirely voluntary and you may choose to withdraw at any time without providing a reason. Incomplete surveys will be excluded from the analyses.

What happens when the study finishes?

The results from this study may be published in scientific journals and international conferences.

Who is organising and funding the research?

The research is being organised and funded by Brighton and Sussex Medical School.

Contact for Further Information

If you have any further questions please do not hesitate to contact the researcher:

Tom Nadarzynski
Division of Public Health & Primary Care
Brighton & Sussex Medical School
Room 323 Mayfield House,
Falmer, Brighton,
BN1 9PH, UK
Email: T.Nadarzynski@bsms.ac.uk

Please complete this survey ONLY ONCE.

Please tick the CONSENT button to indicate that you agree with the following statements:

- YOU ARE WILLING TO PARTICIPATE IN THE SURVEY
- WE CAN USE YOUR ANONYMOUS INFORMATION FOR OUR RESEARCH PURPOSES
- YOU ARE WILLING TO BE CONTACTED BY EMAIL TWO WEEKS LATER WITH ANOTHER SHORT SURVEY
- YOU HAVE READ AND UNDERSTOOD THE ABOVE

Consent

I agree with the following statements

Thanks for entering the survey! The bar above will indicate your progress.

Firstly, we'd like to ask a few questions about you. This will allow us to ask you only the most relevant questions.

What is your age?

Are you:

- A man
- A woman
- Transgender/Transsexual (Man to woman)
- Transgender/Transsexual (Woman to man)

Which of the following options best describes how you think about yourself?

- Heterosexual or Straight
- Gay or Lesbian
- Bisexual
- Prefer not to say
- Other (please specify)

Many thanks for your interest in taking part in the survey.
However, at this stage of our research you do not match our inclusion criteria.
Thank you for your time.

You can also contact Tom Nadarzynski with any questions related to this study.

Tom Nadarzynski
Division of Public Health & Primary Care
Brighton & Sussex Medical School
Room 323 Mayfield House,
Falmer, Brighton,
BN1 9PH, UK
Tel: 01273 641887
email: T.Nadarzynski@bsms.ac.uk

Some vaccines are specifically offered to men who have sex with men. Thinking about this type of vaccine, please answer the following questions:

Have you ever been vaccinated against hepatitis B?

- No, I am naturally immune to hepatitis B (because I had the infection in the past)
- No, and I don't know if I'm immune
- Yes, and I completed the course of 3 injections
- Yes, but I did not complete the course of 3 injections
- Yes, but I did not respond to the vaccination
- I don't know

Have you ever been vaccinated against hepatitis A?

- No, I am naturally immune to hepatitis A (because I had the infection in the past)
- No, and I don't know if I'm immune
- Yes, and I completed the course of 2 injection
- Yes, but I did not complete the course of 2 injections
- Yes, but I did not respond to the vaccination
- I don't know

How much do you know about Human Papilloma Virus (HPV)?

- Never heard of it before
- Very little
- Some
- A lot

Have you ever been vaccinated against Human Papilloma Virus (HPV)?

- No, I am naturally immune to HPV (because I had the infection in the past)
- No, and I don't know if I'm immune
- Yes, and I completed the course of 3 injections
- Yes, but I did not complete the course of 3 injections
- Yes, but I did not respond to the vaccination
- I don't know

Please read each of the statements about Human Papilloma Virus (HPV) and indicate whether they are true or false by clicking the appropriate box. If you don't know the answer please click "Don't know"

	True	False	Don't know
HPV is very rare	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HPV can be passed on by skin-to-skin contact	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HPV can cause AIDS	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HPV can cause health problems in men	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HPV always has visible signs or symptoms	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HPV can cause genital warts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Most sexually active men will get HPV at some point of their lives	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HPV can cause anal cancer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Only women suffer from HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HPV can cause genital herpes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Men cannot get HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

The following questions will help us to understand how you think about your own health.

Compared to other men your age, what do you think are your chances of you...

	Much below average	Below average	Average	Above average	Much above average
Contracting a sexually transmitted infection	<input type="radio"/>				
Ever being infected with HPV	<input type="radio"/>				
Ever being infected with hepatitis B	<input type="radio"/>				
Having genital or anal warts, sores or blisters	<input type="radio"/>				
Developing genital or anal cancer	<input type="radio"/>				

How likely is that you would undertake any of the following:

	Very unlikely	Somewhat unlikely	Neither likely not unlikely	Somewhat likely	Very likely
Tell your doctor that you have sex with men in order to be vaccinated against HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Visit a sexual health clinic to be vaccinated against HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Seek information about HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ask your doctor about HPV vaccine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Consider being vaccinated against HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Accept HPV vaccine if a doctor offered it to you	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Receive a course of 3 injections of HPV vaccine over 6 months period	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please read carefully the information about HPV and HPV vaccine:

A 50.0% Human Papilloma Virus (HPV) is a common sexually transmitted infection. HPV infection does not usually cause any symptoms or health problems, so most men will not know that they are already infected. In very rare cases, HPV can lead to genital warts and cancers.

