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# HIV Preventive Interventions, Sampling Methods and Sexual Risk Behaviour among Men who have Sex with Men

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HIV preventive interventions, sampling methods and sexual  
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By

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## ABSTRACT

**Background:** Gay, bisexual and other men who have sex with men (MSM) are at high risk of HIV globally. HIV rates among MSM in Europe show increasing trends, in contrast to declining trends in the general population. During the last five years, an increase in reported HIV cases among foreign-born MSM have been observed in Sweden. Representative data about the MSM population is difficult to collect due to lack of a sampling frame. Respondent driven sampling has been developed to access hidden groups and achieve high response rates. Online sampling methods such as Web-based Respondent driven sampling and stratified sampling in a Web community are new and innovative ways of reaching MSM.

**Aims:** To systematically gather and review evidence for HIV prevention interventions among men who have sex with men in the European Union/European Economic Area and to test and evaluate different sampling methods to study sexual risk behaviour among Men who have sex with Men.

**Methods:** A systematic review of HIV preventive interventions among MSM applying the Highest Available Standard of Evidence grading framework was performed to inform European guidelines. Web-based respondent driven sampling was implemented to study sexual risk behaviour and Internet use among MSM. Stratified sampling in a Web community was performed to study HIV testing and prevention uptake among foreign-born MSM living in Sweden. Finally, the samples of MSM in Sweden achieved through Web-based respondent driven sampling, stratified sampling in a Web community, time location sampling and online banner survey sampling, were compared regarding sociodemographics and sexual risk behaviour for HIV.

**Results:** In total, twenty-four interventions were reviewed and fifteen interventions were graded to be strongly, probably or possibly recommended. Condom use, peer outreach, peer-led groups, and universal coverage of antiretroviral treatment were found to be strongly recommended. Web-based respondent driven sampling generated a sample of MSM whom all reported unprotected anal intercourse with at least one casual and one regular sex partner in the past twelve months. Stratified sampling in a Web community produced a sub-sample of foreign-born MSM of which 45% had tested for HIV during the past twelve months. A fifth of participants had never tested. Having talked with a prevention worker in the last year was associated with having tested for HIV in the same time frame. The four different sampling strategies used to study sexual risk behaviour among MSM in Sweden captured participant samples that differed regarding sociodemographic characteristic and reported sexual behaviour.

**Conclusions:** Condom use, peer outreach, peer-led groups, and universal coverage of antiretroviral treatment are evidence-based corner stones of HIV preventive interventions for MSM. Web-based respondent driven sampling reached MSM engaging in sexual risk behaviour and holds promise for online interventions and referrals to prevention programmes. To achieve higher uptake of HIV testing among foreign-born MSM in Sweden outreach programmes could be scaled up and evaluated. Future studies could benefit from using different sampling methods to achieve comprehensive data and validate findings across samples of MSM.

**Key words:** HIV prevention, Men who have Sex with Men, Sampling Methods, Non probability sampling, Respondent Driven Sampling, Sexual risk behaviour, Epidemiology, Public Health



## LIST OF SCIENTIFIC PAPERS

- I. **Strömdahl S**, Hickson F, Pharris A, Sabido M, Baral S, Thorson A.  
A systematic review of evidence to inform HIV prevention interventions among men who have sex with men in Europe. *Eurosurveillance* 2015 Apr 16;20(15). pii: 21096.
- II. **Strömdahl S**, Lu X, Bengtsson L, Liljeros F, Thorson A.  
Implementation of Web-Based Respondent Driven Sampling among Men Who Have Sex with Men in Sweden. *PLoS One*. 2015 Oct 1;10(10):e0138599.
- III. **Strömdahl S**, Liljeros F, Ekéus Thorson A, Ingemarsdotter Persson K, Forsberg B.  
HIV Testing and Prevention among Foreign-born Men Who Have Sex with Men: An Online Survey from Sweden. *Manuscript*.
- IV. **Strömdahl S**, Ingemarsdotter Persson K, Forsberg B, Berglund T, Kühlmann-Berenzon S, Tikkanen R, Velicko I, Bergström J, Lu X, Bengtsson L, Ekéus Thorson A.  
Sampling strategies used in Sweden to study sexual risk behaviour for HIV/STI among men who have sex with men: Online banner survey, time location sampling, Web respondent driven sampling and stratified sampling in a Web community. *Manuscript*.

These articles will be referred to by their Roman numerals (I-IV).

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## LIST OF ABBREVIATIONS

MSM	Men who have Sex with Men
HIV	Human Immunodeficiency Virus
AIDS	Acquired Immunodeficiency Syndrome
STI	Sexually Transmitted Infections
ART	Antiretroviral Treatment
ECDC	European Centre for Disease Prevention and Control
EU	The European Union
EEA	European Economic Area
UAI	Unprotected Anal Intercourse
RDS	Respondent Driven Sampling
WebRDS	Web-based Respondent Driven Sampling
TLS	Time Location Sampling
HASTE	Highest Attainable Standard of Evidence
GRADE	Grading of Recommendations, Assessment, Development and Evaluation
PICO	Population, Intervention, Comparison, Outcome model
MeSH	Medical Subject Headings
LGBTI	Lesbian, Gay, Bisexual, Trans and Intergender
RFSL	The Swedish Foundation of LGBTI Rights / Riksförbundet för homosexuellas, bisexuellas, transpersoners och queeras rättigheter
SSWC	Stratified Sampling in a Web Community
EMIS	European MSM Internet Survey
PEP	Post-Exposure Prophylaxis
PrEP	Pre-Exposure Prophylaxis



# 1 INTRODUCTION

My interest for this thesis topic was sparked by a few different events. During the first years in medical school I volunteered in a programme providing peer education to Swedish youth on sexual health including sexual health around same sex practices. This work provided an introduction to the topic.

Later in 2005, during a course at a rural dispensary in the Northern part of Tanzania, I witnessed the mass death due to AIDS. The roll out of the first treatment programme in the area had just started and the life saving treatment also had a large societal impact, saving children from becoming orphans. This experience motivated me to contribute in the fight against the HIV pandemic.

A few months later I was introduced to the Division of International Health at the Karolinska Institutet where colleagues guided me into the field of epidemiology and global health. I was hooked. Around the same point in time I was introduced to the HIV situation among men who have sex with men (MSM) living in Sweden through clinical work at a MSM clinic. This work provided insights into the disproportionate burden of HIV in this group. I have continued to work with MSM patients in periods, in parallel to my thesis research.

This path eventually took me to a Master in Public Health, research among key populations for HIV in low income settings and work at the World Bank to scale up HIV services in Sub Saharan Africa. Finally, I had the opportunity to further my knowledge through the research work presented in this thesis. The research presented here is inspired by patients' stories, which provided insights to the thesis topics.

Hereby follows a short introduction to the thesis work, which in most parts follows the chronological order of when the studies were performed. The thesis aims to contribute with improved knowledge regarding evidence based HIV prevention and sampling methods to reach gay men and other men who have sex with men for study purposes and HIV preventive interventions.

A systematic review was performed to inform a European guidance for HIV prevention among men who have sex with men issued by the European Centre for Disease Prevention and Control in 2015. The guidance work and dissemination thereof by the ECDC contributed with knowledge sharing between different diverse European setting and most importantly provide leadership for the scale up of HIV preventive interventions for MSM in the European Union and European Economic Area (EU/EEA) (1).

Studies among MSM often lead to questions around the representativeness of findings to the larger MSM population in a country or geographical area. As MSM represents a population without a known sampling frame there is a need for additional strategies to probability sampling to recruit MSM to studies. For example there is no national register of MSM living in Sweden as this is prohibited to protect the group, but there are meeting venues both in real life and online where researchers may access MSM. Online strategies are interesting to explore as people globally spend increasing amounts of time on the Internet. Therefore, two different Web-based studies were implemented as part of this thesis. Web-based respondent driven sampling applied peer recruitment within the online social network of MSM. In addition, Sweden's largest Web community for Lesbian, Gay, Bisexual, Transgender and Intergender member registry was used for stratified sampling.

To further our understanding of differences and similarities in samples of MSM participants recruited through different sampling methods, four studies performed between 2010 and 2013 were compared. The included sampling methods 2010 and 2013 in Sweden to study sexual risk behaviour among MSM include an online banner survey, time location sampling, Web-based respondent driven sampling and stratified sampling in a Web community.

## **2 BACKGROUND**

### **2.1 THE GLOBAL HIV EPIDEMIC**

In 2014 the global burden of human immunodeficiency virus (HIV) (2) was estimated to include 36.9 million people living with HIV (3). Among adults between the ages of 15 and 49 years HIV prevalence was estimated at 0.8% (4). Encouragingly, we are now seeing a globally declining trend in new HIV infections and decreasing morbidity and mortality due to HIV and AIDS. Access to antiretroviral treatment (ART) and improved treatment regimens are important factors behind these trends (5).

#### **The HIV Epidemic among Men who have Sex with Men**

Gay, bisexual and other men who have sex with men (MSM) are disproportionally affected by HIV compared to other adult males in every setting where data are available (6). HIV rates reported among MSM show an increasing trend, in contrast to the declining trends reported in the general population (7). In high-income countries data reveal male-predominant HIV epidemics, with a male : female median case ratio of 2.5 : 1 (8).

#### **The European HIV Epidemic among Men who have Sex with Men**

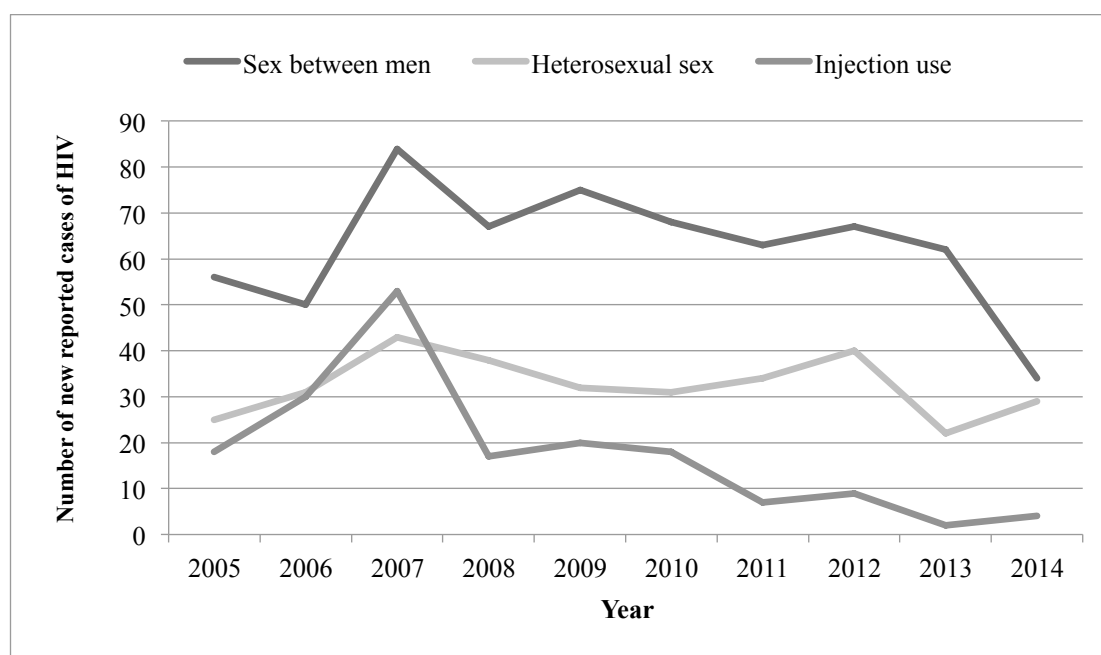
About 30 000 persons were newly diagnosed with HIV in 2014 in the European Union/European Economic Area (EU/EEA). This translates to a rate of 5.9 diagnoses per 100 000 people. Sex between men was estimated to account for 42% of these cases (9). Since 2005, MSM represents the only key population for HIV where an increase in HIV diagnoses has been observed in EU/EEA (10). Between 2004 and 2013, the increase of HIV diagnoses among MSM was estimated to be 33% (11). In some European settings steep increases of more than 100% of newly diagnosed HIV cases among MSM are observed during this time period, including Bulgaria, Cyprus, Czech Republic, Hungary, Romania, and Slovakia. HIV prevalence among MSM was estimated to be at or above 5% in 14 of the 26 EU/EEA countries reporting national data in 2013 (12).

#### **The Swedish HIV Epidemic among Men who have Sex with Men**

Since the beginning of surveillance of the HIV epidemic in Sweden 1983 until December 2014, totally 11247 people have been diagnosed and reported to be living with HIV in Sweden. An estimated 6800 people were living with HIV in Sweden in April 2015, of which a third were MSM, which translates to 69 out of 100 000 persons in the Swedish population (13).



The latest national surveillance data available in Sweden are from 2014. During this year, 473 new cases of HIV were reported of which 272 were male and 199 female. Of these newly reported cases, 83% reported transmission abroad either while travelling or before migrating to Sweden, 14% reported transmission in Sweden and in 3% the country of transmission is unknown (13). The key populations MSM and people who inject drugs are both represented in the HIV epidemic in Sweden. Figure 1 shows the trends in newly reported cases due to domestic transmission, where MSM represents the group with the most cases of HIV transmission that takes place in Sweden.



*Figure 1. Number of reported new cases of HIV per transmission route where transmission is reported to have occurred in Sweden during 2005 to 2014. Monitoring data from the Public Health Agency of Sweden (13)*

HIV prevalence among MSM in Sweden was estimated in 2012 to be between 2-6%, compared to an estimated HIV prevalence of 0.06% in the general population of Sweden (14). During 2010-2014, an average of 130 new HIV cases per year were reported due to sexual transmission between men. Half of these cases were reported among foreign-born MSM, which is an increase compared to 40% during the previous five year period (2005-2009) (15). The proportion of newly reported HIV cases among foreign-born MSM resulting from sex between men while in Sweden is increasing as well, from 26 percent between 2005 to 2009 to 36 percent between 2010 to 2014 (13). Indicating that foreign-born MSM are at risk of HIV while in Sweden.

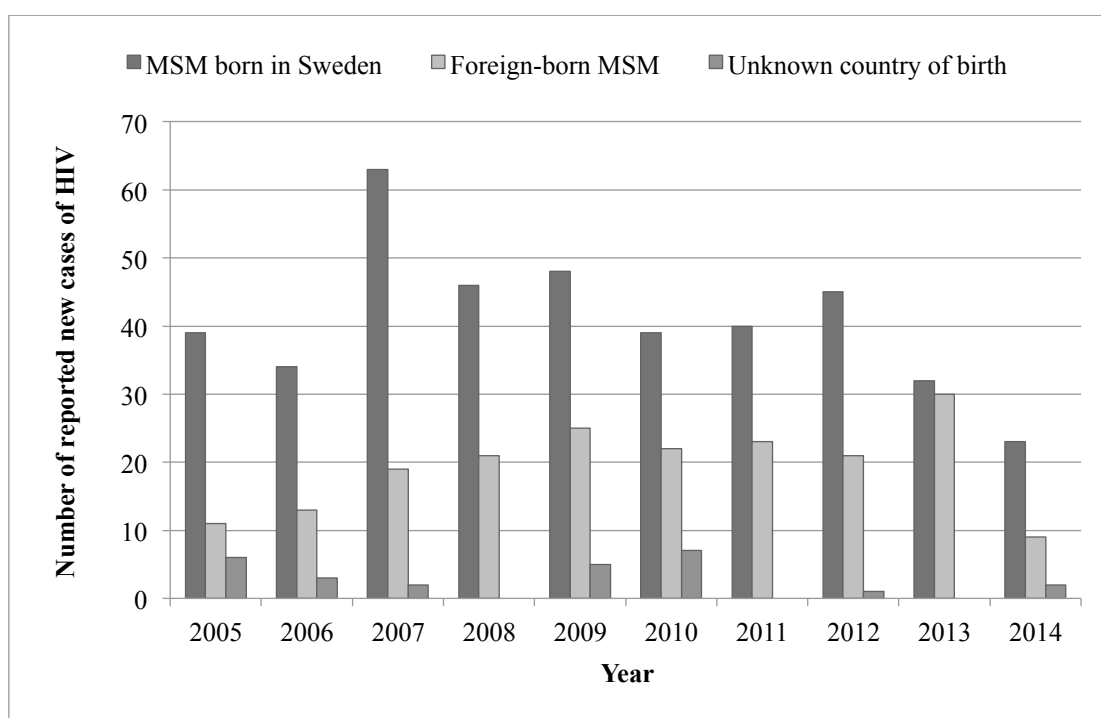


Figure 2. Number of reported new cases of HIV resulting from sex between men while in Sweden. Monitoring data from the Public Health Agency of Sweden (13)

## 2.2 MEN WHO HAVE SEX WITH MEN

The term ‘men who have sex with men’ refers to the population of men engaged in same-sex sexual behaviour irrespective of sexual orientation (homosexual, bisexual, heterosexual, or gay) and gender identity (male, female, transgender, queer). The term was introduced in research on HIV to capture the larger group of men engaging in sex with men and not only those identifying as homosexual (16-19). This is beneficial for including all at risk of HIV due to male same sex practices and MSM have become the standard term within HIV prevention work and research (20). It is important to note that individual men belonging to this population may not refer to themselves as MSM, rather gay, bisexual, straight or experimenting. It can be beneficial to gather sexual identity data in studies of MSM in order to take differences between sub groups of MSM into account.

Biological males with female identities are generally referred to as transgender women. Transgender women might share some heightened HIV risks with MSM, such as unprotected receptive anal intercourse and local sexual networks. However, their female gender identity may place them in a different population and they are not included as MSM in this thesis work. In addition, data shows a higher HIV burden among transgender women indicating a different epidemic scenario (21). I use the term ‘men who have sex with men’ recognizing the diversity of this population and the limitations of this term.

## **2.3 SEXUAL TRANSMISSION OF HIV**

HIV-1 is the predominant existing HIV type worldwide and the focus in this thesis and here referred to as HIV (3). HIV-1 is further divided into four groups (M, N, O, P), where M stands for the majority of the global HIV epidemic (22). The contagiousness of HIV during sex is an important determinant of the HIV epidemic among MSM. We have limited knowledge of biological determinants of HIV transmission due to that randomized trials cannot be performed with regards to ethical considerations. However, data reveals several factors that impact the HIV transmission probability, including factors relating to the person living with HIV, the person exposed to HIV and the virus itself (23-25).

The risk of HIV-1 transmission during penile-vaginal intercourse between a seropositive and seronegative partner has been estimated across studies to be 0.04% per act in female to male transmission risk and 0.08% per act in male to female transmission risk (23). For receptive anal intercourse the per act risk is estimated to be 1.4% (24). The risk of HIV transmission at insertive anal intercourse is lower than at receptive anal intercourse (24, 26, 27). These estimates are uncertain and the HIV transmission risk varies both in between different individuals and over time for the same individual (24).

The extent of infectiousness in the person living with HIV is determined by the amount of HIV there is in the blood and body fluids (28). An estimate of this amount can be measured through determining the HIV viral load in a blood specimen (29). During the acute HIV infection stage, a period of weeks to months after the HIV infection has occurred, there are high amounts of virus in body fluids (30). During this period the immune system has not yet fully started to defend the body against the virus. The virus replicates quickly and can achieve a high viral load. Later the immune system keeps the viral load at lower levels during the asymptomatic phase of the HIV infection. If the HIV infection is not treated, high viral load are present at the late stage of infection when the body's immune system is weakened by the virus (31).

The per act risk of HIV transmission at penile-vaginal intercourse during the acute phase is estimated to be about nine times higher than during the asymptomatic stage, and about seven times higher during the late phase (23). Estimations for the per act risk of HIV transmission at receptive anal intercourse during the acute and late phase has been estimated to 18%, however with a very wide 95% confidence interval of 2.08-24.6, reflecting diversity in the pooled data used for this estimate (24). Successful antiretroviral treatment can decrease the viral load to undetectable levels thereby the risk of HIV transmission becomes close to 0 (32).

The versatility of the insertive/receptive sexual role among MSM enables quicker onwards transmission in comparison to male-female vaginal sex where the insertive and receptive roles are biologically determined (7, 33).

Other sexually transmitted infections (STI) affect the risk of HIV transmission. Genital ulcer disease increases the risk of HIV transmission at penile-vaginal intercourse about five times (23). Gonorrhoea has been estimated to increase HIV transmission at UAI about seven times and anal warts has been estimated to increase the risk of HIV transmission at UAI four times (26).

## **2.4 RISK FOR HIV AMONG MSM**

In the studies presented here sexual risk behaviour for HIV among MSM at the individual level is defined as unprotected anal intercourse (UAI) with male sex partners of positive or unknown HIV status. To facilitate understanding of HIV risk among MSM, the individual risk level may be placed in a larger perspective (34).

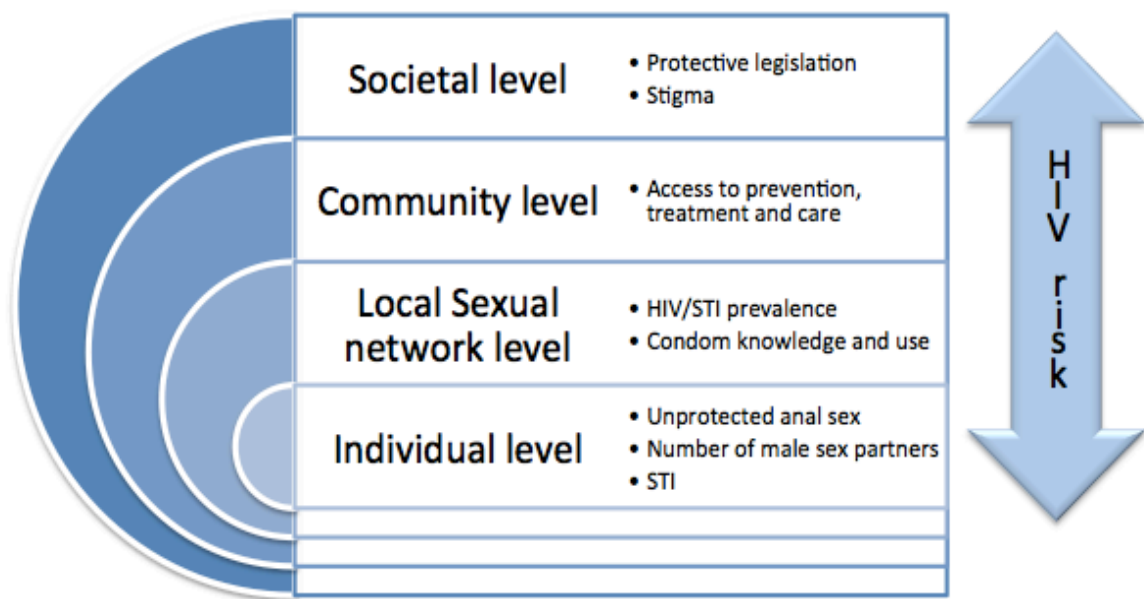
At the individual level, risk involves frequency of unprotected anal intercourse, number of male sex partners, concurrent sex partners and number of lifetime sex partners (35-40).

