Covariates for Frequent HIV Testing among Dutch Men who have Sex with Men

Thesis based on existing data

Social Policy and Public Health

Anouk van Duinkerken (6533485)

Supervisor: John de Wit

Date: 24-06-2019

Word count: 7604

Abstract

Background: In the Netherlands, late presentation into HIV care among MSM has not declined since 2008. The availability of antiretroviral therapy was expected to increase testing rates, but this has not happened. It is important that MSM know their HIV status, because getting into care when HIV has not progressed allows for a more effective and efficient treatment. Therefore, sexual active MSM are advised to test every 3-6 months. The objective of this study is to gain insight into the covariates for frequent testing among MSM.

Methods: The data was collected through a large scale survey among Dutch MSM. The dependent variable was testing frequency, which was divided in two groups: those who test frequently (every 3-6 months) and those who test less frequently. Those who never tested were not included in the analysis. The covariates were related to sexual behaviour and relationship status, social environment, health and wellbeing and HIV prevention beliefs. Bivariate logistic regression is used to calculate odds ratios. Those with a significance level of $p<0.10$ were included in the model for multivariate analysis.

Results: 3321 respondents were included in the analysis, 56.1% of them do not follow the guidelines of testing every 3-6 months. Factors associated with a higher likelihood of testing frequently in multivariate analysis are having a non-Western migration background, engaging in anal sex with casual partners and one night stands, engaging in group sex, ever having used PrEP, ever had an STI before and perceived likelihood of HIV infection. Factors associated with a lower likelihood of testing frequently in multivariate analysis are being in a relationship, living outside of Amsterdam and being notified to test for HIV.

Discussion: One possible explanation for these covariates is risk perception: those who perform more risk behaviour and perceive the likelihood of HIV infection to be higher are more likely to test frequently. Another explanation can be the prevention efforts taken in Amsterdam and for people with a non-western migration background, which explains why they are more likely to test frequently than those outside of Amsterdam and from a Dutch origin. The third potential explanation is social norms, in settings where testing for HIV is more normalized, for example in Amsterdam, other people are also more likely to get tested. Sexual health promotion for MSM should be more widespread, focusing on different types of MSM, including those with a low risk and those living outside of Amsterdam.

Problem Statement

In the Netherlands, men who have sex with men [MSM] present to be the biggest risk group for contracting HIV (Van den Broek et al., 2015). Since 2007, the HIV positivity rate has declined among MSM, from 2.7% to 0.8% (Visser et al., 2018). However, in that same period, late presentation among Dutch MSM into HIV care has remained stable (Visser et al., 2018). Late presentation for HIV care means first getting into treatment when HIV has already progressed to a certain level, CD4 count <350/mm3, or AIDS (Visser et al., 2018), meaning that they are not able to fully benefit from antiretroviral therapy [ART] (Antinori et al., 2011). As mentioned by Moreno, Mocroft and Montforte (2010), late presentation is related to greater risk of morbidity and mortality as well as the need for more resources to manage the disease. It is also associated with being more likely to spread the virus to others because getting an HIV diagnosis is related with safer sexual behaviour and getting ART (Girardi et al., 2004; Chesney & Smith, 1999). According to Smit, Hallett, Lange, Garnett and De Wolf (2008), 25% of MSM presents when HIV symptoms have already developed, and it is estimated that mortality from HIV could be reduced by 20% when all of these MSM were to receive ART on time. The availability of ART was expected to increase early testing, but this trend has not been witnessed in Europe (Mounier-Jack, Nielsen & Coker, 2008).

To ensure that everyone who is HIV positive receives HIV treatment as soon as possible after contracting the virus, frequent testing is important (Smit et al., 2008). Guidelines advice sexually active MSM to get tested every six months at least, every three months for those in a high-risk category (Soa Aids Nederland, 2013). However, 21.2% of MSM in the Netherlands have not been tested for HIV at all (den Daas et al., 2018). Next to this, there also is a big group that does not get tested frequently (31.4%) (den Daas et al., 2018), which can also lead to late presentation for HIV care. While frequent testing is so important, no nation-wide research has been conducted to the factors associated with frequent HIV testing among MSM in the Netherlands. This can also guide research further into barriers and motivators and motives for frequent HIV testing among Dutch MSM. Motives for (in)frequently getting tested are still unclear and it is recommended by Visser, Heijne, Hogewoning and van Aar (2017) that more research into testing behaviour is conducted. Gaining insight into the factors that are associated with frequency of HIV testing is important, because it can present

possibilities for more effective interventions by shining light upon where change is needed and enabling tailoring of interventions. There are several ways to encourage early testing: routine screening of the general population or at-risk groups (such as MSM), improving recognition by healthcare providers and focus on changing social norms regarding HIV testing (Yazdanpanah, Lange, Gerstoft & Cairns, 2010), and looking at the factors associated with frequent HIV testing provides insight which approach would be the most effective.

Barriers and Motivators to HIV testing

A literature review done by Deblonde et al. (2010) identified several barriers to HIV testing in Europe. The main goal of the papers that were included in the review was reporting barriers to testing for HIV. The articles were not screened on setting, methodology or response rate so no quality assessment of the included articles is done, possibly increasing bias. However, only articles published in peer-reviewed journals were included to guarantee quality of the papers. In total, 24 articles were included in the review. Several barriers were included and then classified to several levels: client/patient level, health care provider level and institutional/policy level. The first level included the following barriers to HIV testing: fear of disease and its consequences (specifically related to stigma), low risk perception, lack of knowledge (regarding location for health services, benefits of HIV testing and about HIV itself), worries about confidentiality and language problems. At the level of the health care provider, the following barriers were identified: inability to address HIV effectively, reluctance in offering HIV test, doubting on the benefits, perceived lack of training in order to cope with the challenges of HIV, anxiety. Barriers falling under the institutional/policy level are: lack of resources, lack of knowledge, lack of guidelines, lack of political will, lack of advocacy, no policy for universal offering of HIV testing and policies trying to repress sex work and drug use.