Gay, bisexual and other men who have sex with men are at much higher risk of genital warts and anal cancers, as a result of HPV infection.

HPV vaccine can help protect these men against the types of HPV that most commonly cause health problems. However, it only protects against new HPV infections. It does not cure existing HPV infections or disease (like genital warts). HPV vaccine is most effective when given as early as possible, ideally before men start having sex. It is because sexual experience increases the likelihood of HPV infection, making the vaccine less effective.

B 50.0% Human Papilloma Virus (HPV) is a common sexually transmitted infection. HPV infection does not usually cause any symptoms or health problems, so most men will not know that they are already infected. In very rare cases, HPV can lead to genital warts and cancers.

Gay, bisexual and other men who have sex with men are at much higher risk of genital warts and anal cancers, as a result of HPV infection.

HPV vaccine can help protect these men against the types of HPV that most commonly cause health problems such as genital warts. HPV vaccine is most effective against new HPV infections. However, the vaccine could also treat existing infection in half of the men who have already been exposed to HPV. Therefore, sexually active men may also benefit from HPV vaccination. Some doctors at sexual health clinics recommend this vaccine to their gay and bisexual patients.

Please indicate how effective do you think the HPV vaccine is.

	Not effective	Slightly effective	Moderately	Very	Extremely effective
How effective do you think the HPV vaccine is in preventing genital warts?	<input type="radio"/>				
How effective do you think the HPV vaccine is in preventing anal cancer?	<input type="radio"/>				
How effective do you think HPV vaccine is for men who are already sexually active?	<input type="radio"/>				
How effective do you think HPV vaccine is for men who had genital warts in the past?	<input type="radio"/>				
How effective do you think HPV vaccine is for men who are infected with HIV (HIV-positive)?	<input type="radio"/>				
How effective do you think HPV vaccine is for you?	<input type="radio"/>				

The next set of questions is about your sexual health. These will help us to understand who would most benefit from HPV vaccination. Again, we would like to assure you that responses are confidential and only the main researcher will be able to view them.

How old were you the first time you had sex with a man involving genital areas?

Altogether, in your life so far, how many men have you had sexual intercourse with?

Please indicate which of these roles best describes your preference during anal sex:

- Top/Active (mostly insertive anal sex or fucking)
- Bottom/Passive (mostly receptive anal sex or being fucked)
- Versatile (both insertive and receptive anal sex)
- Other
- Not applicable

In the last 12 months, how often have you had receptive anal sex with a man? This is a partner's penis in your anus (rectum or back passage)

- Not at all
- 1-2 times
- 3-10 times
- 11-30 times
- 31-50 times
- More than 50 times
- Prefer not to say

Have you ever had a test for sexually transmitted infections at a sexual health clinic?

- Yes
- No
- Maybe / Not sure

If yes, how old were you the first time you had a test for sexually transmitted infections at a sexual health clinic?

Where do you usually test for sexually transmitted infections? Tick as many as apply

- At a general NHS practice / family surgery
- At a private practice
- At a sexual health clinic
- At a hospital
- At an HIV testing service (this is not in a hospital or clinic)
- At a community service (e.g. Terrence Higgins Trust / youth service)
- At a blood bank, while donating blood
- I use a home testing kit
- In a bar, pub, club or sauna
- Mobile medical unit
- Other (please specify)

Have you ever been diagnosed with a sexually transmitted infection (other than HIV)?

- Yes
- No
- Prefer not to say

When did you last have an HIV test at a sexual health clinic?

- Within the last 7 days
- Within the last 4 weeks
- Within the last 6 months
- Within the last 12 months
- Within the last 2 years
- Within the last 5 years
- More than 5 years ago
- Never had an HIV test at a sexual health clinic

What do you think your current HIV status is (whether or not you've ever tested for HIV)?

- Definitely negative (I don't have HIV)
- Probably negative
- Probably positive
- Definitely positive (I do have HIV)
- I don't know
- Prefer not to say

Have you ever told any health professional (doctor or nurse) that you have sex with men?

- Yes
- No
- Maybe / Not sure

If yes, how old were you the first time you told any health professional (doctor or nurse) that you have sex with men?

Some of the questions we will be asking in this section are similar to previous questions. Please reply to these questions again as this is relevant for this research.

Compared to other men your age, what do you think are the chances of you...

