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**Men who have sex with men who do not access sexual health clinics nor disclose sexual orientation are unlikely to receive the HPV vaccine in the UK**

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## **Abstract**

**Background:** Men who have sex with men (MSM) are recommended the Human Papillomavirus (HPV) vaccination due to their higher risk of genital warts and anal cancer.

**Purpose:** To examine HPV vaccine acceptability amongst MSM in the UK. **Methods:** Using advertisements via Facebook, MSM were recruited to an online survey measuring motivations for HPV vaccination. Logistic regression was performed to identify predictors of HPV vaccine acceptability. **Results:** Out of 1508 MSM (median age = 22, range: 14–63 years) only 19% had good knowledge of HPV. Overall, 55% of MSM were willing to ask for the HPV vaccine and 89% would accept it if offered by a healthcare professional (HCP).

Access to sexual health clinics (SHCs) [OR = 1.82, 95% CI 1.29–2.89], the disclosure of sexual orientation to a HCP [OR = 2.02, CI 1.39–3.14] and HIV-positive status [OR = 1.96, CI 1.09–3.53] positively predicted HPV vaccine acceptability. After receiving information about HPV, perceptions of HPV risk [OR = 1.31, CI 1.05–1.63], HPV infection severity [OR = 1.89, CI 1.16–3.01], HPV vaccination benefits [OR = 1.61, CI 1.14–3.01], HPV vaccine effectiveness [OR = 1.54, CI 1.14–2.08], and the lack of perceived barriers to HPV vaccination [OR = 4.46, CI 2.95–6.73] were also associated with acceptability.

**Conclusions:** Although nearly half of MSM would not actively pursue HPV vaccination, the vast majority would accept the vaccine if recommended by HCPs. In order to achieve optimal uptake, vaccine promotion campaigns should focus on MSM who do not access SHCs and those unwilling to disclose their sexual orientation.

## INTRODUCTION

Vaccination against human papillomavirus (HPV), which is a common sexually transmitted infection (STI) protects associated genital warts as well as anogenital and oral cancers.[1]. From 2007, many developed countries introduced a female-oriented HPV vaccination strategy focussing on the prevention of cervical cancer. Data from Australia showed that high coverage of female-oriented vaccination could result in a parallel decline of the virus in unvaccinated heterosexual men of corresponding age, indicating that this strategy is capable of “herd protection”. [2] However, this strategy is unlikely to protect men who have sex outside of the vaccinated “herd”, such as men who have sex with men (MSM). In Australia, gender-neutral vaccination of adolescents at schools began in 2012 and a recent analysis indicated that additional targeted vaccination of MSM would also be beneficial and cost-effective.[3] In England, female-oriented HPV vaccination has consistently achieved 85% coverage and due to little clinical benefit of adding boys to HPV vaccination, the UK’s Joint Committee on Vaccination and Immunisation (JCVI) decided against a gender-neutral HPV vaccination strategy but recommended targeted HPV vaccination of MSM below the age of 46 years.[4,5]

MSM are at substantial risk of HPV-related diseases. Female-oriented HPV vaccination without an MSM-targeted approach is likely to increase health inequalities, as the rates of genital warts will decline in heterosexual populations, but not MSM.[3] HPV is very common amongst MSM, increasing the chances of acquiring HIV.[6] HIV-positive MSM are at substantially higher risk of anal cancer due to HPV, even after the introduction of highly active antiretroviral therapy (78 per 100 000 men).[7] Although most MSM would acquire at least one HPV type while being sexually active, the HPV vaccine protects against multiple HPV types, therefore reducing opportunities for further transmission.

## **HPV vaccine acceptability**

A lack of motivation towards the HPV vaccine could compromise the effectiveness of an MSM-targeted approach. There is evidence that MSM can be highly receptive to HPV vaccination, especially those who know about the virus and perceive themselves at risk of infection.[8] Although MSM in the UK have generally positive attitudes towards vaccinations against STIs, they do not perceive themselves at particular risk of HPV and its associated diseases.[9] MSM consider HPV to be mainly ‘a female’ issue relating to cervical cancer; thus suggesting that they might not perceive HPV vaccination as an urgent preventative intervention. Four fifths of MSM recruited in a London clinic expressed willingness to receive the vaccine[10]. However, MSM living outside of the capital might be less likely to access SH clinics or disclose sexuality to a healthcare professional (HCP), factors likely to be associated with vaccination uptake. Hence, the aim of this study was to identify factors associated with HPV vaccine acceptability in MSM in the UK nationwide.

## **METHODS**

### **Design and Participants**

The present study was a cross-sectional online survey exploring HPV vaccine acceptability. Demographic, behavioural and psychological factors were measured to identify correlates of HPV vaccine acceptability. Participants were self-identified gay, bisexual and other MSM over 16 years of age. The study used an online convenience sampling method to recruit men from various parts of the UK in order to gather views from MSM living in a variety of rural and urban areas. Participants, who were born outside of the UK and resident overseas, were excluded from the study because of their limited relevance to MSM-targeted HPV vaccination in the UK. All cisgender women, and self-identified heterosexual men with no experience of sexual intercourse with other men, were also excluded from the analysis.