Lorenc et al. (2011) also did a literature review with regards to HIV testing, specifically among MSM (at least 50% of the sample used in the studies included in the review). This systematic review included qualitative research to the perceptions or attitudes to HIV testing (services) in countries that are a member of the OECD. In total, 17 articles were included. Quality of the papers was assessed using a standardized tool, resulting in a quality rating. However, this quality assessment did not result

in exclusion of articles, since it was only used to estimate the validity of the findings. The findings were classified into four groups: cues and triggers, uncertainty, fear and denial, responsibility, relationships and social norms and lastly, HIV testing services. The first category is cues and triggers, shining light upon the motivations to get tested for HIV. Experiencing symptoms, being at risk, getting informed of an(ex-)partner's or friend's HIV infection, encouragement from peers, media or health care professionals, doubting a partner's behaviour and being required to test from immigration authorities or insurers were motivations to get tested. This shows that there are a lot of different cues, of which the experience of symptoms and perceiving to be at risk are the most frequently mentioned. The second category is labelled uncertainty, fear and denial, an important theme with regards to HIV testing. Uncertainty can work both ways, eliminating it can work as a motivator but the uncertainty can also be seen as easier than dealing with the consequences of a positive test. A decrease in life quality due to treatment and having to change lifestyle and sexual behaviour were mentioned as those consequences of a positive result. The third category is responsibility, relationships and social norms. Responsibility towards oneself and one's partner is mentioned as a reason to get an HIV test but also presents a barrier towards testing because of trust between partners. Another barrier to HIV testing among MSM is the prejudice against gay men, specifically from health care professionals. Also, the stigma towards HIV and HIV testing within the gay scene can also be a barrier to HIV testing, since it is associated with a fear for discrimination or being the subject of gossip. The fourth category is about HIV testing services, in which is stated that community-based, friendly testing sites in which sexuality and STDs/HIV are normalized are ideal. Testing methods that were less intrusive with a short waiting time for results were preferred to traditional methods. Another motivator to get tested for HIV are health care providers that are supportive, non-judgemental and non-prejudiced. Lastly, confidentiality and anonymity were seen as very important.

A literature review done by de Wit & Adam (2008) also identified hindering and promoting factors to HIV testing. The review includes 50 studies addressing psychosocial barriers and facilitators of HIV testing. Quality assessment for inclusion was not described. The review differentiated two types of studies: those that studied reasons for HIV testing and those that looked at relationships between psychosocial factors and HIV testing. Both of these types mentioned the same barriers to HIV testing:

low risk perception and fear of positive test results and it's (social) consequences. Facilitators to testing identified in the first type of study are routine testing and perceiving themselves as being at risk. Within the second type of study, perceiving more benefits (compared to costs) is associated with uptake of HIV testing.

Next to these literature reviews, it is also important to look at studies about frequent HIV testing instead of HIV testing in general. The study done by Adam, de Wit, Bourne, Knox and Purchas (2014) gives insight into the sociodemographic, behavioural and social-cognitive factors associated with routine testing among MSM in New South Wales. The study conducted an online survey answered by 580 non-HIV positive men. Factors associated with routine testing for HIV were knowledge, perceived benefits of HIV testing, attitudes towards HIV testing and perceived behavioural control. Another study looks at the factors associated with frequent HIV testing among MSM in the United States (Mitchell & Horvath, 2013). The sample included 275 HIV negative MSM couples who filled in an online survey. They established a monogamous relationship as one of the factors that is associated with less frequent testing, as well as high levels of trust in their relationships. This can also be framed as low risk perception: since they only have sex with one partner, they perceive themselves not to be at risk for HIV and don't feel the need to get tested frequently.

Theoretical Framework

Cognitive models are often used in public health and offer an understanding about who performs certain health behaviours and what influences their motivation to do so. Cognitive factors deemed important to behaviour change because they are important causes of behaviour, they mediate other effects (such as sociodemographic factors), and because they are more open to change through interventions (Conner & Norman, 2005).

An important, widely used cognitive model is the social cognitive theory [SCT] (Armitage & Conner, 2000). It looks at the constant interaction between environment, the individual and the behaviour itself, explaining how behavioural patterns are acquired and maintained (Glanz, Rimer & Lewis, 2002). The model has a large social component, which is important in health promotion since behaviour is always performed in certain social structures (Fehl, van der Post, Semmann, 2011).