Sexual transmitted infections such as genital ulcer disease, gonorrhoea and anal warts adds to the risk of transmission at UAI (26). Other additional risk behaviours for HIV such injecting drug use and male sex work also contributes to HIV risk among MSM (41-44). Non-injecting drug use such as use of party drugs (Cocaine, Crack, Amfetamin, Ecstasy, LSD, GHB, Heroin) as well as binge drinking of alcohol can cause an increase in sexual risk taking by disinhibition (45). High usage of poppers, nitrite inhalants, among MSM have been reported across Europe (46-49). Nitrite inhalants cause peripheral vasodilatation and may decrease anal sphincter muscle tone, potentially leading to more traumatic sexual intercourse or more direct exposure to HIV target cells. However, this has not been established (50).

The local sexual network represent another level of risk. Sexual networks among MSM holds an important role for HIV transmission, the prevalence of HIV and STI in the local sexual network affects individual HIV risk. Clusters of HIV transmission have been reported indicating outbreaks within certain sexual networks of MSM (51-53). In addition, normative behaviour in the sexual network around condom and lubricant use may lead to an increased or decreased risk of HIV.

At the MSM community level access to HIV prevention services including MSM competent voluntary HIV testing and counselling, STI testing and treatment, information and behavioural HIV prevention holds an important role to modify HIV risk among MSM.

The societal level affects risk by either promoting or hindering a MSM friendly societal climate. Ensuring LGBTI rights through legislation and implementation thereof enables access to and uptake of prevention and care. Stigma around same sex practices similarly affects HIV risk through hindering access and uptake.



*Figure 3. Factors at the societal level, community level, local sexual network level and individual level affect HIV risk for the individual*

**Health impact of stigma around same sex practices between men**

MSM are persecuted for their sexual behaviour in large parts of the world, thereby many MSM to not disclose as MSM (54). Stigma can be divided into enacted stigma such as hate crimes against, and discrimination of MSM, and perceived stigma. Perceived stigma includes perceiving being unequally treated due to sexual orientation. Within the health care system perceived stigma can for example lead to not disclosing as MSM to health care workers, thereby not being offered MSM specific services. Stigma has also been found to contribute to late HIV testing, leading to late diagnosis of HIV (55). Internalized stigma or homonegativity

refers to a process where lesbian, gay and bisexual persons internalize society stigma as part of their self-image. Internalized homonegativity has been found to be associated with sexual risk behaviour and not testing for HIV among MSM in Europe (56-58). All these levels of stigma contribute to MSM being considered a population that is hard to reach for study purposes and intervention programmes and referred to as a hidden population (59-61).

## 2.5 CHALLENGES WHEN STUDYING MSM

MSM populations are of unknown size and parts of the population may be ‘hidden’ and therefore ‘hard to reach’ due to stigma around same sex practices (62). A registry of sexual preference in a population is rare. In many settings such as Sweden law prohibits such registry to ensure protection of minority groups (63). Therefore, it is not possible to define a sampling frame for MSM in most countries (64). Studies on sexual behaviour in the general population could include sub-samples of MSM. Such studies would require very large number of participants in order to capture a sufficient sub-sample of a minority group such as MSM. This is an uncommon approach due to economical constraints and feasibility.

Further, there is a reported trend of low response rates in national public health surveys in several European countries. Low response rates may introduce significant bias. In addition, a low response rate makes it more difficult to reach a sufficient number of MSM (65-67).

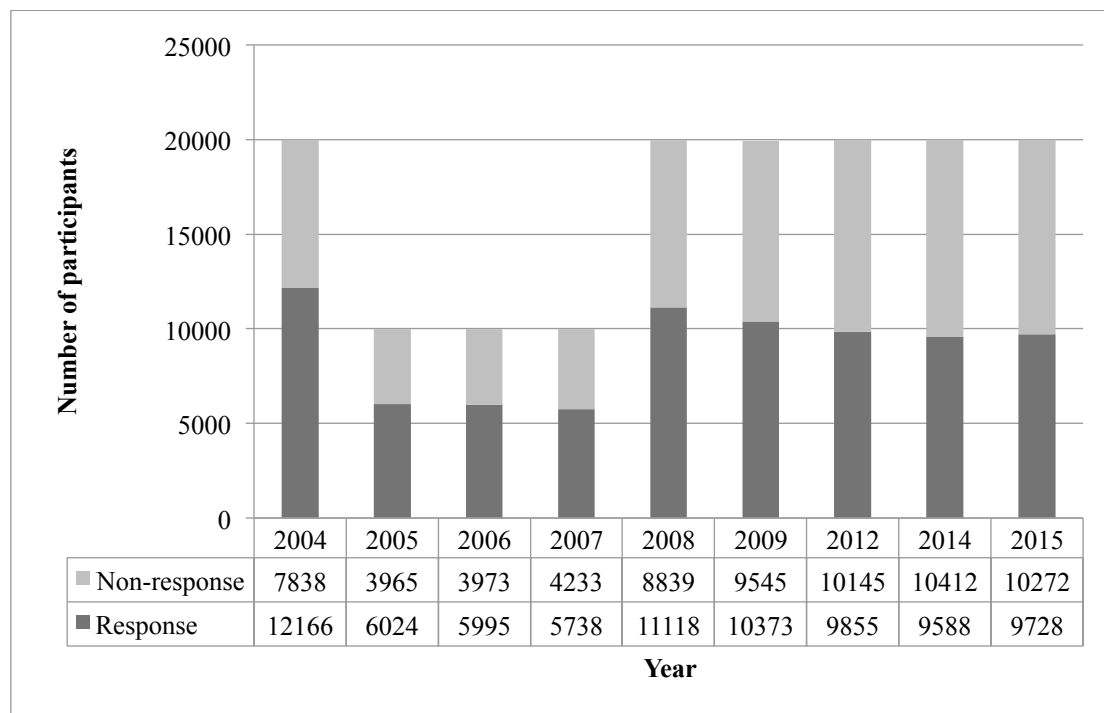


Figure 4. Response rates in the Swedish national public health survey 2004-2015 (66)

To address these challenges non-probability sampling methods have been used to a large extent in national surveillance studies evaluating HIV/STI prevalence and sexual risk behaviour among MSM (62). To improve national surveillance of HIV and sexual risk behaviour for HIV in order to inform prevention programming we need a better understanding of how these sampling methods work in real life.

The fundamental challenge for research among MSM is the absence of proper sampling frames, which is a challenge that most likely will remain. Therefore the key lies in furthering our understanding of other ways of reaching MSM for study purposes and producing population estimates.

## **2.6 OVERVIEW OF SAMPLING METHODS**

To gain knowledge about a population of interest you can gather information about all individuals in that population by complete enumeration, which can also be called a census. Pending on the population size, this can be both time consuming and expensive. Another strategy is to sample some individuals out of the population of interest i.e. to study the whole by the part. When the sample is representative of the population of interest you can estimate population characteristics. This means that the characteristics of the sample approximate the characteristics in the whole population of interest. Thereby the results from the sample population can be inferred to the whole population.

### **2.6.1 Probability sampling**

A sampling frame of the population under study must be established in probability sampling. In order to create a representative sample, each person in the sampling frame is assigned the same probability of being sampled. This can be achieved by simple random sampling. For example a random sample can be selected by assigning every individual in the population with a number and then letting a random numbers table or computerized version of this generate a sample (68).

Another way of sampling is a systematic sampling approach. In systematic sampling you select every  $X^{\text{th}}$  individual in the sampling frame from a randomly selected starting point, for example every third individual. In systematic sampling it's important that the ordering of the population does not correlate with the characteristics of interest. This approach is useful for on-site studies where the sampling frame is not available at the beginning of the study. For example every third patient visiting a clinic can be selected for the study in this manner (69).

Probability sampling can be achieved when the selection probability/inclusion probability of each person in the population of interest can be established. The selection probability/inclusion probability can be used to assign weights to individuals according to their selection probability, thereby generating estimates approximating the characteristics of the population of interest (68).

When there is a particular interest in certain subgroups within the population stratified sampling can be applied. The population is then divided into strata by characteristics such as female and male. Each stratum is then sampled using the simple random sampling approach, which then requires a smaller sample (68). This approach allows researchers to estimate properties of the strata subgroups. Another advantage is that sampling is performed in more homogenous groups when first divided into strata.

Another approach is to define clusters or groups of the population of interest (68). For example defining clusters by geographical location. The clusters constitute the sampling frame, from which a random sample of is drawn. Secondly, sampling of individuals is performed within each selected cluster. The defined clusters may be different from the general population if interest. In addition individuals within a cluster often share characteristics, which are different between clusters. Thereby, the variability of estimates becomes larger than in simple random sampling and a larger sample size is needed.

### **2.6.2 Non-probability sampling**

For some populations it is not possible to define a sampling frame. Then samples are selected in other ways, usually referred to as non-probability sampling.

#### **Convenience sampling**

In convenience sampling researchers recruit individuals who are accessible for example due to location and time. For example, facility-based sampling in a clinic catering to MSM or a gay club. The online version of convenience sampling is banner survey adds on websites recruiting study participants (70, 71).

Convenience sampling is an easy and economical way of gathering data. This method can quickly provide useful information about the target group. However participants are selected due to accessibility, which may correlate to study outcomes (72). For example a study that aims to assess sexual risk behaviour for HIV among MSM using convenience sampling at an STI/HIV-testing clinic for MSM will probably get an overrepresentation of persons engaging



in sexual risk behaviour in the study sample due to that those MSM visiting such a clinic may be there due to STI symptoms or sexual health issues. Thereby the assessment of sexual risk behaviour cannot be generalized to the larger population of MSM, including those not visiting a HIV clinic for MSM.

### **Snowball sampling**

Snowball sampling is a form of chain referral sampling (73). Initially, several persons who fit the study criteria and that are accessible to the researchers are identified and invited to participate in the study. After participation, participants are asked to invite persons they know who also fulfil the study population criteria. The sample then increases quickly in size like ‘a rolling snowball’, thereof the name (74).

A few different aspects need to be considered in snowball sampling. Respondents who volunteer to participate and refer friends/peers to the study are probably more accessible, cooperative and interested/invested in the aim of the study. This introduces volunteerism and salience bias (75). When referring friends or peers to the study this will most probably not be done by random selection of all friends/peers. For example, a participant may choose to invite close friends rather than acquaintances. Another example from MSM studies may be that participants will not invite MSM friends who they know are not comfortable disclosing as MSM. Persons with large social networks may be overrepresented as they are more likely to be invited by friends (76). If they are over sampled and if their characteristics differ to those with small social networks regarding the studied outcomes, bias may be introduced. For example MSM with large social networks could in addition to having many MSM friends (being popular), possibly also have a higher frequency of male sex partners. In a study of sexual risk behaviour for HIV, this may lead to overestimating the number of male sex partner.

### **Time Location Sampling**

Targeted sampling combines different aspects of venue sampling and stratified sampling, by performing an assessment and ethnographic mapping to identify places where the study population meet, such as a gay bar or a street corner for male sex work (77). For each location identified, enrolment plans are developed, so called quotas. Sampling is then performed in the identified places according to the quotas. Estimating the density of study population members in the defined places can be used to assign proportional sampling quotas (78). A further development of targeted sampling is time location sampling (TLS) (also referred to as time-space sampling) (79). In addition, TLS gathers information regarding

when the venues are visited by the target population and divide the venues in venue-day-time units. The list of venue-day-time units constitutes a sampling frame from which a random set of venue-day-time units are drawn. The selected venues are then visited at the selected time to recruit study participants. Recruitment can be performed by either asking everyone there to participate or by systematic sampling (79, 80).

Weighting in TLS usually takes into account the probability of being sampled in the following way: i) the probability that the person attends the venue in the sampling frame on the sampling time, ii) the probability that the person attends the sampling venue given attendance at some other venue included in the sampling frame during the same day iii) the proportion of potential venue sampling time on the day sampling occurred iv) the sampling fraction at this particular sampling event (79, 81). Based on these data, the probability of inclusion can be estimated. Thereby TLS approximates probability sampling. Limitations of TLS includes that it may be difficult and time consuming to list and include all the venues that MSM visit. Those not attending the venues included in the sampling frame are excluded (59).

### **Respondent driven sampling**

Respondent driven sampling (RDS) is an extended form of chain referral sampling within a social network of the population of interest (61). The method was developed with the target to increase response rates by using peer recruitment and giving incentives (61, 82). RDS starts by selecting a few persons (usually five to fifteen) who fit the study population criteria and invite them to participate, these persons are called 'seeds'. Efforts are usually made to have a diverse set of seeds regarding characteristics that are important in the study population. For example, in MSM studies it can be of value to have seeds of different sexual orientation (gay, straight, bisexual) (83, 84).

After having participated in the study, the seeds are given a certain amount (usually three) invitations coupons to the study to give to friends who fit the study inclusion criteria. To let participants invite peers themselves removes some privacy concern when studying a partly stigmatized population such as MSM (61). The restricted number of invitation coupons enables the recruitment process chain to reach far into the social network, finally reaching individuals with few social contacts (76).

Participants are reimbursed for time spent or given a small economical incentive to participate in the study themselves. In addition, they are given the same economical incentive for each friend they successfully recruit who participates in the study (76). This process has

been shown to create a long recruitment chains and a high response rate. The invitation coupons contain a serial code, which makes it possible to follow the recruitment chain i.e. who recruits whom in the sample.

Every participant is asked for their number of contacts or size of her/his personal network, which is also called ‘degree’ (85). The personal network size is used to establish a participants probability of being included i.e. it reflects upon the number of people within the study population that could invite the participant to the study. Participants with large social networks are oversampled and participants with small social networks are under sampled in RDS. To establish the social networks size or degree for each study participant allows adjusting for this differential in sampling probability. Common questions asked to measure participants network size are:

*‘How many persons do you know who fulfil the study population criteria of ...?’ or*

*‘How many friends who also fulfil the study population criteria would you invite to participate in this study if there was no limitation?’*

Proportion estimates can be calculated using the RDS estimator called RDSII according to the formula below (85).

$$\hat{P}_A = \left( \frac{n_A}{n} \right) \left( \frac{\hat{\delta}_U}{\hat{\delta}_A} \right)$$

Where  $n_A$  is the number of individuals with characteristic A,  $n$  is the total sample size,  $\hat{\delta}_U$  is the mean degree of all individuals in the sample and  $\hat{\delta}_A$  is the mean degree of individuals with characteristic A in the sample.

Recently a new RDS estimator has been suggested, RDSI<sup>ego</sup> (86). To increase the accuracy of the degree, respondents are also asked regarding the composition of their personal network. For example, *‘What proportion of your friends live in the same city as you?’* Such questions can only be applied to information participants know about their friends, thereby hidden behaviours may be difficult to include. Simulations of networks and empirical data among female sex workers in China show that this estimator is robust to variations in the network and preference in peer recruitment, leading to less bias in estimates (87).

It has statistically been shown that the RDS proportion estimates are unbiased when certain assumptions, called the RDS criteria are fulfilled:

- (i) Relationships are reciprocal, i.e. there is the same chance of A recruiting B as of B recruiting A.
- (ii) The network forms a single component i.e. each individual in the study population has a chance of being invited.
- (iii) Respondents can accurately report the size of their social network, degree.
- (iv) Sampling of peer recruitment is done with replacement i.e. a study participant can participate more than once.
- (v) Each participant recruits one peer from his/her friends i.e. only one invitation coupon is distributed to each study participant.
- (vi) The peer recruitment is a random selection among all the participant's friends.

If these assumptions are fulfilled the sample composition will converge to a stable level, usually referred to as equilibrium, of proportions of key characteristics of study participants that is independent from the characteristics of the seeds (85). Distribution of key variables such as sociodemographic variables will remain stable when recruiting additional participants after equilibrium has been reached. Thereby sample calculations in RDS studies are usually not performed, rather recruitment continues until additional recruitment waves do not change the composition of the sample (85, 88). Variance in RDS estimates can depend on the structures of the social network the RDS process samples within. If there is a high degree of homophily, i.e. participants are connected with participants who are similar to themselves, variance will increase (89). Weak connections between different parts of the social network can also produce a high variance in estimates (90).

In real life implementation of RDS the RDS criteria may not always be met (90-94). Reciprocal relationships are usually not established or measured (i). Accurately reporting network size may be difficult for participants (iii) (95). Sampling is usually conducted without replacement thereby each respondent is only allowed to participate once (iv). It's common to use more than one invitation coupon, usually three (v). Study participants who receive an invitation coupon may be more likely to recruit a close friend rather than choosing randomly among all friends within the social network, particularly if the study touches upon a sensitive topic such as sexual behaviour (vi) (86, 91, 96, 97). Due to these differences, it has been recommended to report data regarding the six RDS criteria in RDS studies (98).

Violations of the RDS criteria have been reported to affect the population estimates in different ways (89, 99). Bias can be expected to be large if the network is directed or if participants invite friends / peers based on characteristics that are related to the study outcome (100). RDS in a dense network reduces variance, while variance increases if participants choose to invite close rather than distant friends. However, RDS simulations on social networks report that sampling without replacement, low response rates and some error in the reported network size, degree, does not affect the population estimates to a large extent (87, 94, 100).

RDS has been shown to be successful in recruiting so called ‘hard to reach populations’ due to stigma, such as part of the MSM population, and additionally creating high response rates (61, 76, 83). These factors are both very valuable features of a sampling method particularly developed to study hidden groups.

RDS has been implemented online as web-based respondent driven sampling (WebRDS). Online sampling can cover large geographical areas. In addition, costs are decreased in online compared to real life implementation. The online forum also provides privacy and convenience for the participant who can participate at their own chosen time and place. WebRDS has been implemented among students at Cornell University in the US, Facebook users in the US, and the general population in Thailand and the Netherlands, for different study purposes (92, 101-104). In addition, WebRDS has been implemented among MSM in Vietnam to study sexual risk behaviour for HIV and recruitment worked well among Internet-using MSM (105). WebRDS is a promising way to reach MSM for studies on sexual risk behaviour. However, like all online methods it is limited in the sense that you cannot easily collect biological samples to estimate HIV or STI prevalence..

### **3 AIM AND OBJECTIVES**

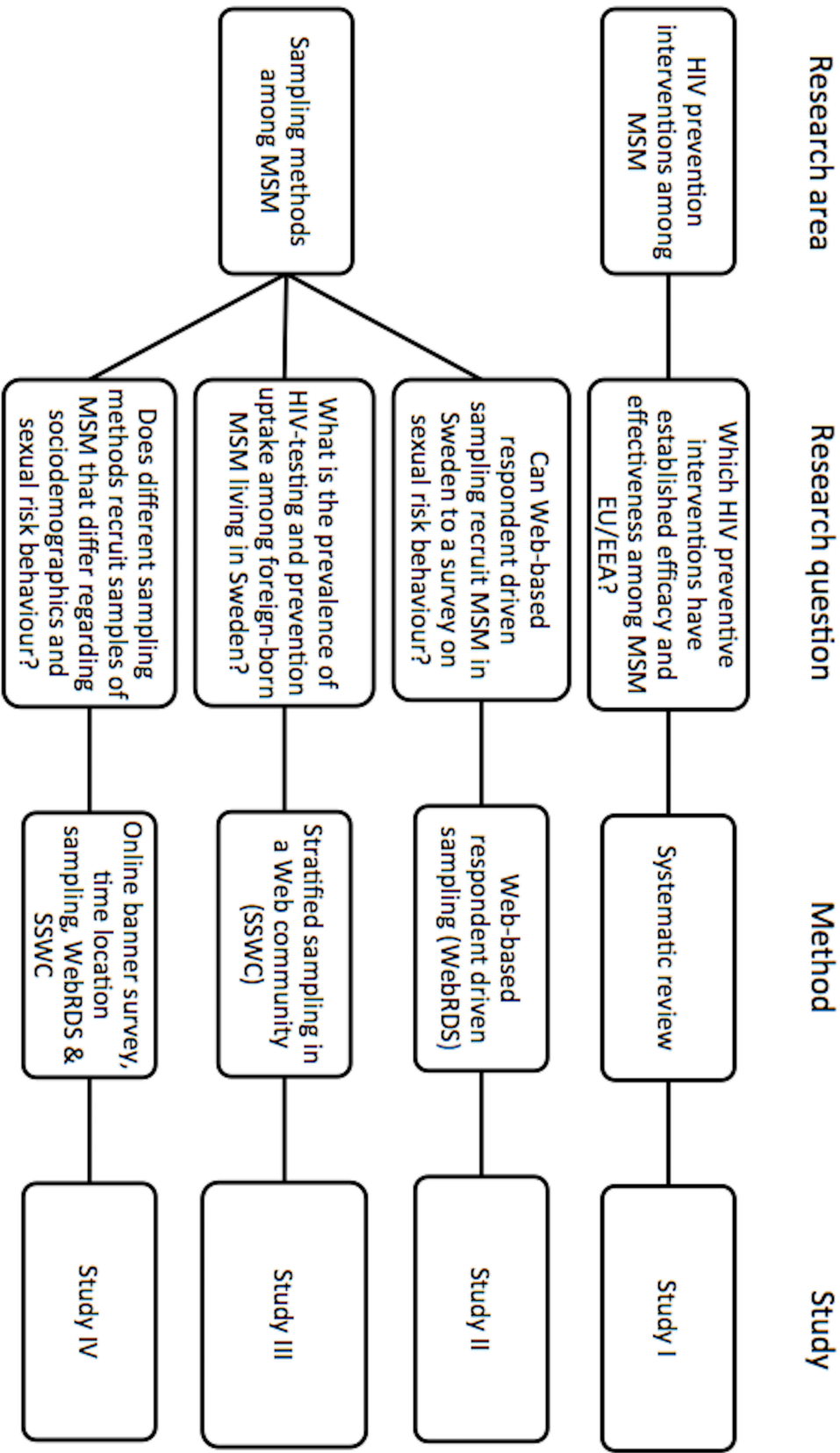
#### **Overall Aim of the PhD thesis**

To systematically gather and review evidence for HIV preventive interventions among men who have sex with men in the European Union and European Economic Area, and to test and evaluate different sampling methods to study sexual risk behaviour among Men who have Sex with Men (MSM).