## **Recruitment and Procedure**

Between July and September 2015, an advertisement was used to publicise the online survey using the Facebook social media platform. The advert encouraged MSM to take part in the study by offering an entry into a prize draw worth £75. The advertisement strategy was set to be shown to men, aged 16-26 years old, who lived in the UK and declared their interest in other men, as specified on their Facebook profiles. Additionally, the participants were encouraged to invite their gay and bisexual male friends to take part in the survey by sharing the study advert.

Once potential participants clicked on the Facebook advert, they were redirected to the online survey and were presented with an information and consent page describing the purpose of the study, confidentiality and participants' right to withdraw at any time. Finally, participants were shown links to health charities for MSM should they have any concerns or further questions.

## **Measurements**

The survey included 64 items. HPV vaccine acceptability was measured using a seven-item scale, developed from the results of a qualitative study about HPV vaccination for MSM (Nadarzynski et al., 2017). It reflected individual motivation and preparedness to initiate and complete the HPV vaccination course. Participants were asked to estimate the likelihood of performing seven activities related to HPV vaccination by choosing one of five responses ranging from "very unlikely" to "very likely". A composite score was calculated by averaging responses from these seven activities. The scale demonstrated good internal consistency in our sample ( $\alpha=0.90$ ).

Eleven single items assessed socio-demographic characteristics (i.e. age, gender identity, sexual identity, educational attainment, ethnicity, country of origin, country of

residence and size of settlement, relationship status, participation in the gay scene, usage of mobile phone dating applications). These were adopted from the Office for National Statistics (ONS; 2015) and the European MSM Internet Survey (EMIS; Weatherburn et al., 2013). Four single items, adopted from EMIS, assessed behavioural risk indicators of HPV infection risk (i.e. age of sexual debut, lifetime number of sexual partners, sexual role during anal sex, and frequency of anal intercourse in the last 12 months). Eight single items, adopted from EMIS, assessed access to healthcare (i.e. settings and uptake of STI screening, previous STI diagnosis, last HIV test, HIV status, sexual orientation disclosure to an HCP and the age of disclosure). Two items, adopted from EMIS, assessed hepatitis A and B status, examining uptake and schedule completion. HPV knowledge was measured using a single perceived knowledge question and a scale specifically developed for this study with eleven true/false statements. Five psychological constructs were measured: comparative risk perceptions of HPV-related diseases, perceived benefits and barriers to HPV vaccination, perceived HPV vaccine effectiveness and vaccine hesitancy, all showing good internal consistency ( $\alpha > 0.80$ ). Information about psychological measurements are available from the corresponding author.

### **Data analysis**

HPV vaccine acceptability scores were transformed into a four category ordinal variable (strongly unacceptable/unacceptable/acceptable/strongly acceptable). Multifactorial ordinal regression models were performed with demographic, behavioural and psychological exploratory factors. Significant variables were then entered into a multifactorial regression model for goodness-of-fit analysis and adjustment. Odds ratios with 95% confidence intervals were calculated to represent the significant associations.

## **RESULTS**

## **Sample characteristics**

In total, 1508 participants completed HPV vaccine acceptability measures. The median age was 22 years (range: 14-63), 93% self-identified as gay and 5% as bisexual (see supplementary Table A). The majority (85%) were born in the UK, 87% lived in England, 92% were White, and 61% reported being single. Around 43% had visited gay venues (e.g. bar, pub or club) and 47% reported using dating websites or mobile applications to meet other men at least once a month. 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 frequencies ranging from 1-2 times (19%) to more than 50 times (11%) in the last 12 months. A third of the sample reported never being tested for an STI at an SH clinic. The median age of the first SH screening was 19 years (range: 13-48). Approximately 26% of participants had not disclosed their same-sex experiences to an HCP. Amongst men who had disclosed, the median age of disclosure was 19 years (range: 13-50). Overall, 27% and 49% of the sample reported completing hepatitis A and B vaccinations, respectively.

## **HPV vaccine acceptability**

Figure 1 outlines the responses to each item of the HPV vaccine acceptability measurement. Overall, 83% of MSM would be willing to receive the HPV vaccine (mean = 3.94, SD=0.91, median=4, interquartile range: 3.4-4.7). Responses to each vaccination behaviour variable is presented in figure 1.