Within these structures, HIV is stigmatized, so involving the social component of behaviour in the model is one of the strengths of social cognitive theory. Personal factors within SCT refer to cognitive processes that happen within the individual, affecting behaviour. Examples of these factors are attitude, knowledge, perceived benefits and self-efficacy. They interact with environmental (social) factors, such as social norms. However, this model does not include intention to perform the behaviour and does not include the actual barriers between intention and the behaviour (Glanz et al., 2002).
Another important social cognitive theory within public health is the integrated behavioural model [IBM], which is designed specifically for the purpose of combining and making sense of various models that exist. In IBM, three cognitive factors are predictors of intention to perform the behaviour: personal agency, perceived norms and attitude. Attitude refers to how the individual feels about the behaviour and the perceived outcomes. Perceived norms are based on how others behave and how the individual perceives how others want them to behave. Perceived control about the behaviour and self-efficacy form the personal agency: whether the individual feels like they can perform the behaviour. These factors influence intention, which is the greatest predictor of behaviour. However, there are also factors included in the model that cause the so called intention-behaviour gap: actual skills to perform the behaviour, salience of the behaviour, environmental constraints and habit. This model captures a lot of important factors that are related to HIV testing, however, it assumes rationality for a large part and it ignores the interrelation between the different factors that influence behaviour.
As described above, the factors related to HIV testing among MSM are abundant, diverse and interrelated. This makes it impossible for a single theoretical model to capture all of the possible pathways that influence frequent testing among MSM. An ecological approach to the matter at hand will be more fitting, in which the interaction between environmental, social and psychological factors play a role. Enhancing motivation and skills among individuals will not suffice when the environment (either physical or sociocultural) hinders them. By taking an ecological approach, multiple levels and their interaction are considered, enabling interventions in which the mechanisms of change at different levels can be targeted (Sallis, Owen & Fisher, 2015). In the perspective of educational and ecological assessment from Green & Kreuter (2005), the factors are classified and mapped, but the complex interrelationships between these factors are not ignored. Classification of the factors into categories

facilitates grouping according to different types of public health interventions. This assessment takes social learning processes into account, in which individuals interact with their environment, “people are producers as well as products of social systems” (Bandura, 1999, p24). The broad framework has a basis in different theories both applicable and appropriate to public health interventions. Factors that influence behaviour can be classified according to the following types: predisposing factors, enabling factors and reinforcing factors.

Predisposing factors refer to those factors that form the rationale or motivation to perform the behaviour, including both cognitive and affective dimensions. Important factors that can be classified as predisposing factors are knowledge, beliefs, values, attitudes, perceived needs and self-efficacy. The latter refers to a feeling of being able to perform the behaviour and interact with their environment, and is linked with actual skills for performing the behaviour. Learning (how) to perform a behaviour can occur through three processes: direct experience, social learning (observing others), assessing information and learning how to anticipate consequences of performing that action leading to self-appraisal. Sociodemographic factors could also be classified as predisposing factors, but since they cannot directly be changed by interventions, they should be used as a means to segment the target population, enabling tailoring of interventions to different subgroups within populations.

Enabling factors are the factors that facilitate or hinder the performance of the behaviour after motivation to perform the behaviour is existing. Important enabling factors in health care are availability, accessibility, affordability of the behaviour at stake. Reinforcing factors are the factors that influence whether the person will continue that behaviour. The consequences of performing the behaviour are a very important factors for whether the individual will repeat the behaviour, key in frequent HIV testing. One of the important reinforcing factors are social norms, norms influence behaviour through social sanctioning: “behaviour that violates social norms brings social censure” (Bandura, 1998, p.628). If an individual gets a negative reaction from their social environment from performing the behaviour, they are less likely to continue that behaviour and vice versa.

Research Question

To get insight in HIV testing practices among MSM in the Netherlands, covariates for testing frequently (every 3-6 months) have to be identified. The following research question will be answered with this study: "Which predisposing, enabling and reinforcing factors can be identified to be associated with HIV testing frequency among Dutch men who have sex with men?"

Methods

Instrument and Participants

The data that was used for the analysis is from the Survey Men & Sexuality 2018 conducted by Soa Aids Nederland, the Netherlands National Institute for Public Health and the Environment and Utrecht University. Recruitment was organised by Soa Aids Nederland and other external professionals, through online and offline channels: social media and gay media. Next to this, various organisations, editorial boards, public health services and professionals in HIV treatment were informed about the survey as well. The link to the survey was clicked by 8101 people, of these people 7986 gave consent to participate in the survey. 1781 people got excluded from the results because they did not meet the inclusion criteria, which are the following: no information about age, being younger than 16 years old, being a woman, only have had sex with women, only attracted to women, never had sex and missing information about sexual behaviour. Of these 6205 men that fit the inclusion criteria, not everyone completed the survey, resulting in 3935 respondents in total. The online survey consisted of questions about sexual behaviour, testing behaviour, perceptions about HIV (treatment), sexually transmittable infections, social identity, sex education/prevention, lifestyle, socioeconomic and psychosocial factors. The survey consisted of 153 default questions: open-ended questions, multiple choice questions, questions to be answered on Likert scales of different ranges, yes/no questions and percentages on a rating scale. The entire questionnaire can be found in appendix A.

Outcome variable

Guidelines advice sexually active MSM to test every 3-6 months (Soa Aids Nederland, 2013). Whether MSM in the Netherlands follow this guideline is measured by self-reported testing frequency,

which is the outcome variable in this study. A distinction was made between testing frequently (those who test between every 0 to 3 months and those who test between every 3 to 6 months) and testing infrequently (those who test less frequently and do not participate in a study). Those who never tested for HIV were excluded from the analysis, as well as those who did not answer the question for the outcome variable: testing frequency. The respondents who answered that they tested regularly because they participated in a study were excluded from the analysis as well, since 'frequently' was not defined in the question and their testing habits outside the study are not known.

Covariates

Sociodemographic factors.

For sociodemographic factors, age, migration background, city of residence, education level and sexual identity were asked. For analysis, migration background was divided into three groups: Dutch, Western and Non-Western. No distinction was made between first or second generation. Education is divided in two groups: high and low. High education level was defined as tertiary education after high school, low education was defined as high school level or lower. Sexual identity was divided into 'homosexual'/'gay' and 'other', since those identifying as bisexual, heterosexual and other was a small group, too small for meaningful analysis if taken apart.