	Much below average	Below average	Average	Above average	Much above average
Contracting a sexually transmitted infection	<input type="radio"/>				
Ever being infected with HPV	<input type="radio"/>				
Ever being infected with Hepatitis B	<input type="radio"/>				
Having genital or anal warts, sores or blisters	<input type="radio"/>				
Developing genital or anal cancer	<input type="radio"/>				

How likely is it that you would undertake any of the following:

	Very unlikely	Somewhat unlikely	Neither likely not unlikely	Somewhat likely	Very likely
Tell your doctor that you have sex with men in order to be vaccinated against HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Visit a sexual health clinic to be vaccinated against HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Seek information about HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ask your doctor about HPV vaccine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Consider being vaccinated against HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Accept HPV vaccine if a doctor offered it to you	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Receive a course of 3 injections of HPV vaccine over 6 months period	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Finally, please indicate to what extent you agree or disagree with the following statements:

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
My religious or moral beliefs will stop me from being vaccinated against HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My fear of needles will stop me from being vaccinated against HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't want people to know I have sex with men	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am not at risk of HPV infection	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HPV infection does not cause any health problems	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't need to be vaccinated against HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
I don't trust vaccines	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't have time to be vaccinated against HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I don't know enough about HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I know where to go for an HPV vaccine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel comfortable to attend my local sexual health clinic	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Being vaccinated against HPV is a sign of promiscuity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HPV vaccine is not relevant to my health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have already been infected with HPV in the past	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My doctor will recommend this vaccine to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel embarrassed to talk to my doctor about my sex life	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I need to test for HPV before I receive HPV vaccine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am concerned about side-effects of the HPV vaccine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am confident I will return to the clinic to complete 3 shots of HPV vaccine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am sexually active so it is too late for me to receive HPV vaccine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have had an unpleasant experiences with vaccines in the past	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I wouldn't accept the HPV vaccine if it was only offered to gay/bisexual men	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
I won't tell my doctor that I have sex with men	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am allergic to vaccinations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

The next set of questions is about your background. All information is anonymous and strictly confidential.

Were you born in the United Kingdom?

- Yes
- No

Which country do you currently live in?

- England
- Northern Ireland
- Scotland
- Wales
- Elsewhere (please specify)

How would you describe the place you live in?

- A very big city or town (a million or more people)
- A big city or town (500,000-999,999 people)
- A medium-sized city or town (100,000-499,999 people)
- A small city or town (10,000-99,999 people)
- A village / the countryside (less than 10,000 people)

What is your highest education qualification?

- No secondary qualification
- CSE (CSE Grades 2-5, NVQ/ SVQ Level 1, GNVQ/ GSVQ Level 1, City & Guilds Certificate Part 1, RSA Stage 1, 2 or 3, Recognised trade apprenticeship completed)
- 'O' level (or CSE Grade 1, GCSEs, SCE Standard, NVQ/ SVQ Level 2, GNVQ/ GSVQ Level 2, City & Guilds certificate-Ordinary/Part 2, RSA Diploma)
- 'A' levels (or AS levels, SCE Higher, NVQ/ SVQ Level 3, GNVQ Advanced/ GSVQ level 3, City & Guilds certificate-Advanced/Part 3, ONC, OND, BTEC National, SCOTVEC National, RSA Advanced Diploma)
- Higher education below degree level (e.g. HNC, HND, Higher Level BTEC, RSA Higher Diploma or other advanced training)
- University degree completed (e.g. Bachelors, Masters, PhD)

Which of these best describe your ethnic background?

- White
- Mixed/Multiple ethnic groups
- Asian/Asian British
- Black/African/Caribbean/Black British
- Other ethnic group (please specify)

Are you currently in a steady relationship? Tick as many as apply

- Yes, with a man
- Yes, with more than one man
- Yes, with a woman
- Yes, with more than one woman
- No, I'm single

How often do you usually go to gay pubs, bars, or clubs?

- At least once a week
- Less often but at least once a month
- Less often but at least twice a year
- Less often but at least once a year
- Less often than once a year
- Never

How often do you usually use websites or apps to meet other men?

- At least once a week
- Less often but at least once a month
- Less often but at least twice a year
- Less often but at least once a year
- Less often than once a year
- Never

Thank you very much for your time - it is much appreciated.

We would be grateful if you could provide us with your email address so that we can contact you by email in 2 weeks with a shorter survey that will take no more than 5 minutes to complete.

All information is strictly confidential and only the main researcher will have access to it.

Entering your email address will also make you eligible for a prize draw to win £75.

Email (please make sure it is spelled correctly):

Please tick the box below if you wish to receive the results of this survey

- Please send me the results

Where did you learn about our survey?

- From social media (e.g. Facebook)
- From a friend
- From a poster or leaflet
- I was approached at the gay bar, pub or club
- Other (please specify)

If you have any comments about the survey, please let us know in the box below.

You can also contact Tom Nadarzynski with any questions related to this study.

Tom Nadarzynski
Division of Public Health & Primary Care
Brighton & Sussex Medical School
Room 323 Mayfield House,
Falmer, Brighton,
BN1 9PH, UK
email: T.Nadarzynski@bsms.ac.uk

Do you need more information?

We have tried to ensure that the questions in this survey did not cause you any distress. However, we have included details about places where you can find out information or speak to someone about any concerns.

NHS Choices (www.nhs.uk)

Anyone in the UK, of any age, can get a free sexual health advice, vaccinations, check-ups and treatment at any NHS clinic. People under 16 do NOT need their parents' permission to visit a clinic. The NHS website provides a list of all sexual health services available in the UK.

Terrence Higgins Trust (www.tht.org.uk)

It is a British charity that aims to promote good sexual health amongst gay, bisexual and other men who have sex with men. The website provides a range of information about various sexually transmitted infections and sexual health services. If you have questions which hasn't been answered on the website, you can call THT Direct on 08088 021 221 for support, advice and information (10am till 8pm Monday to Friday).

London Lesbian and Gay Switchboard (www.llgs.org.uk)

Providing free and confidential support, and information to lesbian, gay, bisexual & transgendered communities throughout the UK.
Helpline: 0300 330 0630 (Daily 10am - 11pm)

Please type your email address in the field below and press NEXT to continue. (please make sure it is the same address you gave us before)

My email:

Some of the questions we will be asking are similar as you replied in the last survey. Please reply to these questions again as this is relevant for this research.

Compared to other men your age, what do you think are the chances of you

	Much below average	Below average	Average	Above average	Much above average
Contracting a sexually transmitted infection	<input type="radio"/>				
Ever being infected with HPV	<input type="radio"/>				
Ever being infected with hepatitis B	<input type="radio"/>				
Having genital or anal warts, sores or blisters	<input type="radio"/>				
Developing genital or anal cancer	<input type="radio"/>				

Have you done any of the following in the last 2 weeks?

	Yes	No
Told your doctor that you have sex with men in order to be vaccinated against HPV	<input type="radio"/>	<input type="radio"/>
Visited a sexual health clinic to be vaccinated against HPV	<input type="radio"/>	<input type="radio"/>
Sough information about HPV	<input type="radio"/>	<input type="radio"/>
Asked your doctor about HPV vaccine	<input type="radio"/>	<input type="radio"/>
Considered being vaccinated against HPV	<input type="radio"/>	<input type="radio"/>
Accepted HPV vaccine if a doctor offered it to you	<input type="radio"/>	<input type="radio"/>
Received a shot of HPV vaccine	<input type="radio"/>	<input type="radio"/>

If not, how likely is it that you would undertake any of the following:

	Very unlikely	Somewhat unlikely	Neither likely nor unlikely	Somewhat likely	Very likely
Tell your doctor that you have sex with men in order to be vaccinated against HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Visit a sexual health clinic to be vaccinated against HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Seek information about HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ask your doctor about HPV vaccine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Consider being vaccinated against HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Accept HPV vaccine if a doctor offered it to you	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Receive a course of 3 injections of HPV vaccine over 6 months period	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please answer the following questions:

	Yes	No
Do you believe that HPV vaccine can protect you from serious diseases?	<input type="radio"/>	<input type="radio"/>
Do you think that most men like you would be willing to receive all recommended vaccinations?	<input type="radio"/>	<input type="radio"/>
Have you ever been reluctant or hesitated to be vaccinated against sexually transmitted infections?	<input type="radio"/>	<input type="radio"/>
Have you ever refused a vaccination?	<input type="radio"/>	<input type="radio"/>

Please indicate how much your life might be impacted by various conditions below.

	Not at all	A little	Moderately	Extremely
How much do you think having HPV would affect your life?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How much do you think having genital warts would affect your life?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How much do you think having oral cancer would affect your life?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How much do you think having anal cancer would affect your life?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How serious would it be if you got HPV?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How serious would it be if you got oral cancer?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How serious would it be if you got anal cancer?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

To what extent do you agree or disagree with the following statements.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Being vaccinated against HPV would be a good way to protect my health	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HPV vaccine would reduce my risk of genital warts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Being vaccinated against HPV would decrease my fear of HPV infection	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Being vaccinated against HPV would be a good way to protect the health of my sex partners	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would recommend HPV vaccine to my gay and bisexual friends	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Being vaccinated against HPV would be a responsible thing to do	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HPV vaccine would reduce my risk of anal cancer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I think my doctor will recommend HPV vaccine to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My friends would think I am smart being vaccinated against HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There is no point in being vaccinated against HPV because I probably am infected with HPV already	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There would be one less thing to worry about if I got vaccinated against HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HPV vaccine would reduce my risk of HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I think health professionals should recommend HPV vaccine to all gay and bisexual men	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Many thanks for completing the survey.