#### **Specific Objectives**

- 1) To gather and review systematically studies on HIV prevention interventions among MSM in relation to implementation data from the European Union and European Economic Area (Study I)
- 2) To implement Web-based Respondent Driven Sampling among MSM in Sweden to analyse sexual risk behaviour (Study II)
- 3) To examine HIV testing and prevention uptake among foreign-born MSM living in Sweden (Study III)
- 4) To compare and analyse similarities and differences in sociodemographics and sexual risk behaviour among samples of MSM participants recruited by four different sampling methods used in Sweden (Study IV)

# STUDY MATRIX



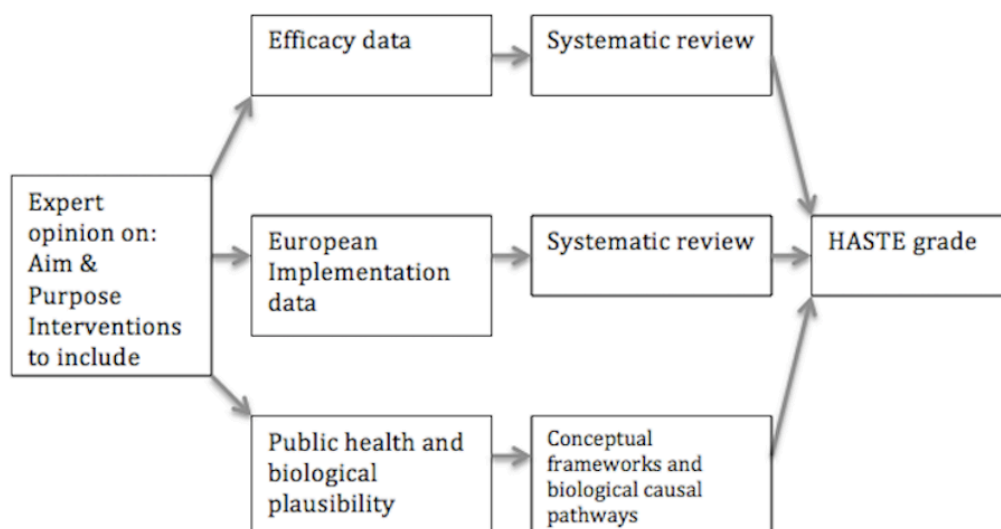
## 4 METHODS

### OVERVIEW OF STUDY DESIGN

The studies presented here first evaluate the evidence for HIV prevention interventions for MSM and implementation data thereof from the European Union and European Economic Area by performing a systematic review and applying the Highest Attainable Standard of Evidence framework. Different sampling strategies were used to examine sexual risk behaviour among MSM living in Sweden. The focus is on implementation and evaluation of the web-based sampling methods WebRDS and stratified sampling in a Web-community, both new and innovative strategies. Finally, four samples of MSM recruited through WebRDS, stratified sampling in a Web community, time location sampling and online banner survey sampling, are analysed regarding similarities and differences.

#### 4.1 SYSTEMATIC REVIEW METHODOLOGY (STUDY I)

The objectives of this review was to identify and describe studies evaluating the efficacy and effectiveness of HIV prevention interventions among MSM in relation to implementation data from the European Union and European Economic Area. The gathered evidence was graded according to the Highest Attainable Standard of Evidence (HASTE) framework as described in table 1 (106). The review was performed to inform the development of a guidance on this topic by the European Centre for Disease Prevention and Control (ECDC) (1).



*Figure 5. Work process for the systematic review of HIV preventive interventions among MSM*



Table 1. Highest Attainable Standard of Evidence System for HIV Interventions (HASTE).  
Modified from Baral et al (48)

<b>HASTE grading level</b>		<b>Strength of Recommendation</b>	<b>Explanation</b>
Grade 1		Strong	<ul style="list-style-type: none"> <li>• High plausibility</li> <li>• Efficacy is consistent</li> <li>• Large body of consistent implementation data</li> </ul>
Grade 2	Grade 2a	Conditional - Probable	<ul style="list-style-type: none"> <li>• Plausibility</li> <li>• Limited efficacy data</li> <li>• Consistently effective from implementation data</li> </ul>
	Grade 2b	Conditional - Possible	<ul style="list-style-type: none"> <li>• Plausibility</li> <li>• Limited or inconsistent efficacy data</li> <li>• Limited or paucity of implementation data*</li> </ul>
	Grade 2c	Conditional - Pending	<ul style="list-style-type: none"> <li>• Plausibility</li> <li>• On-going efficacy trials</li> </ul>
Grade 3		Insufficient	<ul style="list-style-type: none"> <li>• Undefined plausibility</li> <li>• Inconsistent data</li> <li>• Inconsistent or paucity of implementation data</li> </ul>
Grade 4		Inappropriate	<ul style="list-style-type: none"> <li>• Consistent data demonstrating lack of efficacy</li> <li>• Consensus from implementation data of inappropriate intervention</li> </ul>

### Systematic review process

We started out by making a comprehensive list of known interventions which address primary HIV transmission among MSM (Appendix I). We aimed to capture biomedical, psychosocial, and programmatic interventions for the umbrella review. This process included consulting an expert review group gathered by ECDC, which included medical, social science

and policy experts, programme implementers from non-governmental organizations and government representatives.

A systematic review was then performed for each intervention included. The Population, Intervention, Comparison, Outcome (PICO) model was used to develop inclusion criteria and search terms per intervention (107). The population for the intervention was MSM as defined earlier in this thesis. All types of comparison and studies without a comparison were included. Outcomes included were biological such as prevalence and incidence of HIV, self-reported diagnoses of HIV infection and self-reported behavioural outcomes on condom use or UAI. Previous systematic reviews performed on these topics were included. Implementation studies were only included if performed in European setting. Non-peer reviewed literature was not included, however guided further searches for literature.

Electronic searches were performed in PubMed, Embase, Medline, Cinahl, Psycinfo, the Cochrane library and the World Health Organization publication database. The search included medical subject headings (MeSH) terms for HIV or AIDS, and terms associated with MSM and the specific interventions reviewed. Searches were performed between 10 December 2012 and 8 February 2013 (Appendix II).

Titles of articles located through the search process were screened independently by myself and another researcher to exclude those who did not fit the inclusion criteria. For titles deemed relevant, the articles abstract was reviewed and included if the study met the inclusion criteria. When it was unclear from the abstract whether or not the inclusion criteria was met, the full article was reviewed.

A pre-designed form that included details on individual study design, methods of recruitment, sampling frame, sample size, location, response rate, analysis performed, results, confounders, and reported outcomes was used for data extraction from the included studies. Then a critical appraisal using a checklist approach to assess the quality and methodology of each individual study was performed (108). The appraisal was performed independently and in parallel by myself and another researcher to ensure consistency and that nothing was missed. The data was compiled per intervention and then reviewed by myself, another researcher and a senior researcher.

Implementation studies were, when data was available, appraised for availability, acceptability, uptake, feasibility of implementation, implementation costs, and effectiveness of the intervention among MSM in the European setting.

We reviewed the gathered evidence per intervention according to the HASTE grading framework. First I and another researcher independently graded the interventions. Then a senior researcher reviewed the grading. Discrepancies were discussed within the team of co-authors. Biological and public health plausibility was determined through a process of discussions within the team of co-authors.

## **4.2 WEB-BASED RESPONDENT DRIVEN SAMPLING (STUDY II)**

WebRDS had prior to this study been implemented among MSM in Vietnam and worked well to recruit a sample of MSM online (105). The method holds promise to overcome some challenges when aiming to study a 'hidden' population such as providing a high sense of confidentiality and convenience for study participants. Based on this, we set out to implement the WebRDS sampling method for the first time among MSM living in Sweden to study Internet use and sexual risk behaviour for HIV.

### **Formative studies**

I started out by interviewing key persons within the MSM community regarding the social network structure and Internet behaviour within the MSM group. Key informants were accessed through a collaboration with the Swedish Foundation of LGBTI Rights in Stockholm (RFSL Stockholm). In addition, I spent time observing activities on Sweden's and Scandinavia's largest LGBTI Web community that is called Qruiser and is owned by the QX publishing house (109), from hereon referred to as the Web community. This enabled me to understand the context, social networks, dating, finding new sex partners and how quick hook-ups for sex took place on the Web community. From this formative research we concluded that there seemed to be a well-connected social network of MSM online. Thereby, WebRDS may have potential to work as a sampling method within this population.

### **Study design and population**

The study population of MSM was defined as reporting being a man, 15 years old or older (as this is the legal age for when consenting individuals may engage in sexual acts in Sweden), having had any type of sex including oral sex or fondling with another man (110). In addition, participants were required to have an email address to be able to recruit peers in the WebRDS software.

The study is of cross-sectional design and the survey was implemented online from July 11, 2012 to January 21, 2013.

## **Web survey**

The survey consisted of a questionnaire developed taking into account previous Swedish and international studies on this topics among MSM (111-113). We applied the experiences from the WebRDS team's work in Vietnam when designing the survey and aimed to develop an easy to answer survey that would take about fifteen minutes to complete (105). The final survey was available in Swedish and included modules on sociodemographic information, number of sex partners and sex partners for UAI, and Internet use (Appendix III).

The personal network size of individuals was estimated by asking the question:

*‘How many MSM who are 15 years or older, would you like to invite to this study by the described online recruitment process, if possible to invite more than four?’*

In addition, participants were asked how many persons who fit the study criteria they had been in contact with online during the last seven days. The online survey and WebRDS recruitment webpage was piloted with ten key informants. These key informants were of different age (15-25, 25-35, 35-55, >55 years old) and represented a diversity of sexual orientations. The key informants evaluated the web survey and the time it took to participate to ensure user-friendliness and appropriate questions. Some improvements were implemented to ensure that it was user-friendly.

## **WebRDS recruitment**

The same WebRDS software that was used in the Vietnamese study among MSM was used both to implement the web survey and WebRDS recruitment process (105). All communication between the survey webpage and the data server was encrypted.

The recruitment started with thirteen seeds that were identified through the collaboration with the Swedish Federation for LGBTI Rights (four seeds) and through online recruitment of MSM members on the Web community (nine seeds). Two different strategies of recruitment of seeds were used to try to capture diverse seeds (84). To reflect the diversity within the MSM population the seeds were selected from different age groups (15-25, 25-35, 35-55, >55 years old), sexual orientation (homo-, bi- sexual, transgender) and place of residence (urban or rural county). On the Web community seeds were recruited by sending an invitation message to the most recent member who logged in on July 11, 2012 per county of residence, registered as being male and looking for men. Nine Web community members responded positively and were selected as seeds. These seeds represented different age group and reported living in different counties. The seeds were informed regarding the study and the

function of them as seed participants. Invitations to participate were sent via email or message in their Web community inbox including a unique link. The link took them to a web page where the study information was repeated and they could give their consent to participate by an active click that took them to the web survey.

After having answered the web survey, participants were invited to recruit friends / peers via email messages. Each participant could recruit a maximum of four peers. At the last page of the web survey participants were asked to enter their email address. Four recruitment emails with four unique links to the web survey were sent to this email address. Seeds could either forward these invitation emails to friends / peers, or copy the link and send through the online media of their preference (Web community, chat, Facebook, smart phone).

An unexpected server failure took place on August 23 which interrupted the WebRDS and web survey until September 20, 2012. Participants were informed about the server failure when they tried to reach the web survey. In addition, the most recent participant in each recruitment chain was sent an information email. When the server was functioning again, one month later, new invitation emails were sent to inform the last person that participated in the recruitment chain that it was possible to recruit and participate. An additional sixteen seeds were invited on September 20, 2012 and another eight seeds on November 2, 2012. These seeds were invited via the Web community, using the same procedure as described previously, and represented a diversity of age groups and counties of residence in Sweden.

### **Incentive for participation**

Participants were offered an incentive to participate and to recruit friends to participate. Participants were given a gift certificate for one month of the highest standard of membership at the Web community (monetary value of approximately 4 USD in 2012). This may be a rather low economical value for an incentive in a high-income setting such as Sweden (88). However, key informants evaluated the incentive to be attractive and suitable for diverse sub-groups of MSM.

### **Data cleaning**

In total, 148 participants answered the survey through the WebRDS software program. Double participation was identified through duplication of email addresses and eighteen participants were removed. Participants were further excluded due to not fulfilling the inclusion criteria, four reported being a woman and two reported never having had sex with a man. Respondent who answered the web survey very quickly, in less than three minutes,

were excluded due to that it was deemed infeasible to read and answer the questionnaire in such short time frame. One participant was removed for this reason. Seeds were included in the sample. A total sample of 123 participants remained. Seeds were included in the sample.

## Analysis

RDS estimates were calculated using the RDSII estimator and a design effect of 2 (85). Both the data and RDS estimates are reported in study II (98). We evaluated the sampling process regarding if the sample composition stabilized with increasing number of participants. We aimed to analyse equilibrium by the criteria in the RDS literature, however our recruitment process did not fulfil these (85). Therefore, we compared the achieved sample with and without the last 40 respondents to see if the sample composition was still changing.

In order to strengthen our decision to include seeds in the final sample for analysis we have performed the analysis with (n=123) and without (n=90) the eligible seeds included. As shown in the table below this did not contribute with any major difference in results

Table 2. The Web RDS participant sample with and without the seeds included

Variable	Covariate	Mean /proportion	Mean /proportion
Age		32.06	30.31
Nationality	Swedish	0.86	0.90
County of residence	Stockholm county	0.25	0.26
Education	Tertiary	0.29	0.24
	Secondary	0.51	0.58
	Vocational training	0.12	0.11
	Primary (grade 1-9)	0.08	0.07
Occupation	Unemployed	0.21	0.24
Sexual orientation	Homosexual	0.75	0.76
	Bisexual	0.23	0.22
	Heterosexual	0.03	0.03
	Asexual	0.02	0
	Don't know	0.03	0.03
Network size	Reported number of MSM possible to invite	31.03	31.59

### **4.3 EXAMINATION OF HIV TESTING AND PREVENTION UPTAKE AMONG FOREIGN-BORN MSM (STUDY III)**

According to Swedish national surveillance data foreign-born MSM living in Sweden are a part of the MSM population that have a higher risk of HIV, therefore this group is of particular interest to study (114). To understand HIV-testing and prevention uptake is of interest to improve these services for foreign-born MSM.

The Public Health Agency of Sweden in collaboration with the Karolinska Institutet performed this study of sexual risk behaviour among MSM as part of national HIV surveillance in Sweden in 2013. Stratified sampling in a Web community was used to invite participants.(115). The Web community for LGBTI previously mentioned has a member registry that served as the sampling frame (109). Thereby this sampling procedure can only capture those MSM and those foreign-born MSM who are members of the Web community.

This study analyses the sub-sample of foreign-born MSM within this larger study. The sampling method was not designed to capture foreign-born MSM specifically, rather MSM in general. The stratified sampling approach is not taken into account in the analysis, rather the raw data is presented. The motivation for this choice is that we do not know to what extent foreign-born MSM are represented in the chosen sampling strata of age and county of residence on the Web community. In addition, we cannot account for systematic non-response of foreign-born MSM.

#### **Study design options when aiming to study foreign-born MSM**

Foreign-born MSM living in Sweden represents a heterogeneous group and are not likely to be interconnected in one social network, rather they are part of a larger network of MSM and form diverse sub-groups within this network. Therefore RDS could probably capture sub-groups of foreign-born MSM or could be performed to capture a specific sub-group such as for example Latino MSM if a well connected social network exists. A RDS study among Central and East European foreign-born MSM in London report difficulties in RDS recruitment that that might be due to that this group was not be well-connected in the study setting, which indicates that RDS may not be suitable for some groups of foreign-born MSM (116).

#### **Study design and population**

This study is of cross-sectional design and took place online between October 1 and 30, 2013. The Web community member registry was used as sampling frame (109). Being registered as

living in Sweden, 15 years or older and not being registered as a woman defined Web community members' eligibility for the study. Thereby a sampling frame of 52 979 Web community members was established.

Stratified sampling was performed by the age strata of 15-25, 26-35, 36-46, 47 and above years old. In addition, the 21 Swedish counties were used as strata. The stratified random sampling procedure then selected 14 514 Web community membership registered that met the eligibility criteria. Invitations were sent via a message to their inbox at the Web community site with an active link to the web survey. Out of those invited, 2751 participated in the web survey. Thereby producing a response rate of 19%. Out of the participants, 289 reported being born abroad. Forty-five of these were adopted and were excluded as they were not expected to share the experiences of foreign-born migrants. Thereby this sampling strategy provided a sample of 244 MSM participants born abroad and living in Sweden. This sample of participants was included in the data analysis.

### **Web survey**

The web survey was developed by a multi-disciplinary team including researchers, representatives of the Swedish Public Health Agency and different NGO's representing the MSM community. Previous Swedish study questionnaires were taken into account (111-113). In addition, efforts were made to include the same sociodemographic variables as in study II to ease a comparison. The web survey included modules on sociodemographics, condom use, sexual risk behaviour, HIV/STI-testing and experience of HIV/STI prevention interventions and programmes. The final web survey was piloted with eleven MSM informants to ensure appropriateness, simple language and user-friendliness.

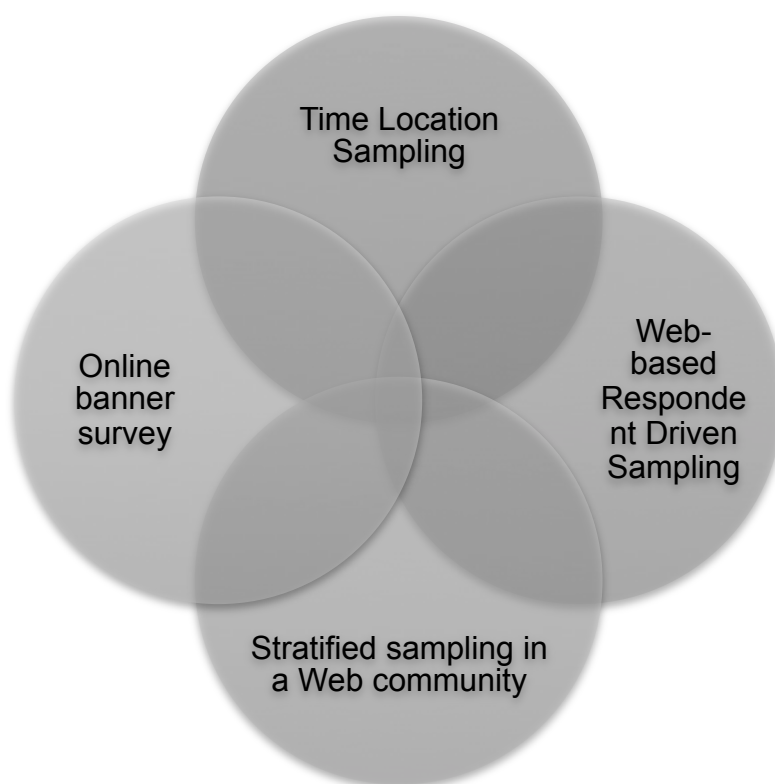
### **Analysis**

The achieved sample of 244 foreign-born MSM is treated as a convenience sample in the data analysis. Descriptive data analysis was performed. The chi-square and t-test was used regarding socio-demographic, sexual identity and practice variables, HIV/STI-testing and experience of HIV/STI preventive interventions. The main outcome variable was defined as having tested for HIV within the past 12 months. Eighteen variables were analysed with univariate logistic regression and t-test to identify factors associated with the outcome. Collinearity test led to that one variable, living with HIV, showing a variance inflation factor of >10 was excluded. No significant interaction was found between the included variables. The variables with a p-value under 0.05 were included in the final model for multivariate logistic regression analysis.



#### 4.4 EVALUATION OF SAMPLING METHODS USED TO STUDY SEXUAL RISK BEHAVIOUR AMONG MSM (STUDY IV)

Between 2010-2013, four different sampling strategies were used in Sweden to study sexual risk behaviour among MSM; online banner survey sampling, TLS, WebRDS, and stratified sampling in a Web community (SSWC). This study aims to analyse the samples of MSM achieved by the four different sampling strategies regarding similarities and differences regarding sociodemographics and sexual risk behaviour.



*Figure 6. The different sampling methods used to study sexual risk behaviour among MSM may recruit samples of participants that have similarities and differences. In addition, there may be some overlap between samples.*

##### **Data collection methods and analysis**

The European MSM Internet Survey (EMIS) web survey was implemented using online banner survey sampling from the 4th of June to the 31st of August 2010 (117). A convenience sample of over 180 000 men answered the EMIS questionnaire online, of which 3089 resided in Sweden and were included in this analysis. The European study Sialon II was implemented using TLS in identified MSM venues in Stockholm between May 11 to August 16, 2013. The WebRDS study is described previously in this thesis,

under study II. The MSM survey in Sweden that used SSWC is described previously in this thesis under study III.

.

### **Analysis**

Analysis was described and performed for socio-demographic variables, sexual orientation, and sexual risk behaviour for HIV/STI variables. TLS estimates were analysed as a two-stage sampling procedure using a weighting procedure based on the inverse of the probability that a person was sampled. RDS estimates were calculated using the RDSII estimator and a design effect of 2. The survey using stratified sampling in a web-community applied stratified sampling with unequal probability of inclusion by age and county of residence, which was adjusted for in the analysis. In addition, estimates were adjusted for non-response with inverse probability of weighting for each age and county of residence strata when analysing data.

## **4.5 ETHICAL CONSIDERATIONS**

The utmost measures were taken to protect the individuals in the studies II, III and IV from identification so as to keep their anonymity. Participants were given clear information on all aspects of the study before deciding on whether they should participate in the study or not. All participants gave their consent to participate in the study. In the web surveys applying webRDS, stratified sampling in a Web community and banner survey consent was given online by an active click, saying yes to participate. Participants could skip any part of the study or question at any time. Participants had the possibility to end the study at any time point and thereby opt out of the study altogether. Data was then deleted and not included in the studies.

The WebRDS survey included a log out button to provide a quick exit. This button removed the survey from the computer. The WebRDS study web page provided detailed information on how to delete browser history. The unique links to the web survey in the invitation messages to the study could only be used from one computer at the time. If inactive, the web survey logged out after ten minutes. Data traffic and storage was encrypted to ensure data safety. In Study II and III, the study information web page was designed to give detailed study information in a positive and informative manner. In Study II, III and IV no personal identifiable data such as personal identification number or full name was collected. In study II, the WebRDS participants were given the option to give their email address. An email address could represent a type of personal identifiable data, but participants could also choose to keep their anonymity by using a temporary email address created only for this study purpose.

No person was coerced or put under pressure at any time of the data collection. All interactions with participants were designed and performed with utmost respect given to the individual. Collected data were kept on one pass word protected computer in a pass word protected file. In addition a backup was kept on a hard drive in locked facilities at the Karolinska Institutet. .

## 5 RESULTS

### 5.1 SYSTEMATIC REVIEW FINDINGS

#### **Main finding**

The HIV prevention interventions condom use, peer outreach, peer-led groups, and using universal coverage of antiretroviral treatment and treatment as prevention were found to be strongly recommended as HIV prevention interventions for MSM. In total, 24 interventions were reviewed and 15 interventions were graded to be strongly, probably or possibly recommended according to the HASTE grading framework. A paucity of implementation data from the European Union and European Economic Area was found for most interventions.

#### **Interventions assigned a strong recommendation, HASTE grade 1**

For four interventions quality data was available to support a strong recommendation. Condom use, peer outreach, peer-led groups, and using universal coverage of antiretroviral treatment and treatment as prevention all held high plausibility, consistent efficacy data and implementation data.

#### **Interventions assigned a probable recommendation, HASTE grade 2a**

Four interventions were assigned a probable recommendation, fulfilling the criteria of plausibility, limited efficacy data and consistently effective implementation data. Voluntary counselling and testing for HIV, using condom-compatible lubricant, using post-exposure prophylaxis (PEP), and individual counselling for MSM living with HIV were assigned a probable recommendation.

#### **Interventions assigned a possible recommendation, HASTE grade 2b**

For the seven interventions; individual counselling for MSM, peer-led group interventions targeting MSM living with HIV, Internet-based HIV prevention messages, interventions in sex-on-premises venues, social marketing interventions, pre-exposure prophylaxis (PrEP) and voluntary medical male circumcision, a level of possible recommendation was found. All these interventions demonstrated plausibility, however limited or inconsistent efficacy data and limited or paucity of implementation data.

### **Interventions assigned a pending recommendation, HASTE grade 2c**

A pending recommendation was assigned to five interventions, including training for health care providers to offer comprehensive care for MSM, MSM-competent health clinics, voluntary anonymous partner notification, campaigns for Lesbian, Gay, Bisexual and Trans equality; and female condom use for anal intercourse. For these interventions plausibility was established and there were on-going efficacy trials.