Relationships, sex and risk.

Questions about relationships, sex and risk were about the past six months. It covers relationship status, anal sex with different types of partners, engagement in group sex, number of sex partners, number of anal sex partners and the use of drugs and alcohol before or during sex.

Health and wellbeing.

Exposure to sexual health related information was measured in frequency in the past six months, ranging from 'never' to 'often'. Sexual health was measured in whether respondents have had an STI in the past six months, whether they ever used PEP and whether they ever used PrEP. Mental health

was measured by anxiety and depression, defined by the Hospital Anxiety and Depression Scale [HADS] (Snaith, 2003). Both of them were measured through 7 different items in the HADS, and the Cronbach Alpha was α=.709 for anxiety and α=.747 for depression. HIV-related stigma was measured by 14 items, relating to cognitions about HIV-positive people, feelings about HIV-positive people and behavior around HIV-positive people of which the Cronbach Alpha is α=.732.

Social environment.

The presence of HIV-positive people was measured with 'yes' or 'no', no distinction was made whether people had a lot or a few HIV-positive people in their environment, since those groups would become too small for meaningful analysis. Social environment was measured by the share of gay men among their friends (ranging from (almost) none to (almost) all), the share of time spent with gay men (ranging from (almost) none to (almost) all) and the feelings of connection to the gay community (ranging from not at all to very strongly).

HIV-prevention beliefs.

HIV prevention beliefs were measured through HIV-related knowledge, attitude towards HIV testing, perceived likelihood of HIV infection and perceived severity of HIV infection. The variable 'HIV-related knowledge' was made up of 4 statements about HIV-prevention and treatment, of which the Cronbach's Alpha is α=.616. Attitude towards HIV testing was made up by questions relating to effectiveness, pleasantness and acceptability of HIV testing, of which the Cronbach's Alpha is α=.803. Perceived likelihood of HIV infection was measured by one question, ranging from very low to very high. Perceived severity of HIV infection was also measured by one question, ranging from not at all severe to very severe.

Data Analysis

Data was analysed in IBM SPSS. Before starting the analysis, data was assessed and recoded if necessary for the analysis. Reliability of the subscales used in the survey were calculated, using the Cronbach's Alpha. To describe the study sample, frequencies and percentages on sociodemographic

factors and testing behaviours were calculated. After doing this, bivariate, logistic regression was conducted to determine which factors are correlated with testing frequency on their own. For inclusion in the multivariate analysis, covariates had to have a significance level of lower than $p<0.10$. The covariates were entered into the model simultaneously. The factors with $p<.050$ were accepted as significant covariates for testing frequency. Nagelkerke's pseudo R2 was included to assess the explained variance by the factors of the model.

Results

Sociodemographic Factors

In total, 3321 respondents were included in the analysis, see table 1 for details on the sociodemographic factors. Most participants were older than 40 years old, followed by the age group of 25-39 and the age group of younger than 25. Most of the participants were highly educated and of Dutch origin. 15.7% of the respondents live in Amsterdam, 6.5% in Rotterdam, 4.5% in The Hague and 4.5% in Utrecht. Most of the participants identified as gay or homosexual, around 10% identified as bisexual, and a very small percentage identified as heterosexual or another sexual identity. 60% of the participants have been tested for HIV in the past six months, so around 40% of them were tested more than six months ago. 56.1% of the respondents did not follow the guidelines of consistently getting tested for HIV every three to six months.

Table 1

Sociodemographic characteristics (n=3321)

	N	%
Education		
Low	1025	30.9%
High	2294	69.1%
Migration background		
NL	2681	80.7%
Western	245	7.4%
Non-Western	395	11.9%
City of residence		
Amsterdam	498	15.7%
Rotterdam	205	6.5%

Tabel 1 (continued)

The Hague	142	4.5%
Utrecht	142	4.5%
Other	2186	68.9%
Age		
<25	875	26.3%
25-39	1077	32.4%
>40	1369	41.2%
Sexual identity		
Gay/homosexual	2932	88.3%
Bisexual	337	10.1%
Heterosexual	16	0.5%
Other	36	1.1%
Time since last HIV test		
0-3 months	1280	38.5%
4-6 months	716	21.6%
6-12 months	507	15.3%
12+ months	818	24.6%
Testing frequency		
Every 3-6 months	1457	43.9%
Less frequent & other	1864	56.1%

Bivariate Analyses

The sociodemographic covariates of testing frequently identified in bivariate analysis are having a non-Western migration background, who are more likely to test frequently compared to those of Dutch origin, living in Utrecht, who are less likely to test frequently compared to those living in Amsterdam and those who do not identify as homosexual/gay, who are less likely to test frequently compared to those identifying as homosexual/gay. Engaging in anal sex with one night stands and casual partners, engaging in group sex and using drugs before or during sex are factors associated with likelihood to test frequently, those who engage in those behaviours are more likely to test frequently than those who do not engage in those behaviours. The amount of sex and anal sex partners in the past six months are also covariates for testing frequency, those with more sex and anal sex partners are more likely to test frequently. Those who had at least one relationship in the past six months are less likely to test frequently compared to those who did not. Seeing more sexual health related information is a covariate for testing frequently, as well as having had an STI in the past six months and ever having used PEP or PrEP. Those who have been notified to test for HIV and those who score higher on the depression scale are less likely to test frequently. Those who have a bigger share of gay men among their friends,

spend more time with gay men, experience more connection to the gay community and who have HIV-positive people in their social environment are more likely to test frequently. Scoring higher on HIV-related knowledge, having a more positive attitude towards HIV-testing and having a higher perception of likelihood of HIV infection are associated with testing frequency. Those who score higher on perceived severity of HIV-infection are less likely to test frequently than those with a low score. In table 2, the odds ratio [OR] and significance level of every factor are noted.

