Understanding HIV risk and addressing barriers to testing for men who have sex with men in Australia

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May 2012
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Abstract

Diagnoses of HIV among men who have sex with men (MSM) are increasing in many developed countries. In Australia, rising rates of HIV diagnoses among MSM have been attributed to increasing prevalence of unprotected anal intercourse, dramatic increases in the prevalence of other STIs including syphilis, gonorrhoea and chlamydia, and (following the introduction of ART) an expanding pool of healthy, sexually active, HIV positive MSM. Surveillance data also suggest a shift in the epidemiology of HIV within Australian MSM populations in recent years, with an increasing proportion of younger MSM being diagnosed with HIV and other STIs. Although identified in other developed countries as a key factor likely to be associated with increasing HIV transmission among MSM, local data on undiagnosed HIV (HIV positive individuals who are unaware of their HIV infection) in Australia is limited. Additional information regarding the prevalence and correlates of undiagnosed HIV among MSM is required to understand how undiagnosed infection may impact on transmission rates.

In addition to initiatives to maintain and enhance awareness of risk and protective behaviours for HIV and other STIs, encouraging regular HIV and other STI testing among MSM is a central part of Australia’s HIV prevention response. Increasing the frequency of HIV and other STI testing among high risk MSM is considered particularly important to detect primary infections and undiagnosed infections. The benefits of testing are several. First, it provides an opportunity for the provision of education and counselling, regardless of the outcome of the test. Second, for those found to have infection, it represents a pathway into HIV care and treatment. Finally, the reduction in viral load that can be achieved through treatment can substantially lower the risk of transmission to sexual partners.

Annual self-reported HIV testing rates among MSM in Australia are consistently high (60%-68%). Nevertheless, recent clinic data suggest that the proportion of MSM undergoing more frequent testing is falling well short of the 3-6 monthly recommendation for high-risk men, and a significant proportion with HIV infection may be undiagnosed or diagnosed late. Numerous barriers to frequent testing among MSM have been identified previously including low risk perception, difficulties getting an appointment, the requirement for multiple clinic appointments for specimen collection and for receiving results, and difficulties in finding a ‘gay-friendly’ doctor.
This thesis provides estimates of the extent of undiagnosed HIV infection in MSM and then describes evaluations of the impact of a range of preventative approaches to increasing HIV and STI testing for MSM in Australia.

Limitations of current HIV epidemiological approaches in Australia and the potential impact of undiagnosed infections (and, in turn, the importance of frequent HIV testing) on HIV epidemiology were highlighted in the ‘Suck it and See’ Study. Field-based HIV testing techniques used for the first time in Australia enabled measurement of the biological prevalence of HIV alongside behavioural data, revealing an undiagnosed HIV prevalence estimate of 31%, and confirmed the previously unrecognised impact of undiagnosed HIV on transmissions. These outcomes, combined with the known limitations of self-report measures for estimating HIV prevalence, as currently used in Australia, makes a strong case for the incorporation of biological measures into routine HIV and behavioural surveillance in Australia.

A quantitative and qualitative evaluation of a national STI awareness campaign demonstrated the effectiveness of social marketing campaigns in encouraging HIV/STI testing. The campaign aimed to increase HIV and STI testing among MSM by improving awareness and knowledge of the importance of regular testing. The quantitative evaluation demonstrated the impact of the campaign on awareness and health-seeking behaviour. These findings were complemented by those of the qualitative evaluation, which identified key elements of campaign style, language and broadcast schedule, in particular the use of mainstream media channels that contributed to impact, reach, acceptability and engagement. The qualitative evaluation also identified campaign limitations, including its limited ability to reduce risk behaviour and encourage community dialogue or interpersonal communication. The lack of portrayal of negative consequences associated with not getting tested and the limited engagement with the campaign content were identified as a potential reason for these limitations.

Web-based interventions offer a new and potentially more engaging approach to health promotion than traditional types of social marketing. In particular, newer Web 2.0 applications like social networking sites have interactive functions and rapidly increasing popularity, characteristic that can be exploited to provide a unique platform to deliver health promotion messages. “Queer as F**K” is an innovative sexual health program delivered to gay men via social networking sites. The evaluation of its pilot provided evidence of the feasibility and acceptability of health promotion delivered through social networking sites and other new media for reaching and engaging gay men in sexual health discussions. Increasing avenues to deliver sexual health promotion and helping to normalise sexual health discussions among MSM are important steps to help reduce stigma and other structural/societal barriers to testing.
These new technologies can support or accompany existing mass media campaigns that have been shown to be effective at encouraging testing.