### **Interventions assigned an insufficient recommendation, HASTE grade 3**

An insufficient level of evidence was found for the four interventions; sero-sorting, to avoid taking semen in the mouth/unprotected oral sex, to avoid use of poppers at UAI and to avoid alcohol binge-drinking. These interventions were assigned an undefined plausibility, inconsistent efficacy data and inconsistent or paucity of implementation data.

## **5.2 EXPERIENCES FROM IMPLEMENTATION OF WEBRDS AMONG MSM**

### **Main finding**

The WebRDS produced a sample of 123 eligible participants, who all reported sexual risk behaviour for HIV during the last 12 months. Recruitment was initially rapid, however after a server failure it was slow. Future studies need to further improve and evaluate the WebRDS method.

### **WebRDS recruitment process**

The recruitment chains varied in length between one to nine waves. The sample of eligible participants is composed of seventeen recruitment chains with at least two connected respondents. In addition, 41 isolated respondents due to exclusion of their links according to the exclusion criteria or being a seed and not recruiting additional participants. Three recruitment chains reached more than three waves. Two seeds and five participants were successful at recruiting the maximum of four friends / peers. Out of the 123 eligible participants 33 were seeds.

Initially the recruitment process was active, recruiting two thirds of the final sample during the first 47 days of recruitment. However, after the server failure recruitment was slow. Ten out of the thirteen recruitment chains that were interrupted by the server failure did not start again after being re-invited. The three recruitment chains that did start recruiting after the server breakdown, recruited in total six more respondents.

To analyse to what extent the sample composition was still changing at the end of the recruitment process, we compared the WebRDS sample with and without the last 40 respondents. A change in proportion between the sample with and without the last 40 respondents showed a change of 0.02 of MSM living in Stockholm, 0.03 having a university education, 0.025 being unemployed, and 0.002 in having a Web community gold membership was found. Numeric change between the sample with and without the last 40 respondents for age was 2.5 and for average personal network size 0.23.

### **Characteristics of study participants**

The mean age among participants was 32 years, with a range from 19 to 73 years old. About half of the respondents (51%) had finalized secondary school and 28% had university-level education. Participants reported residence in the 18 of Sweden's 21 counties, reaching MSM in rural areas with low population density. The majority (75%) reported being homosexual and about a fifth reported being bisexual. The majority (60%) of participants checked their email once or more per day. Web community membership was common and 79% reported having at least one member profile registered.

### **Sexual risk behaviour for HIV among participants**

All respondents reported having had UAI with at least one regular and one casual sex partner during the last 12 months. On average participants reported having had UAI with three casual sexual partners during the past year. The average of male casual sex partners was seven during the past year.

### **5.3 HIV TESTING AND PREVENTION UPTAKE AMONG FOREIGN-BORN MSM**

#### **Main finding**

About half (45%) of participants in this study had tested for HIV during the last twelve months. 20% of participants had never tested for HIV. Participants who had lived in Sweden less than or equal to five years were more likely to have tested for HIV during the last 12 months. Having talked about HIV/STI with a prevention worker in the last year was associated with having tested for HIV. In addition, having had a STI-test during the last 12 months was associated with having had a HIV-test in the same time frame.

#### **Sociodemographics of participants**

The median age among participants was 36 years, with the youngest being sixteen years and oldest participant being 73 years old. Over half (57%) had tertiary education and three participants had not completed lower secondary school. The majority (67%) held an employment and 16% were students.

Median time spent living in Sweden was 15 years, ranging from less than one year to 58 years. Over half (57%) held Swedish citizenship and 25% held a permanent residency permit. One participant was in the process of seeking asylum at the time they answered the survey. The majority of participants (68%) were born in Europe, a fifth were born in Asia (20%), about a tenth in South America (11%) and North America (9%) respectively, and around 1% in Africa.

#### **Sexual identity and behaviour among participants**

The majority (64%) identified as homosexual and about a fourth (23%) as bisexual. Half (50%) reported being single, 35% were in a relationship with a man and 10% with a woman. The median number of sexual partners during the last twelve months was four. About a fourth (26%) reported having had sex with both men and women during the last twelve months. Frequency of male partners for UAI was on average 2, and the median was 0.

### **HIV/STI testing and prevention service experience among participants**

Close to half (45%) had tested for HIV during the last twelve months. A fifth reported never having tested for HIV. Self-reported HIV prevalence among participants was 4%. The majority (88%) felt certain regarding their HIV serostatus, while 11% reported being uncertain. Almost a fifth (17%) reported not knowing where to access HIV testing. Among those who had never tested for HIV, the most common reason given was that 'I've never thought of it' or due to perceiving that 'I don't take risks'. A fifth of those never tested reported that they don't know where to access HIV-testing. 2% reported having been denied a HIV-test by health personnel. Having tested for STIs during the last twelve months was reported by 37% of participants. A third reported never having tested for STIs. During the past twelve months most participants reported having read online (66%) and / or printed information (54%) on HIV/STI. Half of participants had received free condoms and about a third had talked about HIV/STI with a prevention worker in the same time period. The majority (76%) of participants requested rapid test for HIV. In addition, the majority wanted easily accessible condoms and lubricants in places where MSM meet (76%). Other requested services included; anonymous HIV-testing, MSM-friendly clinics, HIV/STI testing outside of the health care setting, vaccination for hepatitis A, B and HPV and the possibility to have condoms and lubricants sent via mail. Over half requested (58%) web-based HIV/STI information.

### **Associations with having tested for HIV during the past twelve months**

In univariate logistic regression analysis the following variables were found to be significantly associated with having tested for HIV during the last 12 months: having lived in Sweden less than or equal to 5 years (OR 1.87, 95%CI 1.04-3.36), knowledge of where to test for HIV (OR 2.21, 95%CI 1.03-4.74), having had other STI-tests than HIV in the last 12 months (OR 18.94, 95%CI 9.31-38.54), talked about HIV/STI with a prevention worker in the last 12 months (OR 5.33 95%CI 2.94-9.65), received free condoms in the last 12 months (OR 2.23, 95%CI 1.30-3.82), read online about STI/HIV in the last 12 months (OR 2.56, 95%CI 1.42-4.60), read printed information about HIV/STI in the last 12 months (OR 1.86 95%CI 1.09-3.19). After multivariate adjustment three variables remained significantly associated with the outcome; having lived in Sweden less than 5 years (aOR 3.39 95%CI 1.49-7.73), having tested for other STIs than HIV in the last 12 months (aOR 26.54 95%CI 10.49-67.19) and talked to a HIV/STI prevention worker in the last 12 months (aOR 4.10 95%CI 1.68-9.97).



## **5.4 DIFFERENCES IN SAMPLES OF MSM PARTICIPANTS**

### **Main finding**

The four different sampling strategies used to study sexual risk behaviour for HIV among MSM in Sweden captured samples of MSM that differed regarding socio-demographic characteristic and sexual behaviour. Particularly, large discrepancies on reported sexual risk behaviour were found in the different samples of MSM.

### **Sociodemographics of respondents**

TLS and WebRDS achieved sample populations with a mean age of 33 and 32 years old respectively. The banner survey and stratified sampling in a web-community both reached an on average older sample population of MSM with the mean age of 37. The majority of the samples had a secondary or tertiary education. Tertiary education differed to some extent between the samples. More than half of the banner survey sample was comprised of men with a tertiary education, as compared to slightly more than a quarter (27%) in the WebRDS sample. Unemployment varied from 6% in the banner survey to 15% in the WebRDS sample. TLS reached a sample of MSM with a large proportion of foreign-born MSM (28%). While WebRDS and the banner-survey both reached populations with about a fifth born abroad. SSWC reached 15% born abroad. Regarding residence in non-urban counties, 42% of the WebRDS sample, 35% of the SSWC sample and 27% of the banner survey sample reported living in counties other than the three large urban areas in Sweden.

### **Sexual identity, behaviour and HIV/STI-testing among respondents**

In the banner survey, TLS and WebRDS participant samples some 76-79% of participants identified as homosexuals, while in SSWC less than two thirds identified as homosexuals.

All respondents in the WebRDS reported more than one sexual partner during the last 12 months. This differed from the other studies, where 12% of the TLS sample, 9% of the online banner survey sample and 4% of the stratified sampling in a Web community reported not having had any sexual partner during the last 12 months. Further all WebRDS participants reported UAI with a casual male sex partner during the last year, while the majority of the other samples had not engaged in UAI with a casual male sex partner. The proportion of sample participants reporting having had UAI with 2-5 casual male sex partners during the

last 12 months differed somewhat, between 13-18% in the three web survey participant samples. The TLS study measured the number of casual male sex partners for UAI during the last 6 months, and a fifth of participants reported UAI with one partner and about a sixth reported UAI with 2-5 casual male sex partners during this time period.

A slight difference in the percentage of participants reporting living with HIV were found, reaching from 2% in TLS to 5% in the banner survey sample. HIV testing frequency differed as well, with 61% of the TLS sample, 43% of SSWC sample and 30% of the banner survey sample reporting having been tested for HIV during the last 12 months.

STI testing during the last 12 months was somewhat lower in the online banner survey and SSWC participant samples compared to the TLS participants, among whom the same proportion (61%) had tested both for HIV and STIs. Lower STI testing rates were reported in the SSWC sample (37%) and online banner survey sample (38%). The highest proportion (19%) reporting having been diagnosed with an STI during the last 12 months was found among TLS participants. While a tenth of the SSWC sample and a twentieth of the banner survey sample reported having had an STI during the last 12 months



## 6 DISCUSSION

### **Future directions of evidence-based HIV prevention among MSM**

The systematic review findings are consistent with the 2010 World Health Organization systematic review that used the GRADE framework (120). There are synergies and dependency between the recommended interventions, therefore combining interventions into programmes is desirable for HIV prevention among MSM (121). For example, an HIV-testing service may achieve high uptake when implemented in combination with peer outreach and social marketing. The delivery modes that were evaluated to be recommended include peer-led interventions, outreach activities and group intervention programmes, supporting findings from a previous World Bank literature review of HIV prevention services for MSM in low and middle income countries (6).

### **Antiretroviral treatment prevention strategies rely on HIV-testing**

Scaling up ART is a most important target both for HIV prevention and for health among MSM living with HIV as according to the World Health Organization guidelines (122). In order to do so, HIV-testing is a key intervention. Thereby antiretroviral treatment prevention strategies rely on behavioural prevention strategies to increase HIV-testing (121). Between 38-61% of MSM participants in study IV had tested for HIV within the last year, indicating a need for increased access to and uptake of regular HIV-testing linked to ART and care among MSM living in Sweden. A scale-up of the preferred services among foreign-born MSM in study III, rapid test, testing outside of the health care setting, anonymous testing and MSM clinics could facilitate higher uptake of HIV-testing. Social marketing has been shown to increase uptake of testing among MSM in the United States and these strategies could be beneficial to apply to increase uptake of testing in Sweden as well (123).

Sweden is, in most parts, a sparsely populated country relying on primary health care facilities to serve the population as the first point of contact with the health care system. The primary health care system covers all areas of Sweden and could be helpful in scaling up testing for MSM and other risk groups to increase coverage of HIV testing. Rapid HIV test services could be offered by trained staff at the primary health care level with quick referrals of those testing positive to HIV clinics. In addition, geographically strategically located primary health care units could be trained to offer comprehensive care and HIV/STI testing

for MSM. A promising approach has been evaluated in Australia where a study introducing comprehensive HIV/STI testing for MSM by a trained nurse at the primary health care level have shown significant increase in testing rates (124). These add on services at already existing primary health care units would increase access to comprehensive HIV/STI testing for MSM living all over Sweden including rural areas. Implementation of such programmes would need to be evaluated both regarding quality assurance and uptake of services in the target populations.

Since the systematic review presented here was performed confirmatory studies have been reported supporting Pre Exposure Prophylaxis (PrEP) as HIV prevention for MSM in the European setting. Therefore there is a need to update the assigned grading for this intervention, which today would have been assigned a grade 2a for probable recommendation as efficacy data is available, limited implementation data is available and biological plausibility is established (125-129). However, drug approval by the European Medicines Agency for emtricitabine and tenofovir disoproxil fumarate (TDF/FTC), brand-named Truvada, to be used as PrEP is still pending thereby limiting the possibility of usage in Europe.

Making PrEP accessible for MSM in Sweden and Europe may contribute to decrease transmission (33, 125, 128, 129). Some MSM participants in all four studies reported a high number of casual sex partner for UAI. If these sex partners are of positive HIV serostatus this would indicate a risk of HIV and a potential benefit of PrEP. MSM living in Sweden that while travelling to other cities or countries, where HIV prevalence is higher, and engage in condomless sex increase their HIV risk at the local sexual network level. This group may also benefit for on demand PrEP use (125).

Post Exposure Prophylaxis (PEP) is available as a part of standard care in Sweden. There may be potential for an increase in uptake by making these services more easily available for MSM (130). In addition information about when to use and where to access PEP can be included in behavioural interventions such as peer education. Studies from Amsterdam and Denmark report low uptake of PEP among MSM and strategies to increase uptake may be relevant for several European settings where PEP is part of standard of care (131-133). As PEP should be initiated as soon as possible after a risk of transmission has occurred, initial treatment could be given at all emergency room units (as already implemented in Sweden) and at primary health care units to enable quick initiation of treatment. The initial treatment may be followed up with referrals to specialised clinics for decision regarding continued PEP and follow-up. Increased correct usage of PEP may also contribute to diminish HIV incidence among MSM.

## **Online strategies to increase uptake of HIV-testing**

The web-based sampling strategies presented here may also be applied for recruiting MSM into online interventions providing information and counselling with referral to the nearest testing site and prevention programme. As the majority of participants in both study II and III reported having used or preferred online information regarding HIV, further development of online prevention seems promising. The next step could include interactive features where the visitor enters information regarding sexual behaviour to enable tailored information on HIV and STI. A pilot study among MSM in Sweden of an Internet-based intervention based on the information-motivation-behavioural skills model report a decrease in number of casual sex partners among participants (134). Smartphone applications also holds promise (135, 136). These applications could provide information regarding the closest facility where you can test for HIV/STI and opening hours based on the person's geographical location. Voluntary anonymous partner notification smartphone applications may also be useful. In addition, information regarding safe sex and where to test could be incorporated in existing dating smartphone applications for MSM.

## **Peer education and outreach work**

Peer outreach work to promote testing, distribute condoms and lubricants, and provide information and counselling may be of advantage particularly to groups of MSM such as foreign-born MSM and MSM visiting sex venues (137). Peer outreach acts as a first point of contact that can offer information and refer to other services, thereby increasing uptake of these services as seen in study III where having talked to a prevention worker was associated with recent HIV-testing among foreign-born MSM.

## **Implementing and evaluating structural interventions**

Structural barriers also limit the effect of HIV prevention programmes by reducing service uptake and compromising the quality of offered services. 38% of European MSM respondents in the European Survey of Lesbian, Gay, Bisexual and Transgender persons conducted in 2012 reported that they have not disclosed their sexual orientation to a health care provider (54). The lack of this information in the counselling process limits the opportunity for MSM-competent health services. Structural interventions aiming to decrease stigma, homophobia and discrimination against MSM may achieve an open climate where

MSM feel safe to disclose and enrol in prevention and treatment programmes more frequently. As these structural changes take place there is a need to evaluate in order to guide future improvements in design and implementation. For example, LGBTI rights will hopefully be improved through structural and policy changes in diverse European settings over the next decade. The opportunity to evaluate the health impact regarding HIV, mental health, and life quality, of these structural changes should not be missed.

### **Scale-up of prevention among foreign-born MSM**

Foreign-born MSM who have recently arrived to Sweden represents a sub-population of people migrating/fleeing to Sweden. As registers of those migrating to Sweden are available this provides opportunities for probability sampling. These registers may also be used to offer this group comprehensive health information and services, which is provided today in parts of Sweden (138, 139). Scale-up of these services are needed and could include sexual health promotion through counselling, information about where to seek HIV/STI testing, treatment and care, being offered HIV/STI-testing and information regarding LGBTI rights and services such as MSM clinics.

Prevention among foreign-born MSM that have lived in Sweden for various amounts of time will benefit from inclusion in HIV prevention programming for all MSM. These programmes may benefit from including culturally sensitive strategies and several different languages used by foreign-born MSM. For example peer outreach in Spanish at venues Latino MSM visit may be beneficial. An evaluation of foreign-born MSM's experience of sexual health clinics in Britain suggests that services needs to be culturally sensitive and also address possible confidentiality concerns (140).

### **Limitations, challenges and advantages with the HASTE grading framework (Study I)**

In this study , a lack of European effectiveness studies was found both regarding new interventions such as implementation of Pre Exposure Prophylaxis (PrEP) programmes and regarding existing interventions such as Post Exposure Prophylaxis (PEP) and voluntary partner notification. The lack of implementation data is a limitation to the systematic review process and also to our understanding on how the reviewed interventions perform in the real life setting. Future evaluations of these interventions would aid in further establishing the evidence base and guide future program implementation.

When designing the systematic review we looked at different ways of evaluating data. The Grading of Recommendations Assessment, Development and Evaluation (GRADE) has been widely endorsed as the most effective methods to grade the current state of evidence of clinical interventions and has informed the development of clinical practice guidelines by the World Health Organization. The GRADE system is built on the traditional hierarchy of evidence (141). The highest quality of evidence is derived from randomized double-blinded controlled trials, followed by unblinded randomized controlled trials, prospective cohort studies, case-control studies, clinical case series and lastly consensus among experts. The GRADE system was developed to evaluate individual level efficacy of clinical interventions by applying the hierarchy of evidence studies and can serve as the basis to evaluate public health interventions as well (141). Public health interventions tend to be context-specific and multifaceted. The existing evidence from randomized controlled trials evaluating public health interventions with biological endpoints for MSM populations are limited (120). Therefore, the GRADE system needs to be complemented when reviewing evidence on HIV preventive interventions among MSM. The HASTE system builds on the GRADE system and was developed specifically to evaluate evidence regarding HIV/STI interventions among most at-risk populations, in particular MSM (106).

The HASTE framework allowed for an inclusive approach to available data and was particularly helpful for highlighting implementation data. In the grading process we spent considerable time on thoroughly discussing the differences between HASTE grade 2a probable, 2b possible and 2c pending- for recommendation. These grades are somewhat overlapping, which requires careful consideration when assigning them. For example, PEP and PrEP holds the same evidence for plausibility. PrEP had at the time limited efficacy data and no implementation data (127). While, for PEP limited efficacy data was found and implementation data reported that PEP was available in most European settings (131-133). The difference in available implementation data led to assigning these interventions different grades, grade 2a for PEP and 2b for PrEP.

Some interventions that have been implemented for long time periods based on plausibility have a sufficient amount of implementation experience but lack efficacy data. These interventions are difficult to place within the HASTE framework. For example voluntary anonymous partner notification have established plausibility, but no efficacy data or on-going trial was found. Implementation data from the European setting was sufficient and reported willingness among MSM index partner to notify their sex partners (142, 143). For grade 2c, the original HASTE framework states that plausibility should be established and that there are



on-going efficacy trials. This intervention was assigned grade 2c even though not fulfilling the criteria of on-going efficacy trials. We thereby made an adjustment to the original HASTE grading framework. The adjustment was helpful for this review and we propose that it will be evaluated in future reviews using HASTE.

Behavioural and biological outcomes were assigned the same value according to the inclusion criteria for this review. As HIV incidence studies are rare we included all available and relevant efficacy data. This leads to that universal antiretroviral treatment which is shown to lead to decrease in HIV transmission and peer outreach that is shown to reduce UAI were both assigned a strong recommendation. However we expect different size of intervention effectiveness regarding decreasing HIV incidence in the MSM population for these two interventions. This review's grading process does not take the expected decrease in HIV incidence into account.

### **Future development and use of Web-based sampling strategies**

The online banner survey, WebRDS and stratified sampling in a Web community discussed in study IV all used Sweden's largest Web community for LGBTI for recruitment in different ways. The Web community is an active social forum, however usage has decreased during the last five years (109). New online social forums have become available including other Web communities, chats and smartphone applications. Future web-based studies may need to consider a variety of online forums. In particular smartphone applications used for dating among MSM may be a potential opportunity for web-based sampling, surveys and interventions (136, 144). WebRDS recruitment could also benefit from applying several online options to recruit peers including smartphone applications such as Grindr, chats, FaceBook and other online social forums. Random probability sampling, such as stratified sampling in a Web community, may also be performed among other online social forums member registers. It could be helpful to sample from several member registers in order to capture a wider population of MSM.

To validate findings between different samples of MSM, such as in study IV, may provide a more comprehensive understanding of the samples of MSM captured and help in interpreting the results. The WebRDS and TLS sample included younger participants in comparison to the banner survey and stratified sampling in a Web community. All sample were on average younger than the male population of Sweden (145, 146). The opposite have been reported from two recent studies among MSM in China that found that TLS participants were on

average older than online banner survey participants and RDS participants (147, 148). These data highlights the diversity between settings and implementation of the sampling methods. The age difference between samples is relevant for understanding the differences in participants' employment status, education level, HIV serostatus and HIV/STI testing experience in the different samples. These outcomes may be related to age as well. WebRDS captured MSM with lower education levels. This finding is consistent with previous RDS among MSM in Brazil and China (148-150).

All participants in the WebRDS reported having had one or more casual male sex partners for UAI in the last 12 months, while more than half of the participants in the other samples reported no casual sex partners for UAI during the same time period. Thereby three sampling methods validate each other, except the WebRDS. This discrepancy can possibly be explained by that the WebRDS recruitment chains were short and early in RDS recruitment hence MSM with large social networks may be oversampled. Having a large social network may imply having more opportunity for sex and thereby sexual risk behaviour (151). Similar proportions of participants in the four samples reported six or more casual male sex partners for UAI in the past 12 months, indicating that the sampling methods can be used to indicate the validity of the data across the samples for some variables.

Web-based or venue based sampling through meeting places and online forums that are also used for finding new sex partners may have implications for measuring sexual risk behaviour for HIV/STI (152). A comparison of an online banner survey and a sub sample of MSM from a national probability sample in the United Kingdom report higher sexual risk behaviour among the online banner survey participants (71). Similar findings are reported in a comparison of studies among the general population in Sweden (153).

Non-probability samples or probability samples with low response rates estimates should be interpreted with caution regarding generalizing results to the larger population of MSM. In most cases inference is not possible.

## **Monitoring the HIV epidemic among MSM**

Different high income countries use different sampling strategies and methods to gather HIV monitoring data of MSM. There are particularly discrepancies regarding collecting only behavioural or in addition also biological data when surveys are performed. Most countries within the European Union / European Economic Area including Sweden report on newly diagnosed cases of HIV and transmission route (12). In addition the Public Health Agency of Sweden have gathered behavioural data among MSM in two online banner surveys (2004, 2006) and the stratified sampling in a Web community study described previously (111, 112). Two large European studies have also been implemented in Sweden as described earlier, EMIS and Sialon II (113, 154). Thereby behavioural data have been collected on repeated occasions applying different sampling methods, while biological data i.e. HIV-testing to estimate HIV prevalence in a sample of MSM have been collected once, in 2013.