Multivariate Analysis

Factors that stayed covariates for testing frequently in multivariate analysis were having a non-Western migration background, engaging in anal sex with one night stands and casual partners, engaging in group sex, having had an STI in the past six months, ever having used PrEP, spending a bigger share of time with gay men, a more positive attitude towards HIV testing, having more HIV-related knowledge and higher perceived likelihood of HIV infection. Factors that stayed associated with lower likelihood of testing frequently in multivariate analysis were living in Utrecht, having a relationship, being notified to test for HIV and scoring higher on the depression scale.

Table 2:

Bivariate and multivariate analyses

	Testing frequently or not frequently			
Covariates	Bivariate: OR [CI95%]	Sig.	Multivariate: OR [CI95%]	Sig.
Sample				
Age	.999 [.998-1.001]	.221		
Migration background				
Dutch	Reference	.000	Reference	.125
Western	1.302 [1.002-1.691]	.049	1.103 [.732-1.662]	.683
Non-Western	1.377 [1.114-1.701]	.003	1.396 [1.011-1.927]	.043
Education				
High	Reference			
Low	.898 [.774-1.042]	.158		

Table 2 (continued)

Place of residence						
Amsterdam	Reference	.000	Reference	.012		
Rotterdam	.728 [.526-1.009]	.057	.821 [.517-1.304]	.404		
The Hague	.834 [.574-1.212]	.341	1.229 [.731-2.006]	.437		
Utrecht	.454 [.309-.668]	.000	.431 [.257-.724]	.001		
Other	.566 [.466-.689]	.000	.938 [.710-1.238]	.649		
Sexual identity						
Homosexual	Reference		Reference			
Other	.615 [.492-.768]	.000	.885 [.617-1.269]	.506		
Relationship, sex and risk						
Relationship (past 6 months)						
No	Reference		Reference			
Yes	.439 [.381-.505]	.000	.500 [.405-.618]	.000		
Anal sex with steady partners?						
No	Reference					
Yes	1.300 [1.053-1.605]	.014				
Anal sex with one or more one night stands?						
No	Reference		Reference			
Yes	4.326 [3.728-5.020]	.000	2.079 [1.661-2.603]	.000		
Anal sex with one or more casual partners?						
No	Reference		Reference			
Yes	3.745 [3.237-4.332]	.000	1.758 [1.420-2.175]	.000		
Group sex (past 6 months)						
No	Reference		Reference			
Yes	3.205 [2.740-3.749]	.000	1.462 [1.163-1.840]	.001		
Total number of sex partners (past 6 months)	1.049 [1.041-1.057]	.000	1.003 [.998-1.008]	.290		
Total number of anal sex partners (past 6 months)	1.100 [1.084-1.116]	.000	.998 [.989-1.007]	.619		
Using drugs during/before sex (past 6 months)						
No	Reference		Reference			
Yes	2.277 [1.941-2.672]	.000	1.196 [.932-1.466]	.177		
Using alcohol during/before sex (past 6 months)	1.083 [1.017-1.153]	.013				

Table 2 (continued)

Health, wellbeing and social environment				
Frequency sexual health related information for gay men	1.459 [1.359-1.566]	.000	1.089 [.982-1.207]	.107
Ever notified to test for HIV				
No	Reference		Reference	
Yes	.574 [.498-.662]	.000	.589 [.476-.729]	.000
Any STI in the past 6 months				
No	Reference		Reference	
Yes	4.052 [3.364-4.881]	.000	2.387 [1.841-3.096]	.000
Ever used PEP				
No	Reference		Reference	
Yes	2.140 [1.567-2.922]	.000	1.206 [.781-1.862]	.398
Ever used PrEP				
No	Reference		Reference	
Yes	6.544 [4.426-9.674]	.000	2.655 [1.602-4.402]	.000
Anxiety	.975 [.956-.994]	.011		
Depression	.970 [.950-.992]	.007	.950 [.921-.980]	.001
HIV-related stigma	.989 [.978-1.000]	.047		
HIV-positive people in environment				
No	Reference		Reference	
Yes	1.913 [1.661-2.204]	.000	1.138 [.907-1.427]	.263
Share of gay men among friends	1.107 [1.074-1.142]	.000	1.009 [.951-1.071]	.763
Share of time spent with gay men	1.148 [1.113-1.184]	.000	1.089 [1.027-1.155]	.004
Connection to the gay community	1.250 [1.184-1.320]	.000	.968 [.882-1.062]	.495
HIV prevention beliefs				
HIV-related knowledge	1.195 [1.169-1.222]	.000	1.083 [1.049-1.119]	.000
Attitude towards HIV testing	1.198 [1.121-1.280]	.000	1.160 [1.061-1.270]	.001
Perceived likelihood of HIV infection	1.422 [1.317-1.535]	.000	1.221 [1.088-1.370]	.001
Perceived severity of HIV infection	.793 [.735-.855]	.000	.981 [.874-1.101]	.749
Nagelkerke's pseudo R2 is .362.				