Despite successful and innovative marketing approaches designed to enhance HIV and other STI testing among MSM, structural barriers to testing remain. Men currently need a second appointment to receive their test results, as conventional HIV serology results are not available for two or more days. Thus, for high-risk men, each HIV test could be associated with two visits to a clinic, meaning up to eight clinic visits per year for HIV testing alone. Rapid HIV testing could enable men to increase their testing frequency by halving the number of visits required. In Australia, HIV testing is only available through clinical settings and until 2011 HIV rapid testing was not supported through the Australian National HIV Testing Policy. To inform changes to HIV testing policy and practice in Australia, and demonstrate the benefit of alternative testing models, a systematic review of community-based models of testing for MSM, with a focus on rapid testing was undertaken. The review provides evidence that community models attract a significant proportion of high-risk MSM and reach a high proportion of men who have never tested before, supporting the diversification of testing strategies in Australia to increase HIV testing rates among MSM.

In summary, while improving access to HIV testing for MSM in Australia is recognised as key to reducing new diagnoses and onward transmission, achieving this outcome requires complementary and supporting strategies, including biomedical, behavioural and structural interventions. As these new strategies are implemented, it is imperative that effective and ongoing evaluations measure the impact of the overall strategy and identify the most effective components. This information in turn informs the ongoing refinement of the prevention strategies that will ultimately help reduce the number of HIV infections among MSM and the burden on the health system and the community.

This thesis contributes greatly to our understanding of the impact of undiagnosed HIV in driving the HIV epidemic among MSM in Australia. It provides strong evidence for the need to diversify testing strategies in Australia to reduce the prevalence of undiagnosed HIV, including the introduction of rapid HIV testing into both clinical and community based settings. Findings presented in this thesis suggest that the introduction of new testing strategies need to be accompanied by engaging sexual health promotion interventions that encourage and increase the uptake and frequency of HIV testing among MSM populations.
General Declaration

Monash University

Monash Research Graduate School

Declaration for thesis based or partially based on conjointly published or unpublished work

In accordance with Monash University Doctorate Regulation 17/ Doctor of Philosophy and Master of Philosophy (MPhil) regulations the following declarations are made:

I hereby declare that this submission is my own work and to the best of my knowledge it contains no material which has been accepted for the award of any other degree or diploma at any university or equivalent institution and that, to the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

This thesis includes three original papers published in peer reviewed journals and three unpublished publications. The conception, development and writing up of all the papers in the thesis were the principal responsibility of myself, the candidate, working within the Department of Epidemiology and Preventive Medicine under the supervision of Dr Mark Stoove, A/Prof Margaret Hellard, Dr Rebecca Guy. A number of the publications are co-authored reflecting the collaborative nature of public health research and acknowledges the input for these relevant research teams. I have reformatted submitted and published papers in order to generate a consistent presentation within the thesis.
In the case of chapters two to seven my contribution to the work involved the following:

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<th>Publication status</th>
<th>Nature and extent of candidate’s contribution</th>
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<td>Published</td>
<td>Study design, data collection and analysis, results interpretation, manuscript preparation and review</td>
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<td>Three</td>
<td>The difference in self-reported and biological measured HIV prevalence implications for HIV prevention.</td>
<td>Published</td>
<td>Study design and management, data collection and analysis, results interpretation, manuscript preparation and review</td>
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<td>Four</td>
<td>Stop the Drama Downunder: A social marketing campaign increases HIV/STI knowledge and testing in Australian gay men</td>
<td>Published</td>
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<td>Submitted</td>
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<td>Six</td>
<td>Queer as F***K: Reaching and Engaging Gay Men in Sexual Health Promotion through Social Networking Sites</td>
<td>Submitted</td>
<td>Study design and management, data collection and analysis, results interpretation, manuscript preparation and review</td>
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<td>Seven</td>
<td>Community-based HIV testing in men who have sex with men (MSM): A systematic review of published outcome data</td>
<td>Submitted</td>
<td>Study design, data collection and analysis, results interpretation, manuscript preparation and review</td>
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Signed

Date: 30/05/2012
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This thesis and the body of work that it encompasses are truly a reflection of the supportive environment and collaborative nature of the workplace that I have had the pleasure of being a part of for the past six years. Like an onion, there have been many layers to my PhD story and I owe much thanks to a few circles of friends, my family and colleagues.

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Special thanks goes to Colin Batrouney and Jason Asselin from VAC/GMHC; whose support, friendship, and sense of humour has made my work enjoyable. It has been a pleasure to work with you both in a truly collaborative nature, as is demonstrated within this thesis.
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Publications and Presentations

A list of publications and oral presentations during the PhD candidature is presented below. Those related to work contained within this thesis are indicated by an asterisk and are included in the Appendix.

Peer-Reviewed Publications


distribution of men who have sex with men diagnosed with HIV in Victoria, Australia. Medical

infectious diseases by general practitioners in Australia. The Australian and New Zealand Journal

Pedrana, A. Hellard, M., Giles, M. Registered post achieved a higher response rate than normal
mail- a randomised controlled trial. Journal of Clinical Epidemiology (Sep 2008 – Vol 61(9): 896-
899).