Monitoring data studies for HIV among MSM in low and middle income countries have to a large extent used RDS sampling for recruitment to HIV Integrated Biological and Behavioural Surveillance Surveys (155). On the contrary biological and behavioural monitoring data among MSM in the United States are gathered by applying TLS in metropolitan areas (80). RDS are being used in the United States for gathering monitoring data on two other key populations for HIV, people who inject drugs and heterosexual adults at increased risk of HIV (156). In Canada, another high income setting, RDS has been used to study several key populations for HIV such as MSM, street youth and people who inject drugs (157). When comparing RDS among these three populations, the recruitment process among MSM was less successful. Aglipay et al. reports that this may be due to the study design and problems with informing MSM regarding the peer recruitment process, however MSM may also have smaller social networks in this setting (157). The different sampling methods used in different settings points towards that RDS and TLS both works well to sample MSM and the methods have different advantages and disadvantages.

Measuring HIV prevalence in a sample of MSM provides insights to the risk of HIV at the local sexual network level. While, behavioural data on UAI provides insights to the risk of HIV at the individual level. UAI only poses a considerable risk of HIV when performed with a sex partner living with HIV and manifest HIV viral blood count. Thereby behavioural and biological data complements each other to provide insights into the HIV epidemic and HIV risk among MSM. Another benefit from gathering biological data as part of monitoring data is to contribute towards increased uptake of testing.

Future efforts of monitoring HIV risk among MSM living in Sweden could benefit from gathering biological and behavioural data. A real life RDS among MSM living in Sweden could employ both real life and web-based peer recruitment with referrals to a study site. A multi-site study may be beneficial in order to reach MSM living in different parts of the country, as Sweden covers a vast geographical area. All of the previously used web-based sampling methods could also be explored to recruit participant to a web survey with an add on referral for anonymous HIV-testing at the nearest clinic. In order to motivate participants to part take in testing incentives could be explored. For example, iTunes song gifting was recently found to be a low-cost efficient methods for recruitment of MSM in the United States (158).

Future monitoring of the HIV epidemic among MSM will most probably continue to involve web-based strategies as Internet use increase globally. Further development of these strategies including the latest online technology such as smartphone and tablet applications holds promise for both research and interventions among MSM.

### **Limitations of used sampling strategies (Study II-IV)**

When studying sexual behaviour there is a risk of bias due to self-reporting. Thereby reporting bias, recall bias and social desirability bias may be introduced (159-161). Social desirability bias may have been reduced by the privacy of the online setting and by not collecting personal identifier data. To diminish recall bias we asked about sexual risk behaviour within a specific time frame to enable participants to focus and recall only for this period (161, 162). However, recall bias may still exist in the data. The same kind of bias may exist in the individual studies examining behavioural outcomes included in the systematic review (study I). In addition, salience bias may have been introduced meaning that some individuals who are interested in the study topic may be more inclined to respond to the study (75).

The different web-based sampling methods presented in study II-IV all have limitations. The online banner survey recruited the largest sample of MSM, but represents a convenience sample. Thereby generalizability of findings to the Internet active MSM population is limited. This sampling method may however be useful when data is needed quickly and at low cost, as it has proven ability to recruit MSM across diverse settings (70, 163, 164).

The time location sampling study provide estimates that are generalizable to the established sampling frame of MSM visiting selected venues in Stockholm and provides a good option when aiming to target MSM in urban areas. In addition TLS offers the opportunity for biological samples in addition to gathering behavioural data. However additional strategies are needed in order to capture MSM not residing in urban areas.

The WebRDS recruitment produced short recruitment chains, similarly to WebRDS studies among the general population in the Netherlands and Thailand (101, 102, 165). Therefore the study may have captured MSM with large social networks, which has implication for the study outcome of sexual risk behaviour. Another limitation is that the web survey format was not adjusted for smart phone and tablets, which should be explored in future studies to ease participation. For example a person may receive the invitation while checking their email inbox on the buss but cannot answer the survey immediately on their smart phone. The invitation email may have been forgotten by the next time the person checks their email on a computer leading to non response. Since the analysis of study II was performed a new RDS estimator has been suggested and evaluated to perform better in comparison to the RDSII estimator used (86, 87). Future RDS analysis may benefit from using the new recommended estimator.

The stratified sampling among the member registry of a Web community achieved a crude overall response rate of 19%. Data was not available in order to know to what extent foreign-born differed from other participants regarding response rate. The findings achieved may be generalizable to the member register of the Qruiser Web community if systematic drop out did not occur, but systematic drop out has been reported from two previous online banner surveys among men and women in Sweden and MSM in the United States (166, 167). In addition, the MSM population living in Sweden may differ in many aspects from the Web community registry. The formative interview studies performed indicated that some MSM have multiple memberships and profiles on the Web community. Thereby one person can have been invited twice through two different Web community profiles.

Foreign-born MSM having recently arrived in Sweden may not be inclined to answer a web survey due to language barrier, being in an asylum process or a hidden refugee, and not wanting to answer questions regarding a stigmatized topic such as same sex practices. In addition, newly arrived MSM may not know of or be members of the Web community where sampling took place. Further strategies are needed to reach this group of foreign-born MSM. One option could be probability sampling among newly arrived migrants/refugees that may capture sufficient sub-samples of MSM.

In study IV, the four studies presented are diverse using different sampling methods of which there is no 'golden standard', thereby only allowing for a descriptive comparison. Inference of the study participant populations to the general population of MSM living in Sweden can only be done with great caution.

## 6.1 CONCLUSIONS

- Condom use, peer outreach, peer-led group interventions and universal coverage of antiretroviral treatment were strongly recommended as HIV prevention among MSM according to the HASTE grading framework. In addition, HIV-testing was deemed essential to achieve coverage of antiretroviral treatment.
- A lack of implementation studies of HIV prevention among MSM from the European Union / European Economic Area was identified.
- Web-based Respondent Driven Sampling among MSM recruited participants that all reported having had unprotected anal intercourse with at least one regular and one casual sex partner during the past year.
- Having lived in Sweden less than or equal to five years, having talked with a prevention worker and having had a STI test during the last 12 months was associated with having tested for HIV during the same time period among foreign-born MSM.
- Preferred testing services among foreign-born MSM participants were rapid HIV test, anonymous testing, testing outside of the health care system and testing at MSM clinics.
- Online banner survey sampling, time location sampling, Web-based Respondent Driven Sampling and stratified sampling in a Web community to study sexual risk behaviour among MSM in Sweden captured samples of MSM that differed regarding sociodemographic characteristics and sexual behaviour.

## 6.2 RECOMMENDATIONS

- Scale-up of HIV-testing, coverage of antiretroviral treatment, peer outreach, peer-led group interventions, and condom promotion and distribution are recommended as HIV prevention among MSM within the European Union and European Economic Area.
- Future studies to evaluate implementation and effectiveness of interventions would be beneficial to guide scale-up of these interventions within the European Union and European Economic Area.
- To further improve the Web-based Respondent Driven Sampling method, the software could be adapted to smart phones and tablets, and apply recruitment strategies on different online social platforms.
- Web-based Respondent Driven Sampling may hold promise for recruiting MSM engaging in sexual risk behaviour to web-based HIV prevention interventions including referrals to testing for HIV and sexually transmitted infections.
- Prevention outreach activities, individual- and group- counselling to promote uptake of HIV testing should be applied and evaluated among foreign-born MSM as well as other MSM living in Sweden.
- By applying different sampling strategies among MSM comprehensive data can be achieved and findings can be validated across the samples.





## 7 SUMMARY IN SWEDISH / SVENSK SAMMANFATTNING

### **Hiv-prevention, urvalsmetoder och sexuellt riskbeteende bland män som har sex med män**

Homosexuella, bisexuella och andra män som har sex med män, benämns inom hälso- och sexualitetsrelaterad forskning för ”män som har sex med män” och förkortas MSM. MSM har en förhöjd risk för humant immunbristvirus, hiv, och är en viktig grupp för riktade preventionsinsatser. Antalet nydiagnostiserade fall av hiv bland MSM i Europa ökar i kontrast till att antalet minskar bland den generella populationen. I Sverige är sex mellan män den vanligaste överföringsvägen av hiv vid inhemsk smitta. Under de senaste åren har en ökning av hiv fall bland utlandsfödda MSM rapporterats. Ytterligare preventionsinsatser behövs bland MSM i Sverige, i Europa och globalt.

Representativitet i data för MSM populationen är svår att uppnå. Stigma kring MSM försvårar även rekrytering till forskningsstudier och gruppen kallas ofta för en dold grupp. För att lösa problemet har andra rekryteringsstrategier för forskningsstudier av dolda grupper utvecklats. ”Respondent driven sampling” är en metod som använder sig av studiedeltagarnas sociala kontakter vilket har visat ge en hög svarsfrekvens. Internet-baserad rekrytering till studier har visats nå MSM. En fördel med Internet-baserade studier är att de ger en hög grad av upplevd anonymitet bland studiedeltagare och kan besvaras vid den tidpunkt och på den plats som passar den enskilde.

Studierna som presenteras här har som syfte att bidra till ökad kunskap kring effektiv hiv-prevention och urvalsmetoder för nå MSM. För att nå MSM och studera sexuellt riskbeteende så använde vi oss av web-baserad ”respondent driven sampling” samt ett stratifierat urval av MSM medlemmar på ett internetforum. Båda urvalsmetoderna användes för första gången i Sverige.

Studie I granskade och utvärderade systematiskt hiv-preventiva interventioner bland MSM i Europa (Europeiska Unionen och det Europeiska ekonomiska samarbetsområdet). Tjugofyra olika hiv-preventiva interventioner för MSM inkluderades varav femton interventioner uppfyllde kraven för att räknas som evidensbaserad hiv-prevention för MSM. Studien visar att de fyra interventionerna: kondom användning, uppsökande

preventionsverksamhet av och för MSM, MSM-ledda gruppaktiviteter med preventionsbudskap och antiretroviral behandling för personer som lever med hiv uppfyller evidens för en stark rekommendation. Hiv-testning bland MSM är grundläggande för att möjliggöra antiretroviral behandling för de personer som lever med hiv. Studieresultaten användes sedan som evidensgrund för att utveckla europeiska riktlinjer kring prevention bland MSM av European Centre for Disease Prevention and Control.

Studie II implementerade och utvärderade web-baserad ”respondent driven sampling” som metod för att studera sexuellt riskbeteende bland MSM i Sverige. Alla studiedeltagarna rapporterade att de haft haft analsex utan kondom med en eller flera tillfälliga manliga sexpartner, och en eller flera regelbundna sexpartner under det senaste året. Studien visade därmed att deltagarna är en grupp av MSM som kan ha nytta av preventionsinsatser. Web-baserad ”respondent driven sampling” kan i framtiden användas för att implementera web-baserade interventioner bland MSM som tar sexuella risker.

Studie III undersökte hiv-testning och prevention bland utlandsfödda MSM i Sverige genom ett stratifierat urval av MSM som är medlemmar på ett Internetforum. Ungefär hälften (45 %) av deltagarna hade testat sig för hiv senaste året medan en femtedel aldrig hade testat sig. Att ha talat med en person som arbetar med hiv-prevention under senaste året var signifikant associerat med att ha testat sig inom samma tidsperiod. Resultaten stärker att uppsökande preventionsverksamhet kan främja testning bland utlandsfödda MSM.

Studie IV analyserade likheter och skillnader med avseende på sociodemografiska faktorer och sexuellt riskbeteende i fyra olika urval av MSM som insamlats mellan 2010 och 2013 i Sverige. Utöver urvalen av MSM från studie II och III så studerades två ytterligare urval. Dels deltagarna i en webbenkät som annonserades via länkar på websidor för MSM (”online banner survey”), och dels data som samlats in på fysiska mötesplatser för MSM så kallad ”time location sampling”. De fyra urvalen av MSM studiedeltagare skiljde sig avseende sociodemografiska variabler och sexuellt riskbeteende. Sammantaget gav data från flera urvalsmetoder en ökad förståelse för sexuellt riskbeteende bland MSM. Framtida studier kan dra nytta av att kombinera urvalsmetoder för att validera insamlad data mellan flera urval av MSM.

För att vända hiv-situationen bland MSM i Europa rekommenderas en ökad satsning på implementering av evidensbaserad hiv-prevention. Web-baserade urvalsmetoder visade på möjlighet att rekrytera en bred representation av MSM och bör vidareutvecklas både för forskningsstudier och för implementering av preventiva interventioner. Utvärdering av data från olika urvalsmetoder bidrar med att ge en större förståelse för sexuellt riskbeteende bland MSM.



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## 9 REFERENCES

1. European Centre for Disease Prevention and Control. HIV and STI prevention among men who have sex with men. Stockholm: ECDC, 2015.
2. Joint United Nations Programme on HIV/AIDS (UNAIDS). Global Report: UNAIDS report on the global AIDS epidemic 2013. Geneva: UNAIDS, 2013.
3. UNAIDS. AIDS by the numbers 2015. 2015 Updated 26 November 2015. Report No.
4. Organization WH. Global Health Observatory (GHO) data 2013 [cited 2015 Nov 20]. Available from: [http://www.who.int/gho/hiv/epidemic\\_status/cases\\_all/en/](http://www.who.int/gho/hiv/epidemic_status/cases_all/en/)
5. UNAIDS. Global Report: UNAIDS report on the global AIDS epidemic 2013. 2013 Contract No.: ISBN 978-92-9253-032-7.
6. Beyrer C, Baral SD, van Griensven F, Goodreau SM, Chariyalertsak S, Wirtz AL, et al. Global epidemiology of HIV infection in men who have sex with men. *Lancet*. 2012;380(9839):367-77.
7. Beyrer C, Sullivan P, Sanchez J, Baral SD, Collins C, Wirtz AL, et al. The increase in global HIV epidemics in MSM. *AIDS (London, England)*. 2013;27(17):2665-78.
8. Sullivan PS, Jones JS, Baral SD. The global north: HIV epidemiology in high-income countries. *Current opinion in HIV and AIDS*. 2014;9(2):199-205.
9. European Centre for Disease Prevention and Control, World Health Organization Regional Office Europe. HIV/AIDS Surveillance in Europe 2014. Stockholm: ECDC, 2015 Nov 26. Report No.
10. Pharris A, Quinten C, Tavoschi L, Spiteri G, Amato-Gauci AJ. Trends in HIV surveillance data in the EU/EEA, 2005 to 2014: new HIV diagnoses still increasing in men who have sex with men. *Euro Surveill*. 2015;20(47).(doi):10.2807/1560-7917.ES.2015.20.47.30071.
11. European Centre for Disease Prevention and Control, World Health Organization Regional Office Europe. HIV Surveillance in Europe 2013. Stockholm: ECDC, 2014.
12. European Centre for Disease Prevention and Control. Thematic report: Men who have sex with men. Monitoring implementation of the Dublin Declaration on Partnership to Fight HIV/AIDS in Europe and Central Asia: 2012 Progress Report. Stockholm: 2013.
13. Folkhälsomyndigheten. Hivinfektion 2015 [cited 2015 Nov 13]. Available from: <http://www.folkhalsomyndigheten.se/amnesomraden/statistik-och-undersokningar/sjukdomsstatistik/hivinfektion/>.
14. Swedish Institute for Infectious Disease Control (SMI). Global AIDS response: progress report 2012. Stockholm: Swedish Institute for Infectious Disease Control 2012.
15. Folkhälsomyndigheten. MSM2013 - En studie om sex, hiv och hälsa bland män som har sex med män i Sverige. Stockholm: Folkhälsomyndigheten, 2015.
16. Peterson L, Marin G. Issues in the prevention of AIDS among Black and Hispanic Men. *American Psychologist*. 1988;42(11):871-7.
17. Doll LS, Petersen LR, White CR, Ward JW. The Blood Donor Study Group. Homosexuality and non-sexually identified men who have sex with men: a behavioural comparison. *Journal of Sex Research*. 1992;29(1):1-14.
18. Rogers SM, CF. T, . Patterns of same-gender sexual contact among men in the U.S.A.: 1970–1990. . *The Journal of Sex Research*. 1991;28:491–519.
19. Fay RE, Turner CF, Klassen AD, Gagnon JH. Prevalence and patterns of same-gender sexual contact among men. *Science*. 1989;243(4889):338-48.
20. UNAIDS. UNAIDS Terminology Guidelines. 2015.

21. Baral SD, Poteat T, Stromdahl S, Wirtz AL, Guadamuz TE, Beyrer C. Worldwide burden of HIV in transgender women: a systematic review and meta-analysis. *Lancet Infect Dis.* 2013;13(3):214-22. doi: 10.1016/S1473-3099(12)70315-8. Epub 2012 Dec 21.
22. Hemelaar J. The origin and diversity of the HIV-1 pandemic. *Trends Mol Med.* 2012;18(3):182-92. doi: 10.1016/j.molmed.2011.12.001. Epub 2 Jan 11.
23. Boily MC, Baggaley RF, Wang L, Masse B, White RG, Hayes RJ, et al. Heterosexual risk of HIV-1 infection per sexual act: systematic review and meta-analysis of observational studies. *Lancet Infect Dis.* 2009;9(2):118-29.
24. Baggaley RF, White RG, Boily MC. HIV transmission risk through anal intercourse: systematic review, meta-analysis and implications for HIV prevention. *Int J Epidemiol.* 2010;39(4):1048-63.
25. Hool A, Leventhal GE, Bonhoeffer S. Virus-induced target cell activation reconciles set-point viral load heritability and within-host evolution. *Epidemics.* 2013;5(4):174-80. doi: 10.1016/j.epidem.2013.09.002. Epub Sep 23.
26. Jin F, Jansson J, Law M, Prestage GP, Zablotska I, Imrie JC, et al. Per-contact probability of HIV transmission in homosexual men in Sydney in the era of HAART. *AIDS.* 2010;24(6):907-13. doi: 10.1097/QAD.0b013e3283372d90.
27. Vittinghoff E, Douglas J, Judson F, McKinnan D, MacQueen K, Buchbinder S. Per-Contact Risk of Human Immunodeficiency Virus Transmission between Male Sexual Partners. *American Journal of Epidemiology.* 1998;150(3):206-311.
28. Fraser C, Hollingsworth TD, Chapman R, de Wolf F, Hanage WP. Variation in HIV-1 set-point viral load: epidemiological analysis and an evolutionary hypothesis. *Proc Natl Acad Sci U S A.* 2007;104(44):17441-6. Epub 2007 Oct 22.
29. Moyo S, Wilkinson E, Novitsky V, Vandormael A, Gaseitsiwe S, Essex M, et al. Identifying Recent HIV Infections: From Serological Assays to Genomics. *Viruses.* 2015;7(10):5508-24. doi: 10.3390/v7102887.
30. McMichael AJ, Borrow P, Tomaras GD, Goonetilleke N, Haynes BF. The immune response during acute HIV-1 infection: clues for vaccine development. *Nat Rev Immunol.* 2010;10(1):11-23. doi: 10.1038/nri2674. Epub 009 Dec 11.
31. Stine G. *AIDS Update 2014.* 23 ed. Education MH, editor: Dushkin Publishing; 2014.
32. Cohen MS, Chen YQ, McCauley M, Gamble T, Hosseinipour MC, Kumarasamy N, et al. Prevention of HIV-1 infection with early antiretroviral therapy. *N Engl J Med.* 2011;365(6):493-505. doi: 10.1056/NEJMoa1105243. Epub 2011 Jul 18.
33. Sullivan PS, Carballo-Diequez A, Coates T, Goodreau SM, McGowan I, Sanders EJ, et al. Successes and challenges of HIV prevention in men who have sex with men. *Lancet.* 2012;380(9839):388-99. doi: 10.1016/S0140-6736(12)60955-6. Epub 2012 Jul 20.
34. Baral S, Logie CH, Grosso A, Wirtz AL, Beyrer C. Modified social ecological model: a tool to guide the assessment of the risks and risk contexts of HIV epidemics. *BMC Public Health.* 2013;13:482.(doi):10.1186/471-2458-13-482.
35. den Daas C, Goenée M, Bakker BH, de Graaf H, Op de Coul EL. Comparing databases: determinants of sexually transmitted infections, HIV diagnoses, and lack of HIV testing among men who have sex with men. *BMC Public Health.* 2015;15(1):1114. doi: 10.86/s12889-015-2445-3.
36. Garofalo R, Hotton AL, Kuhns LM, Gratz B, Mustanski B. Incidence of HIV infection and Sexually Transmitted Infections and Related Risk Factors among Very Young Men Who Have Sex with Men. *J Acquir Immune Defic Syndr.* 2016;7.
37. Rosenberg ES, Rothenberg RB, Kleinbaum DG, Stephenson RB, Sullivan PS. The implications of respondent concurrency on sex partner risk in a national, web-based

- study of men who have sex with men in the United States. *J Acquir Immune Defic Syndr*. 2013;63(4):514-21. doi: 10.1097/QAI.0b013e318294bcce.
38. Leung KY, Kretzschmar M. Concurrency can drive an HIV epidemic by moving  $R_0$  across the epidemic threshold. *AIDS*. 2015;29(9):1097-103. doi: 10./QAD.00000000000000676.
  39. Lyons A, Hosking W. Prevalence and correlates of sexual partner concurrency among Australian gay men aged 18-39 years. *AIDS Behav*. 2014;18(4):801-9. doi: 10.1007/s10461-013-0613-y.
  40. Tieu HV, Nandi V, Frye V, Stewart K, Oquendo H, Bush B, et al. Concurrent partnerships and HIV risk among men who have sex with men in New York City. *Sex Transm Dis*. 2014;41(3):200-8. doi: 10.1097/OLQ.0000000000000090.
  41. Kramer SC, Schmidt AJ, Berg RC, Furegato M, Hospers H, Folch C, et al. Factors associated with unprotected anal sex with multiple non-steady partners in the past 12 months: results from the European Men-Who-Have-Sex-With-Men Internet Survey (EMIS 2010). *BMC Public Health*. 2016;16(1):47. doi: 10.1186/s12889-016-2691-z.
  42. UNAIDS, World Health Organization. Global AIDS Response Progress Reporting 2015. 2015 Contract No.: ISBN 978-92-9253-072-3.
  43. Oldenburg CE, Perez-Brumer AG, Reisner SL, Mimiaga MJ. Transactional Sex and the HIV Epidemic Among Men Who have Sex with Men (MSM): Results From a Systematic Review and Meta-analysis. *AIDS Behav*. 2015;19(12):2177-83. doi: 10.1007/s10461-015-1010-5.
  44. Perry NS, Wade Taylor S, Elsesser S, Safren SA, O'Cleirigh C. The Predominant Relationship Between Sexual Environment Characteristics and HIV-Serodiscordant Condomless Anal Sex Among HIV-Positive Men Who Have Sex with Men (MSM). *AIDS Behav*. 2015:22.
  45. Vosburgh HW, Mansergh G, Sullivan PS, Purcell DW. A review of the literature on event-level substance use and sexual risk behavior among men who have sex with men. *AIDS Behav*. 2012;16(6):1394-410. doi: 10.007/s10461-011-0131-8.
  46. Schmidt AJ, Hickson F, Weatherburn P, Marcus U. Comparison of the performance of STI screening services for gay and bisexual men across 40 European cities: results from the European MSM Internet Survey. *Sex Transm Infect*. 2013;89(7):575-82. doi: 10.1136/sextrans-2012-050973. Epub 2013 Jun 6.
  47. Macdonald N, Elam G, Hickson F, Imrie J, McGarrigle CA, Fenton KA, et al. Factors associated with HIV seroconversion in gay men in England at the start of the 21st century. *Sex Transm Infect*. 2008;84(1):8-13. Epub 2007 Nov 14.
  48. Ostrow DG, Plankey MW, Cox C, Li X, Shoptaw S, Jacobson LP, et al. Specific sex drug combinations contribute to the majority of recent HIV seroconversions among MSM in the MACS. *J Acquir Immune Defic Syndr*. 2009;51(3):349-55. doi: 10.1097/QAI.0b013e3181a24b20.
  49. Buchbinder SP, Vittinghoff E, Heagerty PJ, Celum CL, Seage GR, 3rd, Judson FN, et al. Sexual risk, nitrite inhalant use, and lack of circumcision associated with HIV seroconversion in men who have sex with men in the United States. *J Acquir Immune Defic Syndr*. 2005;39(1):82-9.
  50. Casper C, Wald A, Pauk J, Tabet SR, Corey L, Celum CL. Correlates of prevalent and incident Kaposi's sarcoma-associated herpesvirus infection in men who have sex with men. *J Infect Dis*. 2002;185(7):990-3. Epub 2002 Mar 11.
  51. Brenner BG, Roger M, Stephens D, Moisi D, Hardy I, Weinberg J, et al. Transmission clustering drives the onward spread of the HIV epidemic among men who have sex with men in Quebec. *J Infect Dis*. 2011;204(7):1115-9. doi: 10.093/infdis/jir468.
  52. Chan PA, Kazi S, Rana A, Blazar I, Dejong CC, Mayer KH, et al. Short communication: new HIV infections at Southern New England academic institutions:

- implications for prevention. *AIDS Res Hum Retroviruses*. 2013;29(1):25-9. doi: 10.1089/AID.2012.0130. Epub 2012 Jul 25.
53. Lewis F, Hughes GJ, Rambaut A, Pozniak A, Leigh Brown AJ. Episodic sexual transmission of HIV revealed by molecular phylodynamics. *PLoS Med*. 2008;5(3):e50. doi: 10.1371/journal.pmed.0050050.
  54. International Lesbian, Gay, Bisexual, Trans and Intersex Association; Carroll A, Itaborahy LP, . *State Sponsored Homophobia 2015: A world survey of laws: criminalisation, protection and recognition of same-sex love* Geneva: ILGA, May 2015. Report No.
  55. Hoyos J, Fernandez-Balbuena S, de la Fuente L, Sordo L, Ruiz M, Barrio G, et al. Never tested for HIV in Latin-American migrants and Spaniards: prevalence and perceived barriers. *J Int AIDS Soc*. 2013;16:18560.(doi):10.7448/IAS.16.1.18560.
  56. Berg RC, Munthe-Kaas HM, Ross MW. Internalized Homonegativity: A Systematic Mapping Review of Empirical Research. *J Homosex*. 2015;5.
  57. Berg RC, Ross MW, Weatherburn P, Schmidt AJ. Structural and environmental factors are associated with internalised homonegativity in men who have sex with men: findings from the European MSM Internet Survey (EMIS) in 38 countries. *Soc Sci Med*. 2013;78:61-9.(doi):10.1016/j.socscimed.2012.11.033. Epub Dec 5.
  58. Ross MW, Berg RC, Schmidt AJ, Hospers HJ, Breveglieri M, Furegato M, et al. Internalised homonegativity predicts HIV-associated risk behavior in European men who have sex with men in a 38-country cross-sectional study: some public health implications of homophobia. *BMJ Open*. 2013;3(2).(pii):e001928. doi: 10.1136/bmjopen-2012-. Print 2013.
  59. Magnani R, Sabin K, Saidel T, Heckathorn D. Review of sampling hard-to-reach and hidden populations for HIV surveillance. *AIDS (London, England)*. 2005;19 Suppl 2:S67-72.
  60. Bernard HR, Hallett T, Iovita A, Johnsen EC, Lyster R, McCarty C, et al. Counting hard-to-count populations: the network scale-up method for public health. *Sexually transmitted infections*. 2010;86 Suppl 2:ii11-5.
  61. Heckathorn DD. Respondent-Driven Sampling: A New Approach to the Study of Hidden Populations. *Social Problems*. 1997(44):174-99.
  62. Sabin KM, Johnston LG. Epidemiological challenges to the assessment of HIV burdens among key populations: respondent-driven sampling, time-location sampling and demographic and health surveys. *Current opinion in HIV and AIDS*. 2014;9(2):101-6.
  63. Regeringsformen 1974:152, (1974).
  64. Johnston LG, Chen YH, Silva-Santisteban A, Raymond HF. An empirical examination of respondent driven sampling design effects among HIV risk groups from studies conducted around the world. *AIDS Behav*. 2013;17(6):2202-10.
  65. Sweden's Public Health Institute / Statens Folkhälsoinstitut. National public health survey, Health on equal terms / Hälsa på lika villkor Resultat från nationella folkhälsoenkäten. 2009.
  66. Boström G. Nationella Folkenkäten. Vad betyder bortfallet för resultatet i folkhälsoenkäter?
  67. Hill A, Roberts J, Ewings P, Gunnell D. Non-response bias in a lifestyle survey. *Journal of public health medicine*. 1997;19(2):203-7.
  68. Rothman KJ, Greenland S. *Modern Epidemiology*.
  69. Van Spall HG, Toren A, Kiss A, Fowler RA. Eligibility criteria of randomized controlled trials published in high-impact general medical journals: a systematic sampling review. *JAMA*. 2007;297(11):1233-40.
  70. Grov C, Rendina HJ, Breslow AS, Ventuneac A, Adelson S, Parsons JT. Characteristics of men who have sex with men (MSM) who attend sex parties: results from

- a national online sample in the USA. *Sex Transm Infect.* 2014;90(1):26-32. doi: 10.1136/sextrans-2013-051094. Epub 2013 Sep 19.
71. Bowen A, Williams M, Horvath K. Using the internet to recruit rural MSM for HIV risk assessment: sampling issues. *AIDS Behav.* 2004;8(3):311-9.
  72. Hedt BL, Pagano M. Health indicators: eliminating bias from convenience sampling estimators. *Stat Med.* 2011;30(5):560-8. doi: 10.1002/sim.3920. Epub 2011 Feb 3.
  73. Sadler GR, Lee HC, Lim RS, Fullerton J. Recruitment of hard-to-reach population subgroups via adaptations of the snowball sampling strategy. *Nurs Health Sci.* 2010;12(3):369-74. doi: 10.1111/j.442-2018.0.00541.x.
  74. Goodman LA. Snowball sampling. *The Annals of Mathematical Statistics.* 1961;32:148-70.
  75. Wallander L, Tikkanen RH, Mannheimer LN, Ostergren PO, Plantin L. The problem of non-response in population surveys on the topic of HIV and sexuality: a comparative study. *Eur J Public Health.* 2015;25(1):172-7. doi: 10.1093/eurpub/cku154. Epub 2014 Sep 15.
  76. Heckathorn DD. Snowball versus respondent-driven sampling. *Sociol Methodol.* 2011;41(1):355-66.
  77. Watters JK, Biernacki P. Targeted sampling: options for the study of hidden populations. *Social Problems.* 1989;36(4):416-30.
  78. Carlson RG, Wang JC, Siegal HA, Falck RS, Guo J. An Ethnographic Approach to Targeted Sampling - Problems and Solutions in Aids-Prevention Research among Injection-Drug and Crack-Cocaine Users. *Human Organizations.* 1994(53):279-86.
  79. Karon JM, Wejnert C. Statistical methods for the analysis of time-location sampling data. *J Urban Health.* 2012;89(3):565-86. doi: 10.1007/s11524-012-9676-8.
  80. MacKellar DA, Gallagher KM, Finlayson T, Sanchez T, Lansky A, Sullivan PS. Surveillance of HIV risk and prevention behaviors of men who have sex with men--a national application of venue-based, time-space sampling. *Public Health Rep.* 2007;122(Suppl 1):39-47.
  81. Leon L, Jauffret-Roustide M, Le Strat Y. Design-based inference in time-location sampling. *Biostatistics.* 2015.
  82. Broadhead RS, Heckathorn DD, Weakliem DL, Anthony DL, Madray H, Mills RJ, et al. Harnessing peer networks as an instrument for AIDS prevention: results from a peer-driven intervention. *Public Health Rep.* 1998;113 Suppl 1:42-57.
  83. Abdul-Quader AS, Heckathorn DD, Sabin K, Saidel T. Implementation and analysis of respondent driven sampling: lessons learned from the field. *J Urban Health.* 2006;83(6 Suppl):i1-5.
  84. Wylie JL, Jolly AM. Understanding recruitment: outcomes associated with alternate methods for seed selection in respondent driven sampling. *BMC Med Res Methodol.* 2013;13:93.(doi):10.1186/471-2288-13-93.
  85. Volz E, Heckathorn D. Probability based estimation theory for respondent driven sampling. *Journal of Official Statistics.* 2008;24(1):79-97.
  86. Xin L. Linked Ego Networks: Improving Estimate Reliability and Validity with Respondent-driven Sampling. *Social Networks.* 2013(35):669-85.
  87. Verdery AM, Merli MG, Moody J, Smith JA, Fisher JC. Brief Report: Respondent-driven Sampling Estimators Under Real and Theoretical Recruitment Conditions of Female Sex Workers in China. *Epidemiology.* 2015;26(5):661-5. doi: 10.1097/EDE.0000000000000335.
  88. Heckathorn DD. Respondent-Driven Sampling II: Deriving Valid Population Estimates from Chain-Referral Samples of Hidden Populations. *Social Problems.* 2002;49:11-34.

89. Salganik MJ. Variance estimation, design effects, and sample size calculations for respondent-driven sampling. *J Urban Health*. 2006;83(6 Suppl):i98-112.
90. Goel S, Salganik MJ. Respondent-driven sampling as Markov chain Monte Carlo. *Stat Med*. 2009;28(17):2202-29.
91. Salganik MJ. Commentary: Respondent-driven Sampling in the Real World. *Epidemiology*. 2012;23(1):148-50.
92. Wejnert C. Social network analysis with respondent-driven sampling data: A study of racial integration on campus. *Soc Networks*. 2010;32(2):112-24.
93. Gile KJ, Handcock MS. Respondent-Driven Sampling: An Assessment of Current Methodology. *Sociol Methodol*. 2010;40(1):285-327.
94. McCreesh N, Frost SD, Seeley J, Katongole J, Tarsh MN, Ndunguse R, et al. Evaluation of respondent-driven sampling. *Epidemiology*. 2012;23(1):138-47.
95. McCormick TH, Salganik MJ, Zheng T. How many people do you know?: Efficiently estimating personal network size. *J Am Stat Assoc*. 2010;105(489):59-70.
96. Johnston LG, Malekinejad M, Kendall C, Iuppa IM, Rutherford GW. Implementation challenges to using respondent-driven sampling methodology for HIV biological and behavioral surveillance: field experiences in international settings. *AIDS Behav*. 2008;12(4 Suppl):S131-41.
97. Salganik MJ, Mello MB, Abdo AH, Bertoni N, Fazito D, Bastos FI. The Game of Contacts: Estimating the Social Visibility of Groups. *Soc Networks*. 2011;33(1):70-8.
98. Richard G. White AJH, Matthew J. Salganik, Michael W. Spiller, Lisa G. Johnston, Ligia RFS. Kerr, Carl Kendall, Amy Drake, David Wilson, Kate Orroth, Matthias Egger, Wolfgang W. Hladik. Strengthening the Reporting of Observational Studies in Epidemiology for Respondent-Driven Sampling Studies: 'STROBE-RDS' Statement. *Journal of Clinical Epidemiology*. 2015.
99. Wejnert C. An empirical test of respondent-driven sampling: point estimates, variance, degree measures, and out-of-equilibrium data. *Sociol Methodol*. 2009;39(1):73-116.
100. Lu X, Bengtsson L, Britton T, Camitz M, Kim BJ, Thorson A, et al. The sensitivity of respondent-driven sampling. *J R Stat Soc a Stat*. 2012;175:191-216.
101. Stein ML, van Steenbergen JE, Buskens V, van der Heijden PG, Chanyasanha C, Tipayamongkholgul M, et al. Comparison of contact patterns relevant for transmission of respiratory pathogens in Thailand and The Netherlands using respondent-driven sampling. *PLoS One*. 2014;9(11):e113711.
102. Stein ML, van Steenbergen JE, Chanyasanha C, Tipayamongkholgul M, Buskens V, van der Heijden PG, et al. Online respondent-driven sampling for studying contact patterns relevant for the spread of close-contact pathogens: a pilot study in Thailand. *PLoS One*. 2014;9(1):e85256.
103. Bauermeister JA, Zimmerman MA, Johns MM, Glowacki P, Stoddard S, Volz E. Innovative recruitment using online networks: lessons learned from an online study of alcohol and other drug use utilizing a web-based, respondent-driven sampling (webRDS) strategy. *J Stud Alcohol Drugs*. 2012;73(5):834-8.
104. Wejnert C, Heckathorn D. Web-based network sampling: Efficiency and Efficacy of respondent-driven sampling for online research. *Sociological Methods and Research*. 2008;37:105-34.
105. Bengtsson L, Lu X, Nguyen QC, Camitz M, Hoang NL, Nguyen TA, et al. Implementation of web-based respondent-driven sampling among men who have sex with men in Vietnam. *PLoS One*. 2012;7(11):e49417.
106. Baral SD, Wirtz A, Sifakis F, Johns B, Walker D, Beyrer C. The highest attainable standard of evidence (HASTE) for HIV/AIDS interventions: toward a public health approach to defining evidence. *Public Health Rep*. 2012;127(6):572-84.

107. Sackett DL, Straus SE, Richardson WS, Rosenberg W, Haynes RB. Evidence based medicine: how to practice and teach EBM. New York: Churchill Livingstone; 2000.
108. Darzins PJ, Smith BJ, Heller RF. How to read a journal article. *Med J Aust.* 1992;157(6):389-94.
109. QX publishing house. Qruiser 2012-15 [cited 2015 Nov 25]. Available from: <https://www.qruiser.com>.
110. Brottsbalk (1962:700) 6 kap. Om sexualbrott 4 §.
111. Tikkanen RH. MSM-enkäten 2008: Riskhandlingar, hivtest och preventiva behov bland män som har sex med män. Malmö, Sweden: Malmö Högskola, 2010 Contract No.: ISBN 978-91-7104-240-8.
112. Tikkanen RH. MSM-enkäten 2006: Person, Relation och Situation. Malmö Högskola, 2008 Contract No.: ISBN 978-91-7104-211-8.
113. Swedish Institute for Infectious Disease Control (SMI). EMIS 2010 Sverige. Stockholm, Sweden: 2013 978-91-86723-25-5.
114. Sweden PHAo. Hivinfektion statistik 2015 [cited 2015 Jan 25]. Available from: <http://www.folkhalsomyndigheten.se/amnesomraden/statistik-och-undersokningar/sjukdomsstatistik/hivinfektion/>.
115. Ingemarsdotter-Persson K, Tikkanen R, Bergström J, Berglund T, Thorson A, Forsberg B. Experimentals, Bottoms, Risk-reducers and Clubbers: Exploring diverse sexual practice in an internet-active high-risk behaviour group of men who have sex with men in Sweden. *Culture, Health & Sexuality* 2015.
116. Evans AR, Wiggins RD, Mercer CH, Bolding GJ, Elford J. Men who have sex with men in Great Britain: comparison of a self-selected internet sample with a national probability sample. *Sex Transm Infect.* 2007;83(3):200-5; discussion 5.
117. Marcus U, Hickson F, Weatherburn P, Schmidt AJ. Prevalence of HIV among MSM in Europe: comparison of self-reported diagnoses from a large scale internet survey and existing national estimates. *BMC Public Health.* 2012;12:978.(doi):10.1186/471-2458-12-978.
118. Sialon II description [cited 2015 27 February]. Available from: <http://www.sialon.eu/en/>.
119. Gios L, Mirandola M, Toskin I, Marcus U, Dudareva-Vizule S, Sherriff N, et al. Bio-behavioural HIV and STI surveillance among Men who have Sex with Men in Europe: the Sialon II protocol. *BMC Public Health.* In press.
120. World Health Organization. Prevention and treatment of HIV and other sexually transmitted infections among men who have sex with men and transgender people: recommendations for a public health approach 2011. World Health Organization, Geneva, 2011. Available at: [http://www.who.int/hiv/pub/guidelines/msm\\_guidelines2011/en/](http://www.who.int/hiv/pub/guidelines/msm_guidelines2011/en/).
121. Coates TJ. An expanded behavioral paradigm for prevention and treatment of HIV-1 infection. *J Acquir Immune Defic Syndr.* 2013;63(Suppl 2):S179-82. doi: 10.1097/QAI.0b013e318299eff0.
122. World Health Organization. Guideline on when to start ART and on PrEP for HIV. Geneva, Switzerland: 2015 Sept. Report No.: ISBN: 978 92 4 150956 5
123. Wei C, Herrick A, Raymond HF, Anglemyer A, Gerbase A, Noar SM. Social marketing interventions to increase HIV/STI testing uptake among men who have sex with men and male-to-female transgender women. *Cochrane Database Syst Rev.* 2011(9):CD009337. doi: 10.1002/14651858.CD009337.
124. Snow AF, Vodstrcil LA, Fairley CK, El-Hayek C, Cummings R, Owen L, et al. Introduction of a sexual health practice nurse is associated with increased STI testing of men who have sex with men in primary care. *BMC Infect Dis.* 2013;13:298.(doi):10.1186/471-2334-13-298.



125. Molina JM, Capitant C, Spire B, Pialoux G, Cotte L, Charreau I, et al. On-Demand Preexposure Prophylaxis in Men at High Risk for HIV-1 Infection. *N Engl J Med*. 2015;1.
126. Cairns G, McCormack S, Molina JM. The European preexposure prophylaxis revolution. *Current opinion in HIV and AIDS*. 2015;23.
127. Grant RM, Lama JR, Anderson PL, McMahan V, Liu AY, Vargas L, et al. Preexposure chemoprophylaxis for HIV prevention in men who have sex with men. *N Engl J Med*. 2010;363(27):2587-99. doi: 10.1056/NEJMoa1011205. Epub 2010 Nov 23.
128. McCormack S, Dunn DT, Desai M, Dolling DI, Gafos M, Gilson R, et al. Pre-exposure prophylaxis to prevent the acquisition of HIV-1 infection (PROUD): effectiveness results from the pilot phase of a pragmatic open-label randomised trial. *Lancet*. 2015:00056-2.
129. Spinner CD, Boesecke C, Zink A, Jessen H, Stellbrink HJ, Rockstroh JK, et al. HIV pre-exposure prophylaxis (PrEP): a review of current knowledge of oral systemic HIV PrEP in humans. *Infection*. 2015;15.
130. Referensgruppen för antiviral Terapi (RAV) L. Antiviral behandling av HIV-infektion 2014, uppdaterad version - Behandlingsrekommendation. 2014.
131. Heuker J, Sonder GJ, Stolte I, Geskus R, van den Hoek A. High HIV incidence among MSM prescribed postexposure prophylaxis, 2000-2009: indications for ongoing sexual risk behaviour. *AIDS*. 2012;26(4):505-12. doi: 10.1097/QAD.0b013e32834f32d8.
132. Lunding S, Katzenstein TL, Kronborg G, Lindberg JA, Jensen J, Nielsen HI, et al. The Danish PEP registry: experience with the use of postexposure prophylaxis (PEP) following sexual exposure to HIV from 1998 to 2006. *Sex Transm Dis*. 2010;37(1):49-52. doi: 10.1097/OLQ.0b013e3181b6f284.
133. Sonder GJ, van den Hoek A, Regez RM, Brinkman K, Prins JM, Mulder JW, et al. Trends in HIV postexposure prophylaxis prescription and compliance after sexual exposure in Amsterdam, 2000-2004. *Sex Transm Dis*. 2007;34(5):288-93.
134. Schonnesson LN, Bowen AM, Williams ML. Project SMART: Preliminary Results From a Test of the Efficacy of a Swedish Internet-Based HIV Risk-Reduction Intervention for Men Who Have Sex With Men. *Arch Sex Behav*. 2015;6.
135. Holloway IW, Rice E, Gibbs J, Winetrobe H, Dunlap S, Rhoades H. Acceptability of smartphone application-based HIV prevention among young men who have sex with men. *AIDS Behav*. 2014;18(2):285-96. doi: 10.1007/s10461-013-0671-1.
136. Levy ME, Watson CC, Wilton L, Criss V, Kuo I, Glick SN, et al. Acceptability of a Mobile Smartphone Application Intervention to Improve Access to HIV Prevention and Care Services for Black Men Who Have Sex with Men in the District of Columbia. *Digit Cult Educ*. 2015;7(2):169-91. Epub 2015 Oct 27.
137. Lorimer K, Kidd L, Lawrence M, McPherson K, Cayless S, Cornish F. Systematic review of reviews of behavioural HIV prevention interventions among men who have sex with men. *AIDS Care*. 2013;25(2):133-50. doi: 10.1080/09540121.2012.699672. Epub 2012 Jul 9.
138. Baker U, Allebeck P. Hälsokommunikatörer i Stockholms län. En utvärdering av projektverksamheten 2010-11. 2012 Contract No.: ISBN: 978 91 7457 707 5.
139. Socialstyrelsen. Hälsoundersökning av asylsökande [cited 2015 Dec 26]. Available from: <http://www.socialstyrelsen.se/vardochomsorgforasylsokandemedflera/halsoundersokning>.
140. McKeown E, Doerner R, Nelson S, Low N, Robinson A, Anderson J, et al. The experiences of ethnic minority MSM using NHS sexual health clinics in Britain. *Sex Transm Infect*. 2012;88(8):595-600. doi: 10.1136/sextrans-2011-050436. Epub 2012 Jun 20.