Discussion

Frequently testing for HIV is important, especially among risk groups such as MSM. This study has been conducted to identify covariates of testing frequency among MSM. To answer this, a large scale survey has been analysed (Den Daas et al., 2018). 43.9% of the respondents test every 3-6 months. Compared to testing rates in the United States and Europe (Mounier-Jack, Nielsen & Coker, 2008; Campbell, Lippman, Moss & Lightfoot, 2018), this sample had a relatively high amount of people that test frequently. In line with the educational and ecological assessment of Green and Kreuter (2005), a wide range of different covariates for frequent testing among MSM were identified. Important covariates for testing frequently are having a non-Western migration background, engaging in anal sex with casual partners and one night stands, engaging in group sex, having had an STI in the past six months, having used PrEP and the perceived likelihood of HIV infection. Important factors associated with a lower likelihood of testing frequently are not living in Amsterdam, having had a relationship in the past six months and ever being notified for HIV.

Predisposing Factors

The covariates for testing frequency that fall into the predisposing category are HIV-related knowledge, attitude towards HIV testing, perceived likelihood of HIV infection, engaging in anal sex with casual partners and one night stands, relationship status, ever having used PrEP, having had an STI in the past six months and being notified to test for HIV. Knowledge and attitude about the behaviour is included in the educational and ecological assessment in the Precede-Proceed model (Green & Kreuter, 2005) and were also found as important factors for routine HIV testing among MSM in the study by Adam et al., 2014. Those engaging in behaviour associated with higher risk are more likely to test frequently. Being in a relationship gets associated with lower risk for HIV, and thus those in relationships are less likely to test frequently. Low risk perception is also identified in other studies as a reason to delay HIV testing (Adam et al., 2014; de Wit & Adam, 2008; Deblonde et al., 2010; Lorenc et al., 2011; Mitchell & Horvath, 2013). The risk assessment that MSM base their decision to test on is also found in the study by Den Daas, Doppen, Schmidt and Op de Coul (2016), in

which MSM that never tested also had lower sexual risk. However, self-assessment of sexual risk is often not accurate among MSM (Sayer et al., 2008).

Enabling Factors

The covariates for testing frequency that fall into the enabling category are living in Amsterdam and having a non-Western migration background, since both of these factors are associated with more prevention efforts. City of residence is another covariate for testing frequency, those who live in Amsterdam are more likely to test frequently than those who live outside of Amsterdam. In other studies, living outside of Amsterdam is identified as a covariate of never having been tested for HIV (Den Daas, Goenee, Bakker, de Graaf & Op de Coul, 2015) and the proportion of undiagnosed HIV cases is higher outside Amsterdam (Op de Coul et al., 2015). This could be explained by prevention efforts taken in Amsterdam, since much of the efforts regarding sexual health promotion targeting MSM are taking place in Amsterdam (Soa Aids Nederland, 2013). The lower likelihood of testing frequently in other cities shows the need for more prevention efforts for high risk populations outside of Amsterdam (Op de Coul et al., 2015). Special prevention efforts are also targeted to MSM with a non-western migration background, which can explain the higher testing frequency of them compared to MSM of Dutch origin.

Reinforcing Factors

Covariates for testing frequency that fall into the reinforcing factors are share of time spent with gay men as well as living in Amsterdam. Share of time spent with gay men was also a covariate in the study by Holt et al. (2012), in which men who spent more time with gay men were more likely to recently have an HIV test. As found by Zablotska, Holt and Prestage (2012), those who experience stronger social engagement with the gay community are more likely to test frequently. However, no significant connection between connection to the gay community and frequency of HIV testing have been found in this study. Possibly, the positive association between time spent with gay men and testing frequency can be explained through social norms. The study by Adam, de Wit, Bourne, Knox

and Purchas (2014) established subjective norms to be associated with routine testing among MSM: those who perceived routine HIV testing to be the norm were more likely to frequently get tested. The prevention efforts in Amsterdam possibly resulted in the normalization of HIV and HIV testing. In (social) environments where HIV(-testing) is more normalized, people are more likely to also perform that behaviour (Richter, Venter & Gray, 2010) and reduced HIV-related stigma lowers barriers to test for HIV among MSM (Fortenberry et al., 2002). HIV-testing in social environments where it is normalized does not lead to social sanctions.

Limitations and Strengths

The first limitation of this study is that the data is self-reported. This can influence the accuracy of the data, since respondents are not objective and can be influenced by moods, emotions and they can forget things. The second limitation is that respondents may have given social desirable answers, since the questions are about sensitive topics (sex, sexual health, substance use, relationships). That the data is collected anonymously and online, and not face-to-face, may have alleviated that bias. The third limitations for this study is that the respondents were recruited through convenience sampling and that it is a self-selected sample. The respondents were recruited mainly through gay-oriented websites, apps and media, which can have an impact on whether a diverse population is reached and the results are generalizable. However, the final sample was large (3935 participants) and diverse, with young MSM, HIV-positive MSM, MSM with a migration background and variety with regards to behaviour and place of residence (Den Daas et al., 2018), so generalizability is not an issue. The fourth limitation is that this study is a cross-sectional survey, information is only given about covariates for testing frequency and nothing can be said about reasoning behind these covariates. A longitudinal study can show light upon factors that influence testing frequency over time. Also, the study design of this study does not involve the reasoning of the participants on why they do (not) get tested frequently, which can contain crucial information for prevention and health promotion interventions. Qualitative, in-depth interviews and/or focus groups can reveal these processes.