## **Factors associated with HPV vaccine acceptability**

Table 1 presents socio-demographic associations of HPV vaccine acceptability. Characteristics such as being younger than 18, born in the UK, of non-White ethnic origin, and living in either a small town or a village were associated with lower HPV vaccine

acceptability. MSM that had never visited gay venues or had not used online apps/websites to meet other men also reported lower levels of HPV vaccine acceptability. The participants who reported higher numbers of lifetime sexual partners and engaged more frequently in receptive anal intercourse showed higher levels of HPV vaccine acceptability. MSM that had disclosed their sexual orientation to a HCP, had previously visited an SH clinic for STI screening and had previously received the hepatitis vaccination were more likely to accept the HPV vaccine. Additionally, men who had tested for HIV in the previous six months, or 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.

Table 2 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. The multifactorial ordinal regression showed that all psychological variables, excluding vaccine hesitancy, were associated with HPV vaccine acceptability, with perceived barriers being the strongest correlate.

## **DISCUSSION**

This study shows that while half of MSM might be unlikely to actively seek the HPV vaccine, nearly all would be willing to accept it if offered by a HCP. MSM face multiple barriers to HPV vaccination such as the difficulty with accessing SH clinics and openly discussing their sexuality. We have observed a trend in which younger MSM, living outside of urban areas, who do not participate in their gay community/socio-sexual networks and have restricted access to SH services are less likely to accept the HPV vaccine. Also, men who perceived numerous barriers and did not see HPV vaccine as beneficial saw themselves

less likely to receive the vaccine. Therefore, HPV vaccination programmes for MSM in the UK need to reduce these barriers to increase motivation towards the vaccine and overall uptake rates.

Similar HPV vaccine acceptability rates had been reported in other developed countries such as Sweden (79%)[11], the USA (86%, 74%)[12, 13], and Italy (89%)[14]. This study also supports the findings of King et al. (2015)[10] which concluded that 83% of MSM in London would find HPV vaccine acceptable. The high acceptability rate could be explained by general positive attitudes of UK MSM towards STI prevention, including vaccinations.[9] However, the contrast in the virtual HPV vaccine acceptability and actual suboptimal completion of hepatitis A and B vaccination we observe in our study suggests MSM face other substantial barriers to vaccinations. Although investigation of the reasons for the suboptimal uptake of hepatitis A and B vaccinations were not within this project's scope, these rates could be indicative of the future actual HPV vaccination initiation and completion rates amongst young MSM.

Our study identified multiple factors associated with HPV vaccine acceptability in MSM. These factors are consistent with previous research of Reiter et al. (2010)[15] and Meites et al. (2014)[16] who showed that MSM, who were at the beginning of their sexual activity, reported lower number of sexual partners and were less likely to accept the vaccine. It is possible that these men have poor knowledge about STIs due to their limited access to socio-sexual networks and SH services, thus may not perceive themselves at risk of STIs, including HPV. An analysis of attendances demonstrated that approximately 374,983 MSM utilised SH clinics in England [17], which accounts for 45% of the estimated size of the MSM population by Public Health England (830,558 MSM) [18]. If only half of MSM access SH clinics and about 60% of those are willing to disclose same-sex behaviours, then the

majority of MSM will remain unvaccinated. Therefore, in order to eradicate the virus in the MSM population alternative vaccination strategies might need to be considered.

### **Strengths and limitations**

While there is no agreed measure of acceptability, this study utilised a 7-item scale, with excellent internal consistency, to better understand the motivation for HPV vaccination amongst MSM. This study used an online recruitment method to reach young, geographically dispersed MSM. The characteristics of this sample are considered to be highly relevant in MSM-targeted HPV vaccination, as a third of the sample reported having less than six lifetime sexual partners and 65% were below the age of 26 years. Although this study relied on a convenience sampling method through Facebook advertisement, the study was advertised nationally and may represent views of a diverse group of MSM. Although it is impossible to specify the representativeness of the sample, several studies have highlighted the benefit of using social media to recruit MSM.[19] Moreover, one analysis demonstrated that there were no differences in the demographic and behavioural characteristics of MSM recruited via conventional sampling methods in various gay-oriented spaces and those recruited via Facebook.[20] Our study used a specific sampling quota targeting only men who disclosed their interest in men, suggesting they were already comfortable disclosing their sexuality online. Thus, the generalizability of these findings is limited. There is a possibility that HPV vaccine acceptability could differ amongst younger MSM who are not yet ready to disclose their sexual orientation. Also, the self-reported data are subject to recall bias and social desirability; it is possible that some participants incorrectly reported vaccination history for HPV or hepatitis, and falsely estimated the age of sexual debut or the number of lifetime sexual partners.

## **Conclusion**

Poor awareness and lack of perceived demand for the HPV vaccine could delay vaccine uptake, reducing the effectiveness of an MSM-targeted HPV vaccination. Active promotion and recommendation of the vaccine by HCPs is essential to achieving optimal uptake. MSM at the beginning of their same-sex activity, who face multiple barriers to accessing SH services and who are the most relevant for the HPV vaccination might be less likely to receive it. If HPV vaccination cannot reach these men, the overall cost-effectiveness of the programme will be compromised. This will require the provision of alternative settings for vaccination of young men still unsure of their sexual orientation.

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