The aim of this survey was to examine personal perceptions of HPV and HPV vaccine amongst men who have sex with men in the UK. We decided to contact you 2 weeks after the initial survey to see if any changes in your perceptions of HPV and HPV vaccine remained over time.

If you would like to discuss this study, please contact:

Tom Nadarzynski
 Division of Public Health & Primary Care
 Brighton & Sussex Medical School
 Room 323 Mayfield House,
 Falmer, Brighton,
 BN1 9PH, UK
 Tel: 01273 641887
 email: T.Nadarzynski@bsms.ac.uk

Do you need more information?

We have tried to ensure that the questions in this survey did not cause you any distress. However, we have included details about places where you can find out information or speak to someone about any concerns.

NHS Choices (www.nhs.uk)

Anyone in the UK, of any age, can get a free sexual health advice, vaccinations, check-ups and treatment at any NHS clinic. People under 16 do NOT need their parents' permission to visit a clinic. The NHS website provides a list of all sexual health services available in the UK.

Terrence Higgins Trust (www.tht.org.uk)

It is a British charity that aims to promote good sexual health amongst gay, bisexual and other men who have sex with men. The website provides a range of information about various sexually transmitted infections and sexual health services. If you have questions which hasn't been answered on the website, you can call THT Direct on 08088 021 221 for support, advice and information (10am till 8pm Monday to Friday),

London Lesbian and Gay Switchboard (www.llgs.org.uk)

Providing free & confidential support & information to lesbian, gay, bisexual & transgendered communities throughout the UK.
 Helpline: 0300 330 0630 (Daily 10am - 11pm)

Appendix L – Ethics approval for the mixed-methods study (Chapter VIII)

BSMS Research Governance & Ethics Committee (RGEC)

BSMS Research Governance & Ethics Committee (RGEC)

Chair: Professor Kevin Davies

Deputy Chair: Professor Bobbie Farsides

Secretary: Miss Caroline Brooks
Tel: 01273 696955 ext. 3905 (Monday – Wednesday) Tel: 01273
872855 (Thursday and Friday) Caroline.Brooks@bsuh.nhs.uk

11/09/2013

Dr Carrie Llewellyn
Brighton & Sussex Medical School
Mayfield House
University of Brighton
Falmer
Brighton
BN1 9PH



Brighton and Sussex Medical School
Medical Teaching Building
University of Sussex
Falmer
Brighton
BN1 9PX

Dear Dr Llewellyn

Full Study Title: Qualitative research into Healthcare professionals' attitudes towards the introduction of targeted Human Papillomavirus (HPV) vaccination for men who have sex with men

R&D Ref No. : 13/164/LLE

I am writing to inform you that the Brighton and Sussex Medical School Research Governance and Ethics Committee (RGEC) Sub-Panel which met on **Thursday 22nd August 2013** has now assessed your application. On our recommendation the University is willing to take on the role of **Research Sponsor** for the duration of the study.

Your project has been allocated the following reference: **13/164/LLE** please quote this on all correspondence.

Conditions of Approval

Please note that you cannot commence this study until you have been given a favourable opinion by the appropriate ethics committee (e.g. NRES). The approval will cover the period stated in your application to that Committee, and will be extended in line with any amendments agreed by the REC.

A favourable opinion must be gained from the appropriate ethics committee within 6 months of the issue date of this letter. Any delay beyond this may require a new review of the project.

If your project receives an unfavourable ethical opinion from NRES, you must submit the new protocol to the R&D office before sponsorship approval is granted for the re-submission.

Indemnity

The study will be indemnified by the University of Brighton.

Research Governance Approval

In addition to a favourable opinion from NRES you will also need to obtain Research Governance approval from each NHS site where you will be conducting the research or recruiting patients.

If your research will also be conducted on University of Sussex or Brighton premises, you will be granted research governance approval by this committee following notification of a favourable opinion from NRES.

Amendments

Any amendments to the project dated after the issue of this approval letter must also be submitted to the BSMS Research Governance and Ethics Committee for approval in order for Sponsorship to be valid. Please submit your application for an amendment to the Committee Secretary (via email) using the 'Request for an Amendment Form'.

Monitoring

The Medical School has a duty to ensure that all research is conducted in accordance with the Research Governance Framework and if appropriate. In order to ensure compliance the department undertakes random audits. If your project is selected for audit you will be given 4 weeks notice to prepare all documentation for inspection.

It is your responsibility to inform me in the event of early termination of the project or if you fail to complete the work.

I wish you luck with your project.

Yours sincerely



Professor Kevin Davies
Chair of the BSMS Research Governance and Ethics Committee

Appendix M – A list of sexual health clinics targeted for recruitment (Chapter VIII)

London SHA	East	East Midlands	North West	South East	South West	West Midlands	Yorkshire, Humberside
Central-Chelsea	Braintree	Ashton-under-Lyne	Ashton-under-Lyne	Ashford	Barnstaple	Birmingham	Barnsley
Central-City of London	Bury St Edmunds	Brighouse	Barrow-in-Furness	Aylesbury	Bath	Cannock	Bradford
Central-Hammersmith, Fulham	Cambridge	Burton-on-Trent	Birkenhead	Banbury	Blandford	Coventry	Bridlington
Central-Mortimer	Chelmsford	Chesterfield	Blackburn	Bognor Regis	Bodmin	Dudley	Cottingham
Central-Paddington	Colchester	Clacton	Blackpool	Bracknell	Bournemouth and Poole	Hereford	Dewsbury
Central-Soho	Grays	Derby	Bolton	Brighton	Bridport	Kidderminster	Doncaster
Central-Tower Hamlets	Great Yarmouth	Eastleigh	Burnley	Camberley	Bristol	Nuneaton	Grimsby
Central-Waterloo	Harlow	Gainsborough	Bury	Canterbury	Cheltenham	Redditch	Halifax
Central-Woolwich	Hertford	Grantham	Carlisle	Chertsey	Chippenham	Rugby	Harrogate
North East-Barking	Huntingdon	Horncastle	Chester	Crawley	Dorchester	Shrewsbury	Huddersfield
North East-Haringey	Ipswich	Kettering	Crewe	Dartford	Exeter	Stafford	Hull
North East-Homerton	Kings Lynn	Leicester	Heywood	Deal	Gloucester	Stoke-on-Trent	Keighley
North East-Leytonstone	Luton	Lincoln	Isle of Man	Dover	Guernsey	Stratford-upon-Avon	Leeds
North East-Newham	Maldon	Loughborough	Lancaster	Faversham	Jersey	Tamworth	Northallerton
North West-Barnet	Norwich	Louth	Leigh	Folkestone	Newquay	Telford	Rotherham
North West-Brent	Peterborough	Mablethorpe	Liverpool	Guildford	Penzance	Walsall	Scarborough
North West-Camden	South Woodham Ferrers	Maidenhead	Macclesfield	Hastings	Plymouth	Warwick	Sheffield
North West-Enfield	St Albans	Northampton	Manchester	High Wycombe	Salisbury	West Bromwich	Wakefield
North West-Hampstead	Stevenage	Nottingham	Middleton	Hythe	St Austell	Wolverhampton	Whitby
North West-Harrow	Watford	Retford	Morecambe	Kent	Swindon	Worcester	York
North West-Hillingdon	Westcliff on Sea	Romsey	Oldham	Leatherhead	Taunton		
North West-Hounslow		Scunthorpe	Preston	Lymington	Torquay		
North West-Islington		Skegness	Rochdale	Maidstone	Truro		
North West-Southall		Sleaford	Runcorn	Margate	Weston Super Mare		
North West-Wembley		Stockport	Salford	Newport	Weymouth		
South East-Bromley		Sutton-in-Ashfield	Southport	Oxford	Yeovil		
South East-Croydon		Tomorden	St Helens	Ramsgate			
South East-Southwark			Stockport	Reading			
South West-Carshalton			Warrington	Redhill			
South West-Kingston-upon-Thames			Wigan	Sheerness			
South West-Richmond			Workington	Sittingbourne			
South West-Tooting				Slough			
				Tunbridge Wells			
				Weston			

Appendix N – A list of sexual health clinics targeted for recruitment (Chapter VIII)



The South East Coast Sexual Health Research Group

Division of Public Health & Primary Care
Brighton & Sussex Medical School
Room 321 Mayfield House,
Falmer, Brighton,
BN1 9PH, UK
Tel: 01273 641911
email: t.nadarzynski@bsms.ac.uk

The South East Coast Sexual Health Research Group is conducting a study to explore attitudes of sexual health professionals towards the potential introduction of targeted HPV vaccination for men who have sex with men (MSM). We would like to invite you to complete our short survey asking about potential HPV vaccination effectiveness, safety and cost.

Please click the link to access the survey:

<http://www.smartsurvey.co.uk/s/109109TDXTG?preview=true>

We aim to investigate further whether targeting MSM would be feasible in the absence of routine HPV vaccination of adolescent males. We would value your participation in telephone interview to explore in more depth your views on the potential targeted HPV vaccination. All contributions will be anonymised and participants will be known only to the research team. Please leave your contact details at the bottom of the survey or contact one of our researchers.

For more information, please contact:

Tom Nadarzynski t.nadarzynski@bsms.ac.uk or call 01273 641 911

Dr Carrie Llewellyn c.d.llewellyn@bsms.ac.uk

Dr Daniel Richardson Daniel.Richardson@bsuh.nhs.uk

Appendix O – Participant information sheet used in mixed-methods study



Division of Public Health & Primary Care
Brighton & Sussex Medical School
Room 321 Mayfield House,
Falmer, Brighton,
BN1 9PH, UK

Tel: 01273 641911
email: t.nadarzynski@bsms.ac.uk

Healthcare professionals' attitudes towards the introduction of targeted Human Papillomavirus (HPV) vaccination for men who have sex with men

Information Page

Dear Sir/Madam

I would like to invite you to take part in an interview study. Before you decide, it is important for you to understand why this research is being carried out and what it will involve. Please take time to read the following information carefully.

Please ask us if there is anything that is not clear or if you would like more information. Do take time to decide whether or not you wish to take part.

What is the purpose of the study?

The study aims to explore the attitudes of various healthcare professionals towards the feasibility of introducing targeted Human Papillomavirus (HPV) vaccination for men who have sex in men. We are interested to understand beliefs regarding the practicability, effectiveness and potential barriers & facilitators of targeted HPV vaccination. We are interested in speaking to consultants from genitourinary medicine (GUM) clinics, General Practitioners, and Pharmacists.

Why have I been invited?

You have been invited to participate, as you fulfil our criteria and work in healthcare settings that could potentially offer vaccination services against HPV for young men who have sex with men.

Do I have to take part?

No. It is up to you to decide whether or not you wish to join the study. If you do agree to take part, we will ask you to sign a consent form.

What will happen to me if I take part?

We will arrange to meet you, at a time and location that is convenient for you (for example - your own place of work) to conduct an anonymous interview for about 30 minutes exploring your views and opinions. With your consent, the interview will be audio-recorded. No video recordings will be made. The recordings will be then transcribed and anonymised before analysis.

<Version 1> <1 Aug 13>

What are the possible benefits of taking part?

Although this research may not directly benefit you, it is hoped by studying the attitudes towards targeted HPV vaccination, we will better understand the implementation issues of introducing such a vaccination intervention programme. We hope this may lead to initiatives to help develop more comprehensive preventive programmes against Human Papillomavirus.

Are there any possible disadvantages or risks of taking part?

We believe that this study will be a straightforward interview and it does not convey any risks to our participants.

What about confidentiality?

All information collected about you during the course of the research will be kept confidential. Your anonymity will be assured. It will not be possible to identify any individuals in any reports of the research.

What will happen to the data collected?

The contents of the interview audio-recording will be transcribed by the interviewer and anonymised. We will not use your name(s) on the written copy or use any identifying information (e.g. other people mentioned in the interview will also be anonymised). The data will be stored in a secure location.

What will happen if I don't want to carry on with the study?

You are free to withdraw at any time and without giving a reason. We will also be happy to discuss with you what will happen to any data that has been collected up to the point of your withdrawal from the study.

What will happen to the results of the research study?

The results of the research study will be written up and form the basis of article(s) to be published in peer-reviewed journals. We will not use your name(s). We can send you a summary of the final report if you wish.

Who has approved this study?

This section will be amended once ethical approval by the Brighton and Sussex Medical School RGEC is received in full.

Queries, comments or complaints

If you have any queries, comments or complaints about this study, please contact myself or my supervisor, Dr Carrie Llewellyn. All contact details are given below.

Thank you for taking the time to read this information sheet. Please do contact us if you have any further questions regarding the study or to register interest to participate.

Contact Details:**Tom Nadarzynski (Primary Researcher)**

Doctoral Researcher
Brighton & Sussex Medical School
Mayfield House, Room 321
Falmer, Brighton
BN1 9PX
Email: T.Nadarzynski@bsms.ac.uk
Phone: 01273 644562

Dr Carrie Llewellyn (Supervisor)

Senior Lecturer
Brighton & Sussex Medical School
Mayfield House, Room 317
Falmer, Brighton
BN1 9PX
Email: C.D.Llewellyn@bsms.ac.uk
Phone: 01273 642187

Dr Daniel Richardson (Clinical Advisor)

Consultant & Hon Clinical Senior Lecturer
Brighton & Sussex Universities NHS Trust
Sexual Health & HIV Medicine
Eastern Road, Brighton
BN2 5BE
Email: Daniel.Richardson@bsuh.nhs.uk
Phone: 01273 664718

<Version 1> <1 Aug 13>

Appendix P – Participant information sheet used in mixed-methods study



Division of Public Health & Primary Care
Brighton & Sussex Medical School
Room 321 Mayfield House,
Falmer, Brighton,
BN1 9PH, UK

Tel: 01273 641911
email: t.nadarzynski@bsms.ac.uk

Healthcare professionals' attitudes towards the introduction of targeted Human Papillomavirus (HPV) vaccination for men who have sex with men

Consent Form

Name of Researchers:

Tom Nadarzynski, Dr Daniel Richardson, Dr Jake Bayley, Prof Helen Smith, Nicky Perry, Dr Carrie Llewellyn

Please initial box

I confirm that I have read and understood the information sheet dated <1 Aug 13> for the study. I have had the chance to read the information and ask questions about the study and am satisfied with the answers I have been given.