Conclusions

One potential pathway behind the covariates and testing behaviour is risk perception (a predisposing factor), in which MSM make a risk assessment and decide to get tested for HIV or not based on that assessment. Health promotion interventions should focus on informing MSM on whether they actually engaged in risk behaviour, since low-risk MSM still have some risk for HIV and should also get tested regularly. The risk assessment they make, on which they base their decision to get tested, should be as accurate as possible. Knowledge and attitude are also important predisposing factors. Knowledge can be targeted through health promotion interventions as well.

Another possible pathway behind the covariates associated with testing frequency is social norms (reinforcing factors), especially descriptive norms (what other people do). Changing social norms with interventions and promotion is difficult, especially since it can result in a boomerang effect (Schultz, Nolan, Cialdini, Goldstein & Griskevicius, 2007). Informing MSM on how many of their peers do get tested frequently could lead to higher testing frequency among those who do not test frequently now, but it could also have the undesirable boomerang effect on those who do test frequently now. To prevent this from happening, adding injunctive norms (what other people think you *should* do) to the message, makes it stronger and possibly prevents the boomerang effect (Cialdini & Goldstein, 2004).

The final possible pathway behind the covariates is sexual health promotion. A lot of prevention efforts are targeted to high-risk MSM, to MSM living in Amsterdam and MSM with a non-western migration background are a target group as well. Spreading these interventions and promotion to other cities in the Netherlands as well as other subgroups among MSM, could have the potential to increase the testing frequency of Dutch MSM overall.

References

Adam, P. C., de Wit, J. B., Bourne, C. P., Knox, D., & Purchas, J. (2014). Promoting regular testing: an examination of HIV and STI testing routines and associated socio-demographic, behavioral and social-cognitive factors among men who have sex with men in New South Wales, Australia. *AIDS and Behavior, 18*(5), 921-932.

Antinori, A., Coenen, T., Costagiola, D., Dedes, N., Ellefson, M., Gatell, J., ... & Mocroft, A. (2011). Late presentation of HIV infection: a consensus definition. *HIV medicine*, *12*(1), 61-64.

Armitage, C. J., & Conner, M. (2000). Social cognition models and health behaviour: A structured review. *Psychology and health*, *15*(2), 173-189.

Bandura, A. (1998). Health promotion from the perspective of social cognitive theory. *Psychology and health*, *13*(4), 623-649.

Bandura, A. (1999). Social cognitive theory: An agentic perspective. *Asian journal of social psychology*, *2*(1), 21-41.

Campbell, C. K., Lippman, S. A., Moss, N., & Lightfoot, M. (2018). Strategies to increase HIV testing among MSM: A synthesis of the literature. *AIDS and Behavior*, *22*(8), 2387-2412.

Cialdini, R.B., & Goldstein, N.J. (2004). Social influence: Compliance and conformity. *Annual Review of Psychology*, *55*, 591-622.

Conner, M.A. R. K., & Norman, P. (2005). Predicting and changing health behaviour: Future directions. *Predicting health behaviour*, *2*, 324-371.

De Wit, J. B., & Adam, P. C. G. (2008). To test or not to test: psychosocial barriers to HIV testing in high-income countries. *HIV medicine*, *9*, 20-22.

Deblonde, J., De Koker, P., Hamers, F. F., Fontaine, J., Luchters, S., & Temmerman, M. (2010). Barriers to HIV testing in Europe: a systematic review. *European journal of public health*, *20*(4), 422-432.

den Daas, C., Doppen, M., Schmidt, A. J., & de Coul, E. O. (2016). Determinants of never having tested for HIV among MSM in the Netherlands. *BMJ open*, *6*(1), e009480.

den Daas, C., Goenee, M., Bakker, B. H., de Graaf, H., & de Coul, E. L. O. (2015). Comparing databases: determinants of sexually transmitted infections, HIV diagnoses, and lack of HIV testing among men who have sex with men. *BMC public health*, *15*(1), 1114.

den Daas, C., Zuilhof, W., van Bijnen, A., Vermey, K., Dörfler, T., de Wit, J. (2018). *Rapport Survey Mannen & Seksualiteit 2018.* Retrieved on 10-06-2019 from: https://www.soaaids.nl/sites/default/files/Rapport-SMS-Mannen-en-seksualiteit-MSM-Soa-Aids-Nederland-2018.pdf

Dowson, L., Kober, C., Perry, N., Fisher, M., & Richardson, D. (2012). Why some MSM present late for HIV testing: a qualitative analysis. *AIDS care*, *24*(2), 204-209.

Fehl, K., van der Post, D. J., & Semmann, D. (2011). Co-evolution of behaviour and social network structure promotes human cooperation. *Ecology letters*, *14*(6), 546-551.

Fortenberry, J. D., McFarlane, M., Bleakley, A., Bull, S., Fishbein, M., Grimley, D. M., ... & Stoner, B. P. (2002). Relationships of stigma and shame to gonorrhea and HIV screening. *American journal of public health*, *92*(3), 378-381.

Girardi, E., Aloisi, M. S., Arici, C., Pezzotti, P., Serraino, D., Balzano, R., ... & Monforte, A. D. A. (2004). Delayed presentation and late testing for HIV: demographic and behavioral risk factors in a multicenter study in Italy. *Journal of Acquired Immune Deficiency Syndromes*, *36*(4), 951-959.

Glanz, K., Rimer, B. K., & Viswanath, K. (Eds.). (2008). *Health behavior and health education: theory, research, and practice*. John Wiley & Sons.

Gray, R. T., Prestage, G. P., Down, I., Ghaus, M. H., Hoare, A., Bradley, J., & Wilson, D. P. (2013). Increased HIV testing will modestly reduce HIV incidence among gay men in NSW and would be acceptable if HIV testing becomes convenient. *PloS one*, *8*(2), e55449.