141. Schunemann H, Hill S, Guyatt G, Akl EA, Ahmed F. The GRADE approach and Bradford Hill's criteria for causation. *J Epidemiol Community Health*. 2011;65(5):392-5. doi: 10.1136/jech.2010.119933. Epub 2010 Oct 14.
142. Down I, Wilson DP, McCann PD, Gray R, Hoare A, Bradley J, et al. Increasing gay men's testing rates and enhancing partner notification can reduce the incidence of syphilis. *Sex Health*. 2012;9(5):472-80. doi: 10.1071/SH12023.
143. Woodward CL, Roedling S, Edwards SG, Armstrong A, Richens J. Computer-assisted survey of attitudes to HIV and sexually transmissible infection partner notification in HIV-positive men who have sex with men. *Sex Health*. 2010;7(4):460-2. doi: 10.1071/SH09146.
144. Hightow-Weidman LB, Muessig KE, Pike EC, LeGrand S, Baltierra N, Rucker AJ, et al. HealthMpowerment.org: Building Community Through a Mobile-Optimized, Online Health Promotion Intervention. *Health Educ Behav*. 2015;42(4):493-9. doi: 10.1177/1090198114562043. Epub 2015 Jan 14.
145. Marcus U, Hickson F, Weatherburn P, Schmidt AJ. Age biases in a large HIV and sexual behaviour-related internet survey among MSM. *BMC Public Health*. 2013;13:826.(doi):10.1186/471-2458-13-826.
146. Statistics Sweden. Folkmängd i riket, län och kommuner efter kön och ålder 31 december 2014 2014 [cited 2015 February 27]. Available from: [http://www.scb.se/sv/\\_Hitta-statistik/Statistik-efter-amne/Befolkning/Befolkningens-sammansattning/Befolkningsstatistik/25788/25795/Helarsstatistik---Kommun-lan-och-riket/159277/](http://www.scb.se/sv/_Hitta-statistik/Statistik-efter-amne/Befolkning/Befolkningens-sammansattning/Befolkningsstatistik/25788/25795/Helarsstatistik---Kommun-lan-och-riket/159277/).
147. Shi LE, Wei C, McFarland W, Yan H, Li J, Raymond HF. Comparing Samples of Men Who Have Sex with Men Recruited Online and in Venues, Jiangsu Province, China, 2013. *LGBT Health*. 2015:29.
148. Zhao J, Cai R, Chen L, Cai W, Yang Z, Richardus JH, et al. A Comparison Between Respondent-Driven Sampling and Time-Location Sampling Among Men Who Have Sex with Men in Shenzhen, China. *Arch Sex Behav*. 2014:20.
149. Kendall C, Kerr LR, Gondim RC, Werneck GL, Macena RH, Pontes MK, et al. An empirical comparison of respondent-driven sampling, time location sampling, and snowball sampling for behavioral surveillance in men who have sex with men, Fortaleza, Brazil. *AIDS Behav*. 2008;12(4 Suppl):S97-104. doi: 10.1007/s10461-008-9390-4. Epub 2008 Apr 4.
150. Wei C, McFarland W, Colfax GN, Fuqua V, Raymond HF. Reaching black men who have sex with men: a comparison between respondent-driven sampling and time-location sampling. *Sex Transm Infect*. 2012;88(8):622-6. doi: 10.1136/sextrans-2012-050619. Epub 2012 Jun 29.
151. Jolly AM, Wylie JL. Sampling individuals with large sexual networks: an evaluation of four approaches. *Sex Transm Dis*. 2001;28(4):200-7.
152. Marcus U, An der Heiden M, Gassowski M, Kruspe M, Drewes J. The impact of meeting locations for men having sex with men on the risk for bacterial sexually transmitted infections: analyses from a cross-sectional online survey. *BMJ Open*. 2015;5(11):e009107. doi: 10.1136/bmjopen-2015-.
153. Ross MW, Mansson SA, Daneback K, Cooper A, Tikkanen R. Biases in internet sexual health samples: comparison of an internet sexuality survey and a national sexual health survey in Sweden. *Soc Sci Med*. 2005;61(1):245-52.
154. Ferrer L, Furegato M, Foschia JP, Folch C, Gonzalez V, Ramarli D, et al. Undiagnosed HIV infection in a population of MSM from six European cities: results from the Sialon project. *Eur J Public Health*. 2015;25(3):494-500. doi: 10.1093/eurpub/cku139. Epub 2014 Aug 26.
155. Malekinejad M, Johnston LG, Kendall C, Kerr LR, Rifkin MR, Rutherford GW. Using respondent-driven sampling methodology for HIV biological and behavioral

- surveillance in international settings: a systematic review. *AIDS Behav.* 2008;12(4 Suppl):S105-30.
156. Broz D, Wejnert C, Pham HT, DiNenno E, Heffelfinger JD, Cribbin M, et al. HIV infection and risk, prevention, and testing behaviors among injecting drug users -- National HIV Behavioral Surveillance System, 20 U.S. cities, 2009. *MMWR Surveill Summ.* 2014;63(6):1-51.
  157. Aglipay M, Wylie JL, Jolly AM. Health research among hard-to-reach people: six degrees of sampling. *CMAJ.* 2015;187(15):1145-9. doi: 10.503/cmaj.141076. Epub 2015 Jun 29.
  158. Holland CM, Ritchie ND, Du Bois SN. iTunes song-gifting is a low-cost, efficient recruitment tool to engage high-risk MSM in internet research. *AIDS Behav.* 2015;19(10):1914-8. doi: 10.007/s10461-015-1130-y.
  159. Gross J, Bayen UJ. Adult age differences in hindsight bias: The role of recall ability. *Psychol Aging.* 2015;30(2):253-8. doi: 10.1037/pag0000017. Epub 2015 Apr 20.
  160. Jaccard JM, R. Wan, C. Dittus, P. Quinlan, S. The Accuracy of Self-Reports of Condom Use and Sexual Behavior. *Journal of Applied Social Psychology.* 2002(32, 9):pp. 1863-905.
  161. Weinhardt LS, Forsyth AD, Carey MP, Jaworski BC, Durant LE. Reliability and validity of self-report measures of HIV-related sexual behavior: progress since 1990 and recommendations for research and practice. *Arch Sex Behav.* 1998;27(2):155-80.
  162. McAuliffe TL, DiFranceisco W, Reed BR. Effects of question format and collection mode on the accuracy of retrospective surveys of health risk behavior: a comparison with daily sexual activity diaries. *Health Psychol.* 2007;26(1):60-7.
  163. Marcus U, Hickson F, Weatherburn P, Schmidt AJ. Estimating the size of the MSM populations for 38 European countries by calculating the survey-surveillance discrepancies (SSD) between self-reported new HIV diagnoses from the European MSM internet survey (EMIS) and surveillance-reported HIV diagnoses among MSM in 2009. *BMC Public Health.* 2013;13:919.(doi):10.1186/471-2458-13-919.
  164. Blas MM, Alva IE, Cabello R, Garcia PJ, Carcamo C, Redmon M, et al. Internet as a tool to access high-risk men who have sex with men from a resource-constrained setting: a study from Peru. *Sex Transm Infect.* 2007;83(7):567-70. Epub 2007 Oct 11.
  165. Stein ML, van der Heijden PG, Buskens V, van Steenberghe JE, Bengtsson L, Koppeschaar CE, et al. Tracking social contact networks with online respondent-driven detection: who recruits whom? *BMC Infect Dis.* 2015;15(1):522. doi: 10.1186/s12879-015-1250-z.
  166. Jain A, Ross MW. Predictors of drop-out in an Internet study of men who have sex with men. *Cyberpsychol Behav.* 2008;11(5):583-6. doi: 10.1089/cpb.2007.0038.
  167. Ross MW, Daneback K, Mansson SA, Tikkanen R, Cooper A. Characteristics of men and women who complete or exit from an on-line internet sexuality questionnaire: a study of instrument dropout biases. *J Sex Res.* 2003;40(4):396-402.

## 10 APPENDICES

### Appendix I: Number of articles found through search strategies, screened and included according to inclusion criteria

Interventions	Articles identified through searches	Nr. of articles included addressing efficacy	Nr. of articles included addressing implementation
Condom use	130	1	3
HIV Treatment as Prevention (TaSP)	9	2	4
Peer-led group interventions	326	2	0
Peer outreach	326	2	0
Voluntary HIV counselling and testing (VCT)	717	2	8
Condom-compatible lubricant use (when using condoms)	130	5	2
Post-exposure prophylaxis (PEP)	28	3	2
Individual counselling for MSM living with HIV	327	4	2
Peer-led group interventions targeting MSM living with HIV	326	1	2
Sex venue-based interventions	25	1	8
Social marketing interventions	476	3	7
Individual counselling for MSM	327	2	1
Internet-based HIV prevention messages	40	6	4
Training for health care providers to provide comprehensive care for MSM	225	0	1
MSM friendly clinics	234	0	1
Voluntary anonymous partner notification	126	0	7
Voluntary Medical male circumcision	49	3	2
Pre-exposure prophylaxis (PrEP)	4	1	0
Campaigns for Lesbian, Gay, Bisexual and Trans equality	3	0	1
Female condom use	4	3	1
Sero-sorting	9	3	4
Avoid ejaculation of semen orally	226	3	0
Avoiding poppers during anal intercourse	5	0	0
Reducing alcohol binge drinking among MSM	119	1	0
Summary	3865	48	60

## **Appendix II: Search Strategies and MeSH terms per intervention**

### **Condom use and Condom-compatible lubricant use**

A systematic review performed in 2010 was included. In addition, the search strategy of this systematic review was updated from up until 8 February 2013.

(Homosexuality or homosexual OR bisexuality or bisexual OR gay OR "men who have sex with men" OR MSM) AND (condom or condoms or lubricant) AND (cohort)

(Homosexuality or homosexual OR bisexuality or bisexual OR gay OR transgender OR transsexual OR bisexual OR "men who have sex with men" OR MSM) AND (condom or condoms or lubricant) AND (Europe) AND (implementation)

### **HIV Treatment as Prevention (TaSP)**

(Homosexuality or homosexual OR bisexuality or bisexual OR gay OR "men who have sex with men" OR MSM) AND (antiretroviral treatment as prevention) AND (chemoprophylaxis) AND (HIV) AND (test and treat)

### **Peer-led group interventions for MSM and targeting MSM living with HIV**

A systematic review performed in 2010 was included. In addition, the search strategy of this systematic review was updated from up until 8 February 2013.

(Homosexuality OR homosexual OR bisexuality OR gay OR transgender OR transsexual OR bisexual OR "men who have sex with men" OR MSM) AND (HIV OR AIDS OR STI IR STD OR sexually transmitted diseases OR sexually transmitted infections) AND (random allocation OR intervention studies OR program evaluation OR random OR randomize OR randomized OR randomly) AND ("2010/01/01"[Date - Publication] : "3000"[Date - Publication])

### **Peer outreach**

A systematic review performed in 2010 was included. In addition, the search strategy of this systematic review was updated from up until 8 February 2013.

(Homosexuality OR homosexual OR bisexuality OR gay OR transgender OR transsexual OR bisexual OR "men who have sex with men" OR MSM) AND (HIV OR AIDS OR STI IR STD OR sexually transmitted diseases OR sexually transmitted infections) AND (random allocation OR intervention studies OR program evaluation OR random OR randomize OR randomized OR randomly) AND ("2010/01/01"[Date - Publication] : "3000"[Date - Publication])

### **Voluntary testing and counselling for HIV (VCT)**

A systematic review performed in 2010 was included. In addition, the search strategy of this systematic review was updated from up until 8 February 2013.

(Homosexuality OR homosexual OR bisexuality OR bisexual OR gay OR transgender OR transsexual OR "men who have sex with men" OR MSM) AND (HIV OR AIDS) AND (testing OR counselling OR "testing and counselling") AND ("2010/01/01"[Date - Publication] : "3000"[Date - Publication])

### **Post-exposure prophylaxis (PEP)**

(HIV) AND Post-exposure prophylaxis AND Men who have sex with men) AND homosexual

### **Individual counselling for MSM and MSM living with HIV**

A systematic review performed in 2010 was included. In addition, the search strategy of this systematic review was updated from up until 8 February 2013.

(Homosexuality OR homosexual OR bisexuality OR gay OR transgender OR transsexual OR bisexual OR "men who have sex with men" OR MSM) AND (HIV OR AIDS OR STI OR STD OR sexually transmitted diseases OR sexually transmitted infections) AND (random allocation OR intervention studies OR program evaluation OR random OR randomize OR randomized OR randomly) AND ("2010/01/01"[Date - Publication] : "3000"[Date - Publication])

### Internet-based interventions

A systematic review performed in 2010 was included. In addition, the search strategy of this systematic review was updated from up until 8 February 2013.

(randomized controlled trial [pt] OR controlled clinical trial [pt] OR randomized controlled trials [mh] OR random allocation [mh] OR double-blind method [mh] OR single-blind method [mh] OR clinical trial [pt] OR clinical trials [mh] OR ("clinical trial" [tw]) OR ((singl\* [tw] OR doubl\* [tw] OR trebl\* [tw] OR tripl\* [tw]) AND (mask\* [tw] OR blind\* [tw])) OR (placebos [mh] OR placebo\* [tw] OR random\* [tw] OR research design [mh:noexp] OR comparative study [mh] OR evaluation studies [mh] OR follow-up studies [mh] OR prospective studies [mh] OR control\* [tw] OR prospectiv\* [tw] OR volunteer\* [tw] ) OR non-randomi\*[tw] OR before after study[tw] OR time series[tw] OR case control[tw] OR prospective cohort[tw] OR retrospective cohort[tw] OR cross- section\*[tw] OR prospective[tw] OR retrospective[tw] OR research design [mh:noexp] OR comparative study[mh] OR evaluation studies[mh] OR follow-up studies[mh] OR prospective studies[mh] OR control\*[tw] OR prospectiv\*[tw] OR volunteer\*[tw] OR longitud\*[tw] OR descripti\*[title/abstract] OR study[title/abstract] OR evaluat\*[title/abstract] OR pre-post[tw] OR (pre-test[tw] AND post-test[tw])) NOT (animals [mh] NOT human [mh])) AND (HIV Infections[MeSH] OR HIV[MeSH] OR hiv[title/abstract] OR hiv-1\*[title/abstract] OR hiv- 2\*[title/abstract] OR hiv1[title/abstract] OR hiv2[title/abstract] OR hiv infect\*[title/abstract] OR human immunodeficiency virus[title/abstract] OR human immunodeficiency virus[title/abstract] OR human immuno-deficiency virus[title/abstract] OR human immune-deficiency virus[title/abstract] OR ((human immun\*) AND (deficiency virus[title/abstract]))) OR acquired immunodeficiency syndrome[title/abstract] OR acquired immunodeficiency syndrome[title/abstract] OR acquired immuno-deficiency syndrome[title/abstract] OR acquired immune-deficiency syndrome[title/abstract] OR ((acquired immun\*) AND (deficiency syndrome[title/abstract]))) HIV Infections[MeSH] OR HIV[MeSH] OR hiv[title/abstract] OR hiv-1\*[title/abstract] OR hiv-2\*[title/abstract] OR hiv1[title/abstract] OR hiv2[title/abstract] OR hiv infect\*[title/abstract] OR human immunodeficiency virus[title/abstract] OR human immunodeficiency virus[title/abstract] OR human immuno-deficiency virus[title/abstract] OR human immune-deficiency virus[title/abstract] OR ((human immun\*) AND (deficiency virus[title/abstract]))) OR acquired immunodeficiency syndrome[title/abstract] OR acquired immunodeficiency syndrome[title/abstract] OR acquired immuno-deficiency syndrome[title/abstract] OR acquired immune-deficiency syndrome[title/abstract] OR ((acquired immun\*) AND (deficiency syndrome[title/abstract]))) OR Sexually Transmitted Diseases[Mesh] OR sexually transmitted[title/abstract] OR Syphilis[Mesh] OR syphilis[title/abstract] OR hepatitis[Mesh] OR hepatitis[title/abstract] AND 20 (Homosexuality, Male[Mesh] OR Bisexuality[Mesh] OR Transsexualism[Mesh] OR homosexual\*[title/abstract] OR gay[title/abstract] OR homosexual\*[title/abstract] OR MSM[tw] OR "men who have sex with men"[title/abstract] OR "same-sex"[title/abstract] OR queer[title/abstract] OR bisexual[title/abstract]) AND ((tailor\*[title/abstract] OR targeted[title/abstract] OR targetted[title/abstract] OR individualised[title/abstract] OR individualized[title/abstract] OR interactive\*[title/abstract] OR interactive\*[title/abstract]) AND (hyperlink\*[title/abstract] OR hypermedia[title/abstract] OR Internet[title/abstract] OR on-line[title/abstract] OR online[title/abstract] OR web[title/abstract] OR web-based[title/abstract] OR website[title/abstract] OR WWW[title/abstract] OR WWW-

based[title/abstract] OR net-based[title/abstract] OR Internet[Mesh])) AND ("2010/01/01"[Date - Publication] : "3000"[Date - Publication])

### **Interventions in sex-on-premises venues**

A systematic review performed in 2010 was included. In addition, the search strategy of this systematic review was updated from up until 8 February 2013.

(randomized controlled trial [pt] OR controlled clinical trial [pt] OR randomized controlled trials [mh] OR random allocation [mh] OR double-blind method [mh] OR single-blind method [mh] OR clinical trial [pt] OR clinical trials [mh] OR ("clinical trial" [tw]) OR ((singl\* [tw] OR doubl\* [tw] OR trebl\* [tw] OR tripl\* [tw]) AND (mask\* [tw] OR blind\* [tw])) OR (placebos [mh] OR placebo\* [tw] OR random\* [tw] OR research design [mh:noexp] OR comparative study [mh] OR evaluation studies [mh] OR follow-up studies [mh] OR prospective studies [mh] OR control\* [tw] OR prospectiv\* [tw] OR volunteer\* [tw] ) OR non-randomi\*[tw] OR before after study[tw] OR time-series[tw] OR case control[tw] OR prospective cohort[tw] OR retrospective cohort[tw] OR cross-section\*[tw] OR prospective[tw] OR retrospective[tw] OR research design [mh:noexp] OR comparative study[mh] OR evaluation studies[mh] OR follow-up studies[mh] OR prospective studies[mh] OR control\*[tw] OR prospectiv\*[tw] OR volunteer\*[tw] OR longitud\*[tw] OR descripti\*[title/abstract] OR study[title/abstract] OR evaluat\*[title/abstract] OR pre-post[tw] OR (pre-test[tw] AND post-test[tw]) NOT (animals [mh] NOT human [mh])) AND (HIV Infections[MeSH] OR HIV[MeSH] OR hiv[title/abstract] OR hiv-1\*[title/abstract] OR hiv-2\*[title/abstract] OR hiv1[title/abstract] OR hiv2[title/abstract] OR hiv infect\*[title/abstract] OR human immunodeficiency virus[title/abstract] OR human immunodeficiency virus[title/abstract] OR human immuno-deficiency virus[title/abstract] OR human immune-deficiency virus[title/abstract] OR ((human immun\*) AND (deficiency virus[title/abstract])) OR acquired immunodeficiency syndrome[title/abstract] OR acquired immunodeficiency syndrome[title/abstract] OR acquired immuno-deficiency syndrome[title/abstract] OR ((acquired immun\*) AND (deficiency syndrome[title/abstract])) HIV Infections[MeSH] OR HIV[MeSH] OR hiv[title/abstract] OR hiv-1\*[title/abstract] OR hiv-2\*[title/abstract] OR hiv1[title/abstract] OR hiv2[title/abstract] OR hiv infect\*[title/abstract] OR human immunodeficiency virus[title/abstract] OR human immunodeficiency virus[title/abstract] OR human immuno-deficiency virus[title/abstract] OR human immune-deficiency virus[title/abstract] OR ((human immun\*) AND (deficiency virus[title/abstract])) OR acquired immunodeficiency syndrome[title/abstract] OR acquired immunodeficiency syndrome[title/abstract] OR acquired immuno-deficiency syndrome[title/abstract] OR ((acquired immun\*) AND (deficiency syndrome[title/abstract])) OR Sexually Transmitted Diseases[Mesh] OR sexually transmitted[title/abstract] OR Syphilis[Mesh] OR syphilis[title/abstract] AND (Homosexuality, Male[Mesh] OR Bisexuality[Mesh] OR Transsexualism[Mesh] OR homosexual\*[title/abstract] OR gay[title/abstract] OR homosexual\*[title/abstract] OR MSM[tw] OR "men who have sex with men"[title/abstract] OR "same-sex"[title/abstract] OR queer[title/abstract] OR bisexual[title/abstract] OR transgender[title/abstract] OR transsexual[title/abstract] OR transexual[title/abstract] AND (Bathhouse\*[title/abstract] OR bath house\*[title/abstract] OR bathouse\*[title/abstract] OR sex club\*[title/abstract] OR sauna\*[title/abstract] OR public sex environment\*[title/abstract] OR PSE[title/abstract] OR PSEs[title/abstract] OR commercial sex environment\*[title/abstract] OR CSE[title/abstract] OR CSEs[title/abstract] OR sex facilitating business\*[title/abstract] OR SFB[title/abstract] OR SFBs[title/abstract] OR sex venue\*[title/abstract] OR sex on premises[title/abstract]) AND ("2010/01/01"[Date - Publication] : "3000"[Date - Publication])

### **Social marketing interventions**

(Homosexuality[title/abstract] OR homosexual[title/abstract] OR bisexuality[title/abstract] OR bisexual[title/abstract] OR gay[title/abstract] OR transgender[title/abstract] OR transsexual[title/abstract] OR "men who have sex with men"[title/abstract] OR MSM[title/abstract]) AND (media[title/abstract] OR Social Marketing[Mesh] OR mass media[title/abstract] OR campaign[title/abstract] OR mass communication[title/abstract] OR multi media[title/abstract] OR

multimedia\*[title/abstract] OR audiovisual equipment[title/abstract] OR patient information[title/abstract] OR visual information[title/abstract] OR radio[title/abstract] OR television[title/abstract] OR leaflet[title/abstract] OR posters\* OR pamphlet\* OR print media[title/abstract] OR printed media[title/abstract] OR skit\* OR talk media[title/abstract] OR broadcast\* OR film\* OR telecommunication\* OR (multimedia[title/abstract] AND marketing[title/abstract]) OR promotional[title/abstract]) AND ("1990/01/01"[Date - Publication] : "3000"[Date - Publication])

### **Pre-exposure prophylaxis (PrEP)**

(Homosexuality or homosexual OR bisexuality or bisexual OR gay OR "men who have sex with men" OR MSM) AND (Antiretroviral chemoprophylaxis) AND (PrEP) AND (Pre-exposure prophylaxis) AND (HIV)

### **Voluntary medical male circumcision**

A systematic review performed in 2010 was included. In addition, the search strategy of this systematic review was updated from up until 8 February 2013.