I understand that my participation in this study is voluntary and that I am free to stop at any time, and I do not have to give a reason for doing so. I understand that if I ask to stop the study my legal rights will not be affected in any way.

I understand that my interview will be audio recorded and this will be deleted as soon as it is transcribed (written down) and anonymised.

I consent to take part in the study

Name of Participant

Date

Signature

-
-
- I have explained the information in this document and encouraged the participant to ask questions and provided adequate time to answer them.

Tom Nadarzynski

Name of Researcher

Date

Signature

<Version 2> <1 March 13>

Appendix R – The format of survey questionnaire (Chapter VII)

The use of HPV vaccination in men



Dear Sexual Health Network Member,

School-based HPV vaccination for adolescent boys and targeted HPV vaccination for MSM is currently under consideration by the Department of Health. This short survey is investigating how sexual health staff see the use and value of HPV vaccine in heterosexual men and MSM.

We would be grateful if you could complete the short survey below and forward it to other practitioners in your department for their opinion.

Your responses are anonymous.

The findings will be used to develop further research examining the use of HPV vaccination in men.

For more information, please contact Tom Nadarzynski (t.nadarzynski@bsms.ac.uk or 01273 641 887)

Tom Nadarzynski
Dr Carrie Llewellyn
Dr Daniel Richardson

Have you ever been involved in HPV vaccination of any men?

- Yes - heterosexual men
- Yes - men who have sex with men
- No
- Not sure

Please indicate to what extent you agree or disagree with the following statements:

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Vaccinating females against HPV will reduce HPV-related cancers in heterosexual men	<input type="radio"/>				
Vaccinating females					

against HPV will reduce HPV-related cancers in men who have sex with men (MSM)	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>
HPV causes too few cancers among heterosexual men to make it worthwhile to offer vaccination	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HPV causes too few cancers among MSM to make it worthwhile to offer vaccination	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
HPV causes too few cancers among HIV-positive MSM to make it worthwhile to offer vaccination	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would recommend HPV vaccination of all men, regardless of their sexual orientation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would recommend targeting MSM to be vaccinated against HPV	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The majority of MSM would be	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

willing to receive the HPV vaccine					
It is too late to vaccinate against HPV if MSM are already sexually active	<input type="radio"/>				
HPV vaccination would encourage MSM to engage with sexual health services	<input type="radio"/>				
Vaccinating MSM could increase the likelihood of unsafe sex	<input type="radio"/>				
All MSM, regardless of their age, should be offered HPV vaccination	<input type="radio"/>				
The patient should cover the vaccine cost	<input type="radio"/>				
Targeted HPV vaccination should be based on individual assessment of each MSM attending sexual health clinic	<input type="radio"/>				
I have the skills to identify MSM that would benefit from the HPV vaccine	<input type="radio"/>				

**HPV
vaccination
should be
offered to
MSM in
alternative
settings
such as GP
practices or
pharmacies**

**Other
healthcare
professionals
would not
recommend
HPV
vaccination
to MSM**

**I feel
sufficiently
informed
about the
HPV
vaccination
for MSM**

<input type="radio"/>				
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<input type="radio"/>				
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

**If you have any additional comments about targeted HPV vaccination,
please write them in the box below:**

Are you:

- Male
- Female
- Transgender

What is your current professional role?

- Consultant
- Doctor in training
- Nurse
- Health advisor
- Other

Please specify the year of your qualification:

Where is your sexual health service located?

- London
- Anglia & Essex
- East Midlands
- South Midlands and Herts
- West Midlands
- Cheshire and Merseyside
- Cumbria and Lancashire
- Greater Manchester
- North East
- Yorkshire and the Humber
- Avon, Gloucestershire & Wiltshire
- Devon, Cornwall and Somerset
- Kent, Surrey & Sussex
- Thames Valley
- Wessex
- Northern Ireland
- Scotland
- Wales

Please indicate approximately what proportion of your service users are men who have sex with men:

- Below 10%**
- Between 10% and 30%**
- Between 30% and 50%**
- Between 50% and 70%**
- Between 70% and 100%**

We would be extremely grateful if you could take part in optional 30 minute telephone interview exploring in more depth your views on targeted HPV vaccination for MSM. If you are willing to participate, please leave your email address or telephone number below so that we can contact you to arrange the interview.

Your participation will be treated with confidentiality.

Name

E-mail address

Telephone

Tom Nadarzynski BSc MSc MBPsS

Doctoral Researcher

Division of Public Health & Primary Care

Brighton & Sussex Medical School

Room 323 Mayfield House,

Falmer, Brighton,

BN1 9PH, UK

Tel: 01273 641 887

email: t.nadarzynski@bsms.ac.uk