**Other Publications**

9(3):20. (Included as Appendix 4)

*Pedrana, A., S**toove, M. (2011). *Quick and easy: how rapid HIV tests can help reduce*
transmission. The Conversation: The Conversation Media Group, 28 June 2011. (Included as
Appendix 5)

testing for men who have sex with men (MSM): Systematic Review 2011*. Melbourne: Centre for
Population Health, Burnet Institute.

blood borne virus exposure among transient workers in rural Victoria, ANEX Bulletin 2008- Vol
6(2): 3.

**Oral Presentations**

*Hellard M, Lim M, Gold J, Pedrana A, S**toove M. Using communication technologies as sexual
health promotion interventions – lessons from the field. Sex:Tech Conference. San Francisco,
April 2012

*Pedrana A, S**toove S, Bowring A, Hellard M, Guy R. Community-based HIV testing services for
gay men: findings from a systematic review. Australasian HIV/AIDS Conference. Canberra,
September 2011


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<td>AIDS</td>
<td>Acquired Immune Deficiency Syndrome</td>
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<tr>
<td>ART</td>
<td>Antiretroviral treatment/therapy</td>
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<tr>
<td>ARVs</td>
<td>Antiretrovirals</td>
</tr>
<tr>
<td>CBO</td>
<td>Community-based organisations</td>
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<tr>
<td>DOH</td>
<td>Department of Health</td>
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<tr>
<td>EIA</td>
<td>Enzyme-linked immunoassay</td>
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<tr>
<td>GCPS</td>
<td>Gay Community Periodic Survey</td>
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<tr>
<td>GP</td>
<td>General practitioner</td>
</tr>
<tr>
<td>HIV</td>
<td>Human immunodeficiency virus</td>
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<tr>
<td>MSM</td>
<td>Men who have Sex with Men</td>
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<tr>
<td>MGCPS</td>
<td>Melbourne Gay Community Periodic Survey</td>
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<tr>
<td>NPEP</td>
<td>Non-occupational post exposure prophylaxis</td>
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<tr>
<td>PLWHA</td>
<td>People living with HIV/AIDS</td>
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<tr>
<td>POC</td>
<td>Point-of-care test</td>
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<tr>
<td>PPV</td>
<td>Positive predictive value</td>
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<tr>
<td>SOPV</td>
<td>Sex-on-premises venue</td>
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<td>STIs</td>
<td>Sexually transmissible infections</td>
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<tr>
<td>STIGMA</td>
<td>Surveillance and Prevention of Sexually Transmissible Infections in Gay Men Action Group</td>
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<tr>
<td>TGA</td>
<td>Therapeutic Goods Administration</td>
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<tr>
<td>RCT</td>
<td>Randomised controlled trial</td>
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<td>UAI (C)</td>
<td>Unprotected anal intercourse (with a casual partner/s)</td>
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<td>UAI (R)</td>
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<td>WB</td>
<td>Western Blot</td>
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<td>WHO</td>
<td>World Health Organization</td>
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Chapter One: Introduction & Literature Review

This chapter provides a background and rationale for the program of research presented in this thesis. It begins by defining the key terms, then describes HIV epidemiology both globally and in Australia, specifically focusing on men who have sex with men (MSM). The chapter then outlines the main behavioural risk factors that increase MSM’s vulnerability to HIV and the key prevention efforts used to reduce and prevent HIV in MSM. Current approaches to increase testing among MSM are then described, including mass media campaigns to improve awareness and encourage and normalise testing, training healthcare providers to reduce stigma and discrimination, and reducing structural barriers and improve access to testing. Methods for evaluating health promotion approaches and of the key theoretical frameworks are discussed. Finally, an overview of the thesis, including aims, is presented.
Setting the Scene: Defining Key Terms

HIV

The human immunodeficiency virus (HIV) is a retrovirus that infects CD4+ T cells of the immune system, destroying or impairing their function. The early stage of HIV infection is known as ‘Acute HIV infection’ or ‘Primary HIV infection’, and usually extends approximately 2-4 weeks from initial infection until the body produces enough HIV antibodies to be detected by an HIV test. In this primary stage the HIV virus replicates rapidly, resulting in the blood having a high number of HIV copies (viral load) and being highly infectious. HIV infection is diagnosed through blood tests detecting the presence or absence of antibodies and antigens. As the HIV infection progresses the immune system becomes weaker, and the person becomes more susceptible to infection with other pathogens. HIV infection moves through four stages: acute infection, asymptomatic infection, symptomatic HIV, and finally the most advanced stage of HIV infection, acquired immunodeficiency syndrome (AIDS). It can take 10-15 years for an HIV-infected person to develop AIDS. Antiretroviral therapy (ART) which became available in the late 1990’s can delay or stop this progression. HIV may be transmitted through unprotected sexual intercourse (anal or vaginal) with an HIV-infected individual, transfusion of contaminated blood products, sharing of contaminated injecting equipment, tattooing, skin-piercing tools and surgical equipment, and from mother-to-child during pregnancy, childbirth and breastfeeding.

Antiretroviral Therapy

Antiretroviral therapy is the recommended treatment for HIV infection. ART involves using a combination of three or more antiretroviral (ARV) drugs from at least two different HIV drug classes to prevent HIV replication. In this thesis, ART refers to the use of combination antiretroviral therapy unless specifically stated otherwise.

MSM

Men who have sex with men (MSM) is a behavioural descriptive term that describes males who have sex with other males, regardless of their sexual orientation or gender identity. It is an inclusive term that encompasses people with a transgender identity, who usually do not self-identify as men. MSM includes any men who report sex with other men, including homosexual (gay-identifying), bisexual and heterosexual men who report any homosexual activity.
For this thesis, the use of MSM refers to the behavioural risk practice of a man having sex with another man as a risk factor for HIV/STI acquisition.

**Sexually Transmissible Infections**

Sexually transmissible infections (STIs) also known as sexually transmitted infections or sexually transmitted diseases, refers to a group infections that spreads from person to person during sexual contact.⁴ There are more than 30 different sexually transmissible bacteria (e.g. *Chlamydia trachomatis, Neisseria gonorrhoeae, Treponema pallidum*), viruses (e.g. HIV, Herpes simplex virus, Human Papillomavirus), and parasites (e.g. *Trichomonas vaginalis*).⁴ The traditional method of diagnosing STIs is by laboratory tests; however, other approaches, including syndromic management based on signs and symptoms of particular STIs, are often used in developing settings due to the prohibitive costs of laboratory testing.⁴ For this thesis, the terms STIs refers specifically to the groups of infections that are commonly diagnosed among MSM in Australia with and without HIV infection in the context of changing patterns of sexual behaviour; namely, gonorrhoea, chlamydia, infectious syphilis and HIV.⁵

**Sexual Health**

The World Health Organization (WHO) defines sexual health as:

> “a state of physical, emotional, mental and social well-being in relation to sexuality; it is not merely the absence of disease, dysfunction or infirmity.”⁶

This definition highlights the inter-related nature of the physical, mental and social dimensions of sexuality and the notion of sexual well-being. The WHO, goes on to state that sexual health requires:

> “a positive and respectful approach to sexuality and sexual relationships, as well as the possibility of having pleasurable and safe sexual experiences, free of coercion, discrimination and violence. For sexual health to be attained and maintained, the sexual rights of all persons must be respected, protected and fulfilled.”⁶

Numerous factors impact directly on an individual’s ability to develop and ensure sexual health and well-being, including poverty, education, access to health care services and stigma and discrimination.⁶ For this thesis, ‘sexual health’ refers to STIs and associated behavioural risk factors for MSM.
Biological and Behavioural Surveillance

Public health surveillance is the continuous, systematic collection, analysis and interpretation of health-related data to help guide the planning, implementation, and evaluation of public health practice. Monitoring of HIV/STI prevalence in a defined population over time, in combination with demographics data and measures of knowledge, attitudes and sexual behaviour, provide a better understanding of the dynamics of the epidemic and can be used as:

- an early warning system for future public health issues;
- a monitoring and evaluation tool to measure the impact of an intervention, or track progress towards specified goals (e.g. Millennium Development Goals); and
- a monitoring tool to clarify the epidemiology of health problems, to allow priorities to be set and to inform public health policy and strategies.

This thesis focuses on surveillance systems that aim to support HIV prevention, through the routine collection of key HIV indicators, such as HIV and STI prevalences, prevalence of undiagnosed HIV, sexual risk behaviours and testing patterns, that can be used to guide the planning and evaluation of HIV prevention initiatives.

Rapid HIV tests

Recent technical advances in HIV testing have resulted in the availability of rapid HIV tests (short-incubation HIV tests); qualitative immunoassays that can detect antibodies to HIV in the blood in less than 30 minutes. They are portable test kits that often use membrane-based test strips enclosed in a plastic test cassette. Most rapid HIV tests detect HIV antibodies in whole blood (finger-prick), serum/plasma, oral fluid or urine. Newer fourth-generation antigen/antibody (Ag/Ab) combination assays enable simultaneous and separate detection of HIV p24 antigen (Ag) and antibodies (Ab) for HIV-1 and HIV-2 in human serum, plasma or whole blood.

Rapid HIV tests require minimal equipment (no laboratory), low or no refrigeration (although rapid test kits do not generally need refrigeration, most need to be stored within a specific temperature range) and basic training to perform tests, making them highly suitable for ‘on site’ or ‘point-of-care’ testing by a trained health care worker.

For this thesis, rapid testing refers to any rapid immunoassays that deliver HIV test results to clients at the point-of-care.
Health Promotion

In 1986, the Ottawa Charter for Health Promotion\(^\text{12}\) defined health promotion as:

“The process of enabling people to increase control over, and to improve, their health”.

The Ottawa charter identified\(^\text{12}\) three basic strategies for health promotion:

- *advocacy* for health to create the essential conditions for health indicated above;
- *enabling* all people to achieve their full health potential; and,
- *mediating* between the different interests in society in the pursuit of health.

The Ottawa charter also outlined five priority action areas for health promotion; 1) Building healthy public policy; 2) Creating supportive environments for health; 3) Strengthening community action for health; 4) Developing personal skills; and 5) Re-orienting health services.\(^\text{13}\)

The definition of health promotion was later refined by the WHO as “the process of enabling people to increase control over the determinants of health and thereby improve their health”.\(^\text{13}\)

It emphasised the role of empowering people and communities to take control over the range of personal, social, economic and environmental factors that determine their health status, and advocate for the improvement of their health.

The 1997 Jakarta Declaration on Leading Health Promotion into the 21st Century\(^\text{14}\) confirmed that these strategies and action areas are relevant for all countries and reaffirmed the commitment to tackling the underlying determinants of health. Recently, a greater understanding of the complexity of health promotion activities and the corresponding need for more advanced and effective evaluation measures has arisen.\(^\text{15}\)

In this thesis, the concept of health promotion focuses on the individual through developing personal skills and knowledge, while also addressing broader structural and environmental factors that help create supporting environments and re-orientate health services.
Know Your Epidemic

HIV/STI Surveillance and Monitoring Methods

Global

The primary role of public health surveillance is to guide the planning and evaluation of policies and programs through the collection, analysis and interpretation of various forms of statistical information. HIV surveillance systems should accurately track the outcomes of a prevention strategy by measuring indicators such as HIV testing uptake and sexual risk behaviours. Surveillance systems should also assess the impact of the prevention strategy by monitoring the number of new (incidence) or existing (prevalence) HIV infections in the population under surveillance.

HIV epidemics can vary considerably over space and time, and the monitoring systems that are used to guide prevention initiatives should be tailored to the specific HIV epidemic in a given setting - hence the emphasis on ‘know your epidemic’. Incidence and prevalence are useful tools to monitor HIV trends over time; as they vary according to the stage of the HIV epidemic, and thus can be used in combination to provide a more comprehensive picture. One of the major challenges for surveillance systems is to allow accurate comparisons over time to enable responsive approaches to any changes in an epidemic.

HIV prevalence has been the cornerstone of HIV surveillance systems around the world. It is important to reliably estimate HIV prevalence, particularly among high-risk groups, in order to monitor changes over time and to help explain factors that may be responsible for changing trends in prevalence. HIV prevalence estimates are also necessary to assess the impact of health promotion and HIV prevention initiatives, inform public health programs, ensure the provision of adequate health services and can be used as the basis of epidemiological modelling. HIV incidence is another key programmatic indicator that reflects the rate of HIV transmission, and is useful in determining both the need for intervention programs and their effectiveness. Alongside HIV transmission and prevalence trends, the surveillance of risk (e.g. unprotected anal intercourse (UAIC)) and protective factors (e.g. regular HIV and other STI testing) among MSM provide important data to help understand the factors contributing to HIV epidemiology. Monitoring of sexual behaviour can identify important exposures contributing to HIV transmission and provide an early warning of changes in HIV transmission.
self-reported testing rates and monitoring the uptake of testing at services can identify important changes in health seeking behaviour in response to health promotion initiatives.

The methods used to measure HIV indicators vary considerably, and include:

- **Routine case reporting (passive surveillance):** This is the most widely used surveillance mechanism for HIV/AIDS and is based on the routine reporting of newly diagnosed cases to a central public health unit. The key indicator derived from these data is usually the number of newly diagnosed infections over a defined time period. The mechanism for case reporting varies from country to country; usually they are notified by doctors or laboratories. Notifications are usually accompanied by basic demographic information including age, sex and area of residence. This system has several limitations; notifications depend strongly on patterns of HIV testing, cannot be interpreted as a measure of HIV prevalence due to limited reliable denominator information, and cannot measure incidence because of limited time of exposure data (again affected by testing patterns).

- **Clinic-based sentinel surveillance:** The provision of testing is a key HIV prevention tool that allows diagnoses of infections and access to treatment, care and support. The basic design of a clinic-based sentinel surveillance system is as a serial, cross-sectional serological survey measuring the prevalence of HIV in a reproducible population at risk and enables tracking of several other key indicators that are useful for program planning and evaluation. This system can measure various outcome and impact indicators related to HIV prevention programs, including: (i) health service utilisation and the characteristics of at-risk populations seeking testing; (ii) the proportion of at-risk populations diagnosed with HIV among those being tested for HIV (positivity rates) which can help determine whether interventions preferentially impact on higher risk groups or encourage those at lower risk to seek HIV testing; and (iii) HIV incidence in those undergoing repeat HIV testing (only possible in sentinel systems capable of identifying the same individuals over time).

- **Repeated surveys:** Recognising some of the limitations of both passive and sentinel surveillance systems in who they represent, repeated community-based surveys have been adopted widely to support the planning and evaluation of HIV prevention programs by providing HIV prevalence estimates. The advantages of such surveys include obtaining targeted information on a defined population that cannot be provided through routine reporting systems, such as additional behavioural data and/or specific information on key risk factors (i.e. sexual or injecting activity). A wide variety of methodological approaches and sampling methods has been used for such surveys,
including cross-sectional surveys, population-based household surveys, facility-based sampling, snowball sampling and time-location sampling.\textsuperscript{21, 23, 24} \n
- Cohort studies – estimating HIV incidence: Longitudinal cohort studies have been used to measure HIV incidence as they avoid some of the limitations of using serial cross-sectional HIV prevalence surveys as a means for estimating HIV incidence.\textsuperscript{25, 26, 27} However, cohort studies are often expensive, resource intense, and require long follow-up periods. As such, cohort studies are not often incorporated into routine surveillance systems and even when they are, they are usually not sustained.

- Alternative approaches: Given the importance of HIV incidence as an indicator, several alternative approaches have been used to provide incidence estimates for the purposes of surveillance, including repeat testing\textsuperscript{28} (including as part of sentinel surveillance systems described above), specialised HIV serological assays (STARHS) which use a blood specimen collected at a single point in time\textsuperscript{29} and mathematical techniques to estimate incidence using HIV prevalence data obtained from repeat surveys.\textsuperscript{30, 31}

### Australia

In Australia, HIV monitoring among MSM is primarily based on HIV case-reporting supplemented by repeated behavioural surveys in MSM and, more recently, a HIV sentinel surveillance system. HIV incidence assays are being trialled as part of the passive notification system, but they are yet to become a routine feature of HIV surveillance. Additional community based surveys and cohort studies of MSM provide valuable monitoring data. There is additional monitoring data contributed by other methodologies including, measures of morbidity through the Australian HIV Observational Database (AHOD),\textsuperscript{32} HIV seroprevalence estimates in injecting drug user populations and through the blood bank database,\textsuperscript{32} and a crude national HIV sentinel surveillance system which uses data from a few key sexual health clinics throughout Australia.\textsuperscript{33}

#### HIV case reporting (passive surveillance)

HIV case reporting (or passive surveillance) is based on the mandatory reporting of newly diagnosed cases to state Departments of Health by doctors and laboratories. Notifications include collection of demographic, clinical, testing and limited risk behaviour data from each person diagnosed with HIV.

#### HIV sentinel surveillance system

The Victorian Primary Care Network for Sentinel Surveillance on BBVs and STIs (VPCNSS) provides more extensive information than other states’ sentinel surveillance systems. It involves
collection of testing, demographic, and risk behaviour data from MSM attending clinical services at three high caseload metropolitan MSM clinics. Data are collected at all test presentations and can be linked for individuals over time to allow estimates of HIV and other STI incidence and associated risk behaviours. VPCNSS collected data from approximately 50% of all HIV notifications in Victoria between 2007 and 2010, but is not designed to measure HIV prevalence as MSM with existing infection are excluded as they do not undergo HIV testing.

**Behavioural surveys in MSM**

The Gay Community Periodic Surveys (GCPS) began in 1998 and consists of repeat cross-sectional surveys of approximately 7,000 MSM conducted in six main Australian jurisdictions. It captures self-reported socio-demographic, sexual behaviour, drug use, HIV and STI testing patterns, HIV status and other information from all participants. With a consistent sampling frame, these surveys provide important information on trends in sexual behaviour, self-reported HIV status and testing rates. Some limitations with this system include, its inability to follow individuals over time, issues with generalisability (as surveys use convenience sampling, participating men may represent only gay community-attached and mostly gay-identified homosexual men) and issues with recruitment strategy (recent declines in recruitment numbers may suggest a shift in gay communities over time).

**Other Surveys of MSM**

Discrete studies have made significant contributions to our understanding of the HIV epidemic among Australian MSM. These have included national cross-sectional behavioural surveys of gay men, such as the Australian Research Centre in Sex, Health and Society national phone survey, which collects data on sex and relationships; the online ‘PASH Study’, which explored men’s experiences of and attitudes toward sex and pleasure; and the online ‘e-male survey’, a study of gay men’s internet use and men’s social and sexual lives. There are also ongoing cross-sectional studies of people living with HIV, including the ‘HIV Futures Study’, and the ‘HIV Seroconversion Study’ which collect data about people’s experiences with HIV, and the AHOD. The ‘TOMS: Three or More Study’ provided risk behaviour and condom negotiation data from a group of high-risk gay men who engaged in group sex. The ‘HiM: Health in Men’ cohort was part of an international collaboration to develop an HIV vaccine that examined changes in behaviour, attitudes and HIV incidence among HIV-negative gay men in Sydney over time. A new cohort study funded through the NHMRC (2011-2014), ‘Opposites Attract’, was also recently implemented by The Kirby Institute to examine risk factors for HIV transmission in serodiscordant homosexual couples. More recently, two community-based HIV prevalence
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studies\textsuperscript{45,46} provided the first biological estimates of HIV prevalence among MSM in Australia, one of which is the subject of the first two papers included in this thesis.

**HIV Epidemiology**

**Global**

The most recent global estimates indicate that 33.3 million people are living with HIV infection, with approximately 2.6 million people newly infected in 2009.\textsuperscript{47} Sub-Saharan Africa continues to account for the majority of new infections (an estimated 1.8 million in 2009).\textsuperscript{47} Importantly between 2001 and 2009, HIV incidence has fallen by more than 25% in 33 countries.\textsuperscript{47} This decrease may reflect the impact of HIV prevention efforts, including the recent commitment to achieving universal access to HIV prevention, treatment, care and support by 2015,\textsuperscript{48,49} but also the natural course of HIV epidemics. The number of AIDS-related deaths worldwide has steadily decreased from the peak of 2.1 million in 2004;\textsuperscript{47} most likely reflecting an increase in access to effective combination ARV therapy and care and support for people living with HIV.\textsuperscript{47} In 2009 alone, 1.2 million people received HIV antiretroviral therapy for the first time, increasing the total number of people receiving treatment by 30% in a single year.\textsuperscript{47}

**Emerging Trends**

Although unprotected heterosexual intercourse accounts for the majority of new HIV infections globally, largely due to the generalised epidemics in Sub-Saharan Africa,\textsuperscript{47} recent increases in HIV prevalence among specific at-risk groups have been documented in countries with concentrated epidemics (where HIV is over 5% in any sub-population at higher risk of infection) and low-level epidemics (where relatively little HIV is measured in any group) among people who inject drugs\textsuperscript{47,50,51} and MSM.\textsuperscript{52-55}

HIV monitoring data recognises MSM as a high risk group for HIV in both developed\textsuperscript{56,57} and developing countries.\textsuperscript{54,58} Recent increases in HIV diagnoses among MSM have been reported across Western Europe.\textsuperscript{53,59-61} Estimates of HIV seroprevalence in MSM from cross-sectional studies in the past five years have ranged from 10-15% in the United Kingdom, France, Denmark, Germany, Switzerland, and Spain.\textsuperscript{62} Several studies have reported significant increases in HIV incidence in Western European countries, including Spain\textsuperscript{63}, Italy\textsuperscript{64} and the Netherlands\textsuperscript{65}. Similar trends have been reported across Northern America, with increases in HIV prevalence reported among MSM populations in the US\textsuperscript{66-68} and Canada,\textsuperscript{69} though trends in incidence have varied.\textsuperscript{70-72} HIV seroprevalence estimates among MSM vary widely across the US,
from 6 - 38% across 21 cities with a median of 19%. Major differences in prevalence are seen between different ethnic groups in the US, highest among young non-Hispanic blacks, and lowest among non-Hispanic whites.

Recent modelling of HIV transmission among MSM has identified undiagnosed HIV as an important contributor to the continuing HIV epidemic. Estimates of undiagnosed HIV prevalence have varied from 15-76% among community samples of MSM in developed countries.

Similar to HIV prevalence estimates, estimates of undiagnosed HIV vary widely across the US, again higher among Black and Hispanic groups. Numerous studies have provided evidence of recent increases in the prevalence and frequency of sexual risk behaviour among MSM populations in developed countries. Hypothesised causes of increasing risk-taking behaviour include ‘safe sex’ fatigue, the use of the internet for meeting sexual partners, low risk perceptions, as well as optimism towards treatment and changing perceptions of the consequences of HIV infection and the benefits of ART. Self-reported annual testing rates among MSM in many developed countries collected through self-report behavioural surveys, have remained reasonably high; 66-68% in Australia, 62% in the 21 US cities, and between 37 to 50% in the UK.

A recent review of increasing HIV incidence and prevalence trends among MSM in developed countries suggested that increasing HIV testing in MSM populations may only partially explain the increase in diagnoses (the more you test the more you find), and implied that actual incidence was increasing. Furthermore, direct measures of HIV incidence based on repeat testers in clinic- and community-based cohorts point to increases in HIV incidence in MSM in North America and Europe. In further support of these findings, a review of HIV notification rates among MSM in North America, Western Europe, and Australia between 1996 and 2005 concluded that increased diagnosis rates could not wholly be explained by changes in HIV testing.

**Australia**

Men who have sex with men account for more than 65% of newly diagnosed and approximately 85% of newly acquired HIV infections each year in Australia. After more than 15 years of declining diagnoses, the annual number of new HIV diagnoses in Australia has been increasing steadily, from 719 in 1999 to approximately 1,000 in 2006-2010 (Figure 1).
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All Australian jurisdictions have, to some degree, seen a resurgence in new diagnoses of HIV infection.\textsuperscript{103} In Victoria, a jurisdiction with the second largest gay population in Australia,\textsuperscript{98} new HIV diagnoses have more than doubled from a nadir of 130 cases in 1999 to 280 in 2011 (Figure 2), with MSM accounting for over 80% of newly diagnosed and approximately 91% of newly acquired infections.\textsuperscript{99}

Figure 1: Number of HIV Notifications 1999-2010, Australia\textsuperscript{33}

![Australia chart]

Figure 2: Number of HIV Notifications 1999-2011, Victoria\textsuperscript{99}

![Victoria chart]
HIV prevalence and incidence

HIV prevalence estimates among MSM in Australia have been based mainly on self-reported HIV status collected in annual behavioural surveys, with recent estimates ranging from 5-9%. However, such surveys are likely to under estimate HIV prevalence because self-report HIV status is affected by testing patterns and the subset of men with HIV infection who are unaware of their positive HIV status at the time of the survey. Internationally, studies among MSM have demonstrated wide discrepancies between self-reported and biological HIV status. The collection of biological samples to estimate HIV prevalence alongside unlinked anonymous behavioural surveys is used as a surveillance tool throughout Europe and Northern America.

Recent epidemic modelling in Australia estimates that approximately 3% of MSM with primary HIV infection and 9% of MSM with undiagnosed HIV contribute to an estimated 19% and 31% of new HIV infections respectively. The reliability of these estimates is dependent upon the accuracy of the parameters used in the model, including an estimated HIV prevalence of approximately 5% in Australian MSM and an estimated prevalence of undiagnosed HIV infection of 9%. However, two recent community-based prevalence studies generated higher estimates. A study of 464 community-recruited gay men in Brisbane, Queensland, in 2007 revealed an HIV prevalence of 8.8%, with 19.5% of positive men identified as having an undiagnosed infection. A similar study in Melbourne, Victoria, recruited 639 gay men through community gay venues and reported a biological HIV prevalence of 9.5%, of which 31.1% were previously undiagnosed. These data suggest that undiagnosed HIV may be contributing more to HIV transmission among MSM in Australia than previously thought. Similar trends have been observed internationally.

In Australia HIV incidence estimates have been derived from various data sets. The ‘HIM: Health in Men’ cohort of homosexual men in Sydney from 2002 to 2006; identified 52 cases of HIV seroconversion among 1426 participants, providing an overall annual incidence estimate of close to 1% with non-significant declines in incidence between 2002 and 2006. However, this study did identify high-incidence subgroups within the cohort corresponding to an HIV incidence of 2.71 per 100 person-years. High incidence subgroups included men reporting any unprotected anal intercourse (UAI) with a known HIV-positive partner, having an HIV positive regular partner, more than 50 casual partners, receptive UAI with a causal partner (UAIC), any anal STI, any injecting drug use and use of illicit drugs (i.e. oral erectile dysfunction medication, methamphetamine use, psychedelics/hallucinogens).
Data from the non-occupational post-exposure prophylaxis (NPEP) service in Victoria has also provided incidence estimates based on linked data with the HIV Surveillance Registry.\textsuperscript{106} Incidence was calculated from men presenting for NPEP who were HIV-negative at baseline and who subsequently seroconverted, with total person-years (PY) of follow-up calculated from the date of first NPEP presentation to either the date of HIV diagnosis or censorship at 31 May 2008. This study reported an incidence of 1.27 per 100 PY; median age of seroconversion was 34.6 years.\textsuperscript{106} There is no cohort-based estimate of the incidence of HIV infection available in Victoria; however, a monitoring system of medical clinics in Victoria with a high caseload of MSM reported an HIV incidence among clinic attendees of 1.2 per 100 PY in the first 9 months of the program.\textsuperscript{107}

Earlier estimates of HIV incidence using community and clinic-based cohort studies in the 1980-1990s provided higher estimates, ranging from 1-5\textsuperscript{108,109} while a more recent study based on data from sexual health clinics in Australia, 1993-1999, provided an estimate of 2.1\% with little variation by year or age group.\textsuperscript{110} No estimates of HIV incidence based on the STARHS algorithm have been published in Australia.

Emerging Trends

Recent Victorian surveillance data suggest a shift in the epidemiology of HIV within gay male populations, with median age at HIV diagnosis among MSM declining significantly from 38.8 years in 2007 to 35.3 years in 2008.\textsuperscript{111} Similar trends were seen in syphilis and gonorrhoea notifications. This