(homosexuality, male OR bisexual OR gay OR transgender OR MSM OR homosexual\* OR male homosexual OR transsexualism) AND (male circumcision OR male circumcisions OR circumcis\* OR uncircumcis\*) AND (HIV Infections[MeSH] OR HIV[MeSH] OR hiv[tw] OR hiv-1\*[tw] OR hiv-2\*[tw] OR hiv1[tw] OR hiv2[tw] OR hiv infect\*[tw] OR human immunodeficiency virus[tw] OR human immunodeficiency virus[tw] OR human immuno-deficiency virus[tw] OR human immune-deficiency virus[tw] OR ((human immun\*) AND (deficiency virus[tw]))) OR acquired immunodeficiency syndrome[tw] OR acquired immunodeficiency syndrome[tw] OR acquired immuno-deficiency syndrome[tw] OR acquired immune-deficiency syndrome[tw] OR ((acquired immun\*) AND (deficiency syndrome[tw]))) OR "sexually transmitted diseases, viral"[MESH:NoExp]) AND ("2010/01/01"[Date - Publication] : "3000"[Date - Publication])

### **Training for health care providers to offer comprehensive care for MSM**

(HIV Infections[MeSH] OR HIV[MeSH] OR hiv[title/abstract] OR hiv-1\*[title/abstract] OR hiv-2\*[title/abstract] OR hiv1[title/abstract] OR hiv2[title/abstract] OR hiv infect\*[title/abstract] OR human immunodeficiency virus[title/abstract] OR human immunodeficiency virus[title/abstract] OR human immuno-deficiency virus[title/abstract] OR human immune-deficiency virus[title/abstract] OR ((human immun\*) AND (deficiency virus[title/abstract]))) OR acquired immunodeficiency syndrome[title/abstract] OR acquired immunodeficiency syndrome[title/abstract] OR acquired immuno-deficiency syndrome[title/abstract] OR acquired immune-deficiency syndrome[title/abstract] OR ((acquired immun\*) AND (deficiency syndrome[title/abstract]))) HIV Infections[MeSH] OR HIV[MeSH] OR hiv[title/abstract] OR hiv- 1\*[title/abstract] OR hiv-2\*[title/abstract] OR hiv1[title/abstract] OR hiv2[title/abstract] OR hiv infect\*[title/abstract] OR human immunodeficiency virus[title/abstract] OR human immunodeficiency virus[title/abstract] OR human immuno-deficiency virus[title/abstract] OR human immune-deficiency virus[title/abstract] OR ((human immun\*) AND (deficiency virus[title/abstract]))) OR acquired immunodeficiency syndrome[title/abstract] OR acquired immunodeficiency syndrome[title/abstract] OR acquired immuno-deficiency syndrome[title/abstract] OR acquired immune-deficiency syndrome[title/abstract] OR ((acquired immun\*) AND (deficiency syndrome[title/abstract]))) OR Sexually Transmitted Diseases[Mesh] OR sexually transmitted[title/abstract] OR Syphilis[Mesh] OR syphilis[title/abstract]) OR hepatitis[Mesh] OR hepatitis[title/abstract] OR anorectal care[title/abstract] OR anorectal health[title/abstract] OR comprehensive care[title/abstract] OR comprehensive health care[title/abstract]) AND (Homosexuality[title/abstract] OR homosexual[title/abstract] OR bisexuality[title/abstract] OR bisexual[title/abstract] OR gay[title/abstract] OR transgender[title/abstract] OR transsexual[title/abstract] OR "men who have sex with men"[title/abstract] OR MSM[title/abstract])



AND (((patients care[title/abstract] OR clinical skill[title/abstract] OR “health services needs and demand” OR “professional practice” OR “clinical practice” OR “doctor patient relation”) OR ((provider[title/abstract] OR professional[title/abstract] OR physician[title/abstract] OR nurse[title/abstract] OR clinician[title/abstract] OR practitioner[title/abstract]) AND (experience OR skill OR train OR competence OR training)))) AND ("1990/01/01"[Date - Publication] : "3000"[Date - Publication])

### **MSM competent clinics**

(Homosexuality OR homosexual OR bisexuality OR bisexual OR gay OR transgender OR transsexual OR "men who have sex with men" OR MSM) AND (HIV OR AIDS) AND (“MSM clinics” OR “STI clinics” OR “sexual health clinics” OR “primary health care” OR “comprehensive care”) AND ("1990/01/01"[Date - Publication] : "3000"[Date - Publication])

### **Voluntary anonymous partner notification**

(randomized controlled trial [pt] OR controlled clinical trial [pt] OR randomized controlled trials [mh] OR random allocation [mh] OR double-blind method [mh] OR single-blind method [mh] OR clinical trial [pt] OR clinical trials [mh] OR ("clinical trial" [tw]) OR ((singl\* [tw] OR doubl\* [tw] OR trebl\* [tw] OR tripl\* [tw]) AND (mask\* [tw] OR blind\* [tw])) OR (placebos [mh] OR placebo\* [tw] OR random\* [tw] OR research design [mh:noexp] OR comparative study [mh] OR evaluation studies [mh] OR follow-up studies [mh] OR prospective studies [mh] OR control\* [tw] OR prospectiv\* [tw] OR volunteer\* [tw] ) OR non-randomi\*[tw] OR before after study[tw] OR time-series[tw] OR case control[tw] OR prospective cohort[tw] OR retrospective cohort[tw] OR cross-section\*[tw] OR prospective[tw] OR retrospective[tw] OR research design [mh:noexp] OR comparative study[mh] OR evaluation studies[mh] OR follow-up studies[mh] OR prospective studies[mh] OR control\*[tw] OR prospectiv\*[tw] OR volunteer\*[tw] OR longitud\*[tw] OR descripti\*[title/abstract] OR study[title/abstract] OR evaluat\*[title/abstract] OR pre-post[tw] OR (pre-test[tw] AND post-test[tw]) NOT (animals [mh] NOT human [mh])) AND (HIV Infections[MeSH] OR HIV[MeSH] OR hiv[title/abstract] OR hiv-1\*[title/abstract] OR hiv-2\*[title/abstract] OR hiv1[title/abstract] OR hiv2[title/abstract] OR hiv infect\*[title/abstract] OR human immunodeficiency virus[title/abstract] OR human immunodeficiency virus[title/abstract] OR human immuno-deficiency virus[title/abstract] OR human immune-deficiency virus[title/abstract] OR ((human immun\*) AND (deficiency virus[title/abstract])) OR acquired immunodeficiency syndrome[title/abstract] OR acquired immunodeficiency syndrome[title/abstract] OR acquired immuno-deficiency syndrome[title/abstract] OR acquired immune-deficiency syndrome[title/abstract] OR ((acquired immun\*) AND (deficiency syndrome[title/abstract])) HIV Infections[MeSH] OR HIV[MeSH] OR hiv[title/abstract] OR hiv-1\*[title/abstract] OR hiv-2\*[title/abstract] OR hiv1[title/abstract] OR hiv2[title/abstract] OR hiv infect\*[title/abstract] OR human immunodeficiency virus[title/abstract] OR human immunodeficiency virus[title/abstract] OR human immuno-deficiency virus[title/abstract] OR human immune-deficiency virus[title/abstract] OR ((human immun\*) AND (deficiency virus[title/abstract])) OR acquired immunodeficiency syndrome[title/abstract] OR acquired immunodeficiency syndrome[title/abstract] OR acquired immuno-deficiency syndrome[title/abstract] OR acquired immune-deficiency syndrome[title/abstract] OR ((acquired immun\*) AND (deficiency syndrome[title/abstract])) OR Sexually Transmitted Diseases[Mesh] OR sexually transmitted[title/abstract] OR Syphilis[Mesh] OR syphilis[title/abstract]) AND (Homosexuality, Male[Mesh] OR Bisexuality[Mesh] OR Transsexualism[Mesh] OR homosexual\*[title/abstract] OR gay[title/abstract] OR homosexual\*[title/abstract] OR MSM[tw] OR “men who have sex with men”[title/abstract] OR “same-sex”[title/abstract] OR queer[title/abstract] OR bisexual[title/abstract] OR transgender[title/abstract] OR transsexual[title/abstract] OR transexual[title/abstract] AND (contact tracing[title/abstract] OR contact-tracing[title/abstract] OR partner notification[title/abstract] OR partner referral[title/abstract] OR expedited-partner treatment[title/abstract] OR expedited-partner therapy[title/abstract] ) AND ("1990/01/01"[Date - Publication] : "3000"[Date - Publication])

## **Campaigns for Lesbian, Gay, Bisexual and Trans equality**

(Homosexuality or homosexual OR bisexuality or bisexual OR gay OR "men who have sex with men" OR MSM) AND (structural interventions) AND (legalization) AND (advocacy) AND (same sex practices)

## **Female Condom Use for Anal Sex among MSM**

(Homosexuality or homosexual OR bisexuality or bisexual OR gay OR "men who have sex with men" OR MSM) AND (female condom) AND (Femidom)

## **Sero-sortiong**

A systematic review performed in 2010 was included. In addition, the search strategy of this systematic review was updated from up until 8 February 2013.

(Homosexuality OR homosexual OR bisexuality OR gay OR transgender OR transsexual OR bisexual OR "men who have sex with men" OR MSM) AND ((serosorting OR Serosort\* OR Seroposition\* OR Seroadapt\* OR Sero-sort\* OR Sero-position\* OR Sero-adapt\* OR (HIV and "partner selection") OR AIDS and "partner selection" OR HIV and "partner choice" OR AIDS and "partner choice" OR "strategic positioning" OR "sexual harm reduction" OR Seroguessing)) AND ("2010/01/01"[Date - Publication] : "3000"[Date - Publication])

## **To avoid semen in the mouth/unprotected oral sex**

(Homosexuality or homosexual OR bisexuality or bisexual OR gay OR "men who have sex with men" OR MSM) AND ((oral sex) AND (oral hiv transmission))

## **Avoiding nitrate inhalants/poppers at UAI**

(Homosexuality or homosexual OR bisexuality or bisexual OR gay OR "men who have sex with men" OR MSM) AND ((poppers) AND (amyl-nitrate))

## **Interventions to reduce alcohol binge-drinking**

A systematic review performed in 2010 was included. In addition, the search strategy of this systematic review was updated from up until 8 February 2013.

(Homosexuality OR homosexual OR bisexuality OR gay OR transgender OR transsexual OR bisexual OR "men who have sex with men" OR MSM) AND (HIV OR AIDS OR STI OR STD OR sexually transmitted diseases OR sexually transmitted infections OR hepatitis) AND (alcohol OR alcohol-binge OR "alcohol binge" OR "alcohol-binge drinking" OR substance use) AND (random allocation OR intervention studies OR program evaluation OR random OR randomize OR randomized OR randomly) AND ("1990/01/01"[Date - Publication] : "3000"[Date - Publication])

## Appendix III: Questionnaire Study II

### Studie för män som har sex med män

Karolinska Institutet genomför den här studien för att utvärdera hur man bäst når män som har sex med män med enkätundersökningar för att studera risk för sexuellt överförbara sjukdomar.

Studien vill nå män med olika ålder och bakgrund. Delta om du är en man, känner dig som en man eller var född som man och är 15 år eller äldre. Mer information om studien (*Läs mer*)

*Här frågar vi angående sociodemografisk information för att förstå vilken del av gruppen, män som har sex med män, som studien når. (Läs mer)*

#### 1. Vilket år är du född?

#### 2. Föddes du i Sverige

- ☐ Ja
- ☐ Nej

#### 2b. Vilket land föddes du i?

#### 3. Vilket län bor du i?

#### 4. Vilken är din högst avslutade utbildning?

- ☐ Grundskola, årskurs 1–6
- ☐ Grundskola, årskurs 7–9
- ☐ Gymnasieskola, folkhögskola
- ☐ Eftergymnasial utbildning, KY-utbildning
- ☐ Högskole-/universitets-utbildning/kurs
- ☐ Forskarutbildning

#### 5. Vilket av följande beskriver bäst din nuvarande sysselsättning? Du kan svara med ett eller två alternativ.

- ☐ Anställd
- ☐ Student
- ☐ Arbetslös
- ☐ Egenföretagare
- ☐ Pensionerad

#### 6. Identifierar du dig som man?

- ☐ Ja
- ☐ Nej
- ☐ Annat:

#### 7. Föddes du med biologiskt manligt kön?

- ☐ Ja
- ☐ Nej
- ☐ Annat:

**8. Har du haft sex med en man?**

- ☐ Ja
- ☐ Nej

**9. Hur definierar du din sexuella läggning?** Du kan svara med ett eller flera alternativ.

- ☐ Homosexuell
- ☐ Bisexuell
- ☐ Heterosexuell
- ☐ Asexuell
- ☐ Vet ej
- ☐ Annat:
- ☐

*Här frågar vi angående sexuellt beteende, för att bättre förstå risk för sexuellt överförbara sjukdomar bland män som har sex med män. (Läs mer)*

**10. Hur många män har du regelbundet haft sex med senaste 12 månaderna?** Med regelbundet sex menar vi att ni har träffats vid flera tillfällen och haft sex, såsom en pojkvän, make, knullkompis eller andra regelbundna partners.

**11. Hur många män har du regelbundet haft anala samlag utan kondom med under de senaste 12 månaderna?**

**12. Hur många tillfälliga manliga partners har du haft sex med senaste 12 månaderna?** Med tillfällig partner så menar vi att ni har träffats vid ett tillfälle och haft sex, såsom 'one night stands'.

**13. Hur många tillfälliga manliga partners har du haft analt samlag utan kondom med under de senaste 12 månaderna?**

*Här frågar vi angående hur du använder Internet och om ditt sociala nätverk för att kunna utvärdera om den här sortens studier på internet är ett bra sätt att nå alla inom gruppen män som har sex med män. (Läs mer)*

**14. Hur ofta har du kollat något av dina epostkonton de senaste 7 dagarna?** Räkna både privat mail och jobbmail.

- ☐ Inte alls
- ☐ 1-3 gånger totalt
- ☐ 4-6 gånger totalt
- ☐ 1-5 gånger per dag
- ☐ Mer än 5 gånger per dag
- ☐ Jag är inloggad på min mail större delen av tiden

**15. Vad är din relation till den som bjöd in dig till denna enkätstudie?** Du kan svara med ett eller två alternativ.

- ☐ Okänd för mig (jag har inte kommunicerat med honom innan han bjöd in mig till denna undersökning )
- ☐ En bekant / en ytlig bekant
- ☐ En vän men inte någon jag kan prata om personliga saker med
- ☐ En vän som jag kan prata om personliga saker med
- ☐ En nuvarande sexpartner, men inget fast förhållande

- ☐ Någon jag är ihop med/gift med
- ☐ Vi var ihop förut eller har haft sex förut
- ☐ Släkting/Familj

**16. Hur många män som har sex med män, äldre än 15 år, skulle du kunna tänka dig att bjuda in via internet (mail, quiser, grindr, facebook etc.) till den här studien?** Det är viktigt för studien att du försöker uppskatta även om det inte blir exakt.

**17. Ungefär hur många män som har sex med män har du haft kontakt med via Internet under de senaste 7 dagarna?** Räkna all sorts nätkommunikation (facebook, quiser, email, chat, grindr etc.) oavsett relation (kompis/kollega/sexpartner/flört etc.) Det är viktigt för studien att du försöker uppskatta även om det inte blir exakt.

**18. Av de X män som har sex med män som du haft kontakt med via internet under de senaste 7 dagarna, hur många är i samma åldersgrupp som du?** Med åldersgrupp menar vi 5 år yngre till 5 år äldre än dig själv.

- ☐ Alla, eller nästan alla (80-100%)
- ☐ Mer än hälften (60-80%)
- ☐ Hälften (40-60%)
- ☐ Mindre än hälften (20-40%)
- ☐ Ett fåtal (0-20%)
- ☐ Inga (0%)
- ☐ Vet ej

**19. Av de X män som har sex med män som du har haft kontakt med via Internet under de senaste 7 dagarna, hur många bor i samma län som du?**

- ☐ Alla, eller nästan alla (80-100%)
- ☐ Mer än hälften (60-80%)
- ☐ Hälften (40-60%)
- ☐ Mindre än hälften (20-40%)
- ☐ Ett fåtal (0-20%)
- ☐ Inga (0%)
- ☐ Vet ej

**20. Vilken/vilka av följande sociala nätverk har du varit inloggad på under den senaste månaden?** *Du kan svara med ett eller flera alternativ.*

- ☐ Facebook
- ☐ Quiser
- ☐ GayRomeo
- ☐ Grindr
- ☐ Boyfriend.dk
- ☐ gaydar.co.uk
- ☐ dudesnude.com
- ☐ twitter
- ☐ Sylvester
- ☐ gaysir.no
- ☐ manhunt.com
- ☐ recon.com
- ☐ Inget
- ☐ Annat/andra, vad:

*Här frågar vi angående hur du använder QX Qruiser, ett web-Community för homosexuella, bisexuella, transgender och queer samt deras vänner. QX Qruiser har tidigare använts för att hitta deltagare till studier, därför vill vi förstå QX Qruisers roll bättre. Det hjälper oss att förstå vilka vi når med den här studien och hur vi kan förbättra studien för att alla män som har sex med män ska ha samma chans att delta. (Läs mer)*

**21. Är du medlem på Qruiser?**

- ☐ Ja
- ☐ Nej

**22. Har du guldmedlemskap på Qruiser?**

- ☐ Ja
- ☐ Nej

**23. Av de X män som har sex med män som du har haft kontakt med via Internet under de senaste 7 dagarna, hur många är medlemmar på Qruiser?** Det är viktigt för studien att du försöker uppskatta även om det inte blir exakt.

- ☐ Alla, eller nästan alla (80-100%)
- ☐ Mer än hälften (60-80%)
- ☐ Hälften (40-60%)
- ☐ Mindre än hälften (20-40%)
- ☐ Ett fåtal (0-20%)
- ☐ Inga (0%)
- ☐ Vet ej

**24. Hur många av din/dina Qruiserprofiler har du varit inloggad på under de senaste två månaderna?**

- ☐ 0
- ☐ 1
- ☐ 2
- ☐ 3 eller fler

*Här frågar vi angående den Qruiserprofil som du använder mest, studien använder den här informationen för att utvärdera om studien når alla delar av gruppen män som har sex med män. (Läs mer)*

**25a. Hur många gånger har du varit inloggad på den Qruiserprofil som du använder mest de senaste 7 dagarna?**

- ☐ Inte alls
- ☐ 1-3 gånger totalt
- ☐ 4-6 gånger totalt
- ☐ 1-5 gånger per dag
- ☐ Mer än 5 gånger per dag
- ☐ Jag är inloggad större delen av tiden

**25b. Vilken ålder har du registrerat på den Qruiserprofil som du använder mest / på din Qruiserprofil?**

**25c. Vilket län har du registrerat på den Qruiserprofil som du använder mest / på din Qruiserprofil?**

**25d. Vad har du registrerat för sexuell läggning på den Qruiserprofil du använder mest / på din Qruiserprofil?**

- ☐ Homosexuell
- ☐ Bisexuell
- ☐ Experimentell
- ☐ Queer
- ☐ Heterosexuell
- ☐ Asexuell
- ☐ Vet ej / Annat

**25e. Vilken sorts kontakt har du registrerat att du söker efter på den Qruiserprofil du använder mest / på din Qruiser profil?** Du kan svara med ett eller flera alternativ.

- ☐ Chat
- ☐ Vänskap
- ☐ Sex
- ☐ Relation
- ☐ Har ej registrerat

**25f. Vad har du registrerat för civil status på den Qruiserprofil du använder mest / på din Qruiser profil?**

- ☐ Singel
- ☐ Har en partner
- ☐ Har flera partners
- ☐ Har en partner som jag bor med
- ☐ Förlovad
- ☐ Gift
- ☐ Har ej registrerat

**25g. Hur många favoriter har du på den Qruiserprofil du använder mest / på din Qruiser profil?** Dubbelkolla gärna på din Qruiserprofil om du inte kommer ihåg.

**25h. Vad har du registrerat för sysselsättning på den Qruiserprofil du använder mest / på din Qruiser profil?**

- ☐ Anställd
- ☐ Student
- ☐ Arbetslös
- ☐ Egenföretagare
- ☐ Pensionerad
- ☐ Har ej registrerat

Här frågar vi angående den *Qruiserprofil* som du använder näst mest, studien använder den här informationen för att utvärdera om studien når alla delar av gruppen män som har sex med män. (Läs mer)

**26a. Hur många gånger har du varit inloggad på den *Qruiserprofil* som du använder *näst mest* de senaste 7 dagarna?**

- ☐ Inte alls
- ☐ 1-3 gånger totalt
- ☐ 4-6 gånger totalt
- ☐ 1-5 gånger per dag
- ☐ Mer än 5 gånger per dag
- ☐ Jag är inloggad större delen av tiden

**26b. Vilken ålder har du registrerat på den *Qruiserprofil* som du använder *näst mest*?**

**26c. Vilket län har du registrerat på den *Qruiserprofil* som du använder *näst mest*?**

**26d. Vad har du registrerat för sexuell läggning på den *Qruiserprofil* du använder *näst mest*?**

- ☐ Homosexuell
- ☐ Bisexuell
- ☐ Experimentell
- ☐ Queer
- ☐ Heterosexuell
- ☐ Asexuell
- ☐ Vet ej / Annat

**26e. Vilken sorts kontakt har du registrerat att du söker efter på den *Qruiserprofil* du använder *näst mest*?** Du kan svara med ett eller flera alternativ.

- ☐ Chat
- ☐ Vänskap
- ☐ Sex
- ☐ Relation
- ☐ Har ej registrerat

**26f. Vad har du registrerat för civil status på den *Qruiserprofil* du använder *näst mest*?**

- ☐ Singel
- ☐ Har en partner
- ☐ Har flera partners
- ☐ Har en partner som jag bor med
- ☐ Förlovad
- ☐ Gift
- ☐ Har ej registrerat

**26g. Hur många favoriter har du på den *Qruiserprofil* du använder *näst mest*?** Dubbelkolla gärna med din *quiserprofil* om du inte kommer ihåg.

**26h. Vad har du registrerat för sysselsättning på den *Qruiserprofil* du använder *näst mest*?**

- ☐ Anställd
- ☐ Student
- ☐ Arbetslös
- ☐ Egenföretagare
- ☐ Pensionerad
- ☐ Har ej registrerat



Här frågar vi angående din tredje Qruiserprofil, studien använder den här informationen för att utvärdera om studien når alla delar av gruppen män som har sex med män. (Läs mer)

**27a. Hur många gånger har du varit inloggad på din tredje Qruiserprofil de senaste 7 dagarna?**

- ☐ Inte alls
- ☐ 1-3 gånger totalt
- ☐ 4-6 gånger totalt
- ☐ 1-5 gånger per dag
- ☐ Mer än 5 gånger per dag
- ☐ Jag är inloggad större delen av tiden

**27b. Vilken ålder har du registrerat på din tredje Qruiserprofil?**

**27c. Vilket län har du registrerat på din tredje Qruiserprofil?**

**27d. Vad har du registrerat för sexuell läggning på din tredje Qruiserprofil?**

- ☐ Homosexuell
- ☐ Bisexuell
- ☐ Experimentell
- ☐ Queer
- ☐ Heterosexuell
- ☐ Asexuell
- ☐ Vet ej / Annat

**27e. Vilken sorts kontakt har du registrerat att du söker efter på din tredje Qruiserprofil? Du kan svara med ett eller flera alternativ.**

- ☐ Chat
- ☐ Vänskap
- ☐ Sex
- ☐ Relation
- ☐ Har ej registrerat

**27f. Vad har du registrerat för civil status på din tredje Qruiserprofil?**

- ☐ Singel
- ☐ Har en partner
- ☐ Har flera partners
- ☐ Har en partner som jag bor med
- ☐ Förlovad
- ☐ Gift
- ☐ Har ej registrerat

**27g. Hur många favoriter har du på din tredje Qruiserprofil? Dubbelkolla gärna med din quiserprofil om du inte kommer ihåg.**

- ☐ (Box to add number 0-)
- ☐ Vet ej

**27h. Vad har du registrerat för sysselsättning på din tredje Qruiserprofil?**

- ☐ Anställd
- ☐ Student
- ☐ Arbetslös
- ☐ Egenföretagare
- ☐ Pensionerad
- ☐ Har ej registrerat

**28. Om du vill ha information om säkrare sex, vart vänder du dig då? Du kan svara med ett eller flera alternativ.**

- ☐ Vänner
- ☐ Familj
- ☐ Partner
- ☐ Skola/universitet
- ☐ Sjukvårdspersonal
- ☐ Mottagningar för sexuellt överförbara sjukdomar
- ☐ Mottagningar riktade till män som har sex med män, såsom Venhälsan & Gayhälsan
- ☐ Ungdomsmottagning
- ☐ RFSL:s sexperter
- ☐ Noaks Ark
- ☐ RFSU
- ☐ Hjälpelinje (telefon)
- ☐ [www.sentry.nu](http://www.sentry.nu)
- ☐ Söker på internet
- ☐ Tidning/tidskrift
- ☐ Bok/böcker
- ☐ Annat:
- ☐ Inte aktuellt
- ☐ Vet ej