Green, L. W. and Kreuter, M. W. (2005) *Health Program Planning: An Educational and Ecological Approach*. 4th edition. McGraw-Hill, New York.

Holt, M., Rawstorne, P., Wilkinson, J., Worth, H., Bittman, M., & Kippax, S. (2012). HIV testing, gay community involvement and internet use: social and behavioural correlates of HIV testing among Australian men who have sex with men. *AIDS and Behavior*, *16*(1), 13-22.

Hutchinson, A. B., Farnham, P. G., Sansom, S. L., Yaylali, E., & Mermin, J. H. (2016). Cost-effectiveness of frequent HIV testing of high-risk populations in the United States. *Journal of acquired immune deficiency syndromes, 71*(3), 323.

Lorenc, T., Marrero-Guillamón, I., Llewellyn, A., Aggleton, P., Cooper, C., Lehmann, A., & Lindsay, C. (2011). HIV testing among men who have sex with men (MSM): systematic review of qualitative evidence. *Health education research, 26*(5), 834-846.

Mitchell, J. W., & Horvath, K. J. (2013). Factors associated with regular HIV testing among a sample of US MSM with HIV-negative main partners. *Journal of acquired immune deficiency syndromes, 64*(4), 417.

Moreno, S., Mocroft, A., & Monforte, A. D. (2010). Medical and societal consequences of late presentation. *Antiviral therapy, 15*(1), 9.

Mounier-Jack, S., Nielsen, S., & Coker, R. J. (2008). HIV testing strategies across European countries. *HIV medicine, 9*, 13-19.

Op de Coul, E. L., Schreuder, I., Conti, S., van Sighem, A., Xiridou, M., Van Veen, M. G., & Heijne, J. C. (2015). Changing patterns of undiagnosed HIV infection in the Netherlands: who benefits most from intensified HIV test and treat policies? *PLoS One, 10*(7).

Richter, M., Venter, W. D., & Gray, A. (2010). Home self-testing for HIV: AIDS exceptionalism gone wrong. *South African Medical Journal, 100*(10), 636-642.

Sallis, J. F., Owen, N., & Fisher, E. (2015). Ecological models of health behavior. *Health behavior: Theory, research, and practice, 5*, 43-64.

Sayer, C., Fisher, M., Nixon, E., Nambiar, K., Richardson, D., Perry, N., & Llewellyn, C. (2008). Will I, won't I? Why do MSM present for PEPSE? *Sexually Transmitted Infections, 85*, 206-211.

Scherer, C. W., & Cho, H. (2003). A social network contagion theory of risk perception. *Risk Analysis: An International Journal, 23*(2), 261-267.

Schultz, P. W., Nolan, J. M., Cialdini, R. B., Goldstein, N. J., & Griskevicius, V. (2007). The constructive, destructive, and reconstructive power of social norms. *Psychological science*, *18*(5), 429-434.

Smit, C., Hallett, T. B., Lange, J., Garnett, G., & De Wolf, F. (2008). Late entry to HIV care limits the impact of antiretroviral therapy in The Netherlands. *PloS one*, *3*(4), e1949.

Snaith, R. P. (2003). The hospital anxiety and depression scale. *Health and quality of life outcomes*, *1*(1), 29.

Soa Aids Nederland. (2013). *Onder controle. Strategie voor de aanpak van soa's en hiv onder MSM in Nederland, 2018*. Retrieved on 10-06-2019 from https://www.soaaids.nl/sites/default/files/documenten/ManmetMan/msm-meerjarenstrategie-onder-controle-2013.pdf

Van den Broek, I. V. F., Van Aar, F., Van Oeffelen, A. A. M., Woestenberg, P. J., Heijne, J. C. M., den Daas, C., ... & Nielen, M. M. J. (2016). *Sexually transmitted infections in the Netherlands in 2015.* National Institute for Public Health and the Environment. Retrieved on 10-06-2019 from https://rivm.openrepository.com/bitstream/handle/10029/614880/2016-0027.pdf?sequence=3&isAllowed=y

van Veen, M. G., Presanis, A. M., Conti, S., Xiridou, M., Stengaard, A. R., Donoghoe, M. C., ... & De Angelis, D. (2011). National estimate of HIV prevalence in the Netherlands: comparison and applicability of different estimation tools. *Aids*, *25*(2), 229-237.

Visser, M., Aar., F., Op de Coul, E.L.M., Slurink, I.A.L., van Wees, D.A., Hoenderboom, B.M., … van Benthem, B.H.B. (2018). Sexually transmitted infections in the Netherlands in 2017. *National Institute for Public Health and the Environment.* Retrieved on 10-06-2019 from https://www.rivm.nl/bibliotheek/rapporten/2018-0012.pdf

Visser, M., Heijne, J. C., Hogewoning, A. A., & van Aar, F. (2017). Frequency and determinants of consistent STI/HIV testing among men who have sex with men testing at STI outpatient clinics in the Netherlands: a longitudinal study. *Sex Transm Infect*, *93*(6), 396-403.

Yazdanpanah, Y., Lange, J., Gerstoft, J., & Cairns, G. (2010). Earlier testing for HIV—how do we prevent late presentation? *Antiviral therapy*, *15*(1), 17.

Zablotska, I. B., Holt, M., & Prestage, G. (2012). Changes in gay men's participation in gay community life: implications for HIV surveillance and research. *AIDS and Behavior*, *16*(3), 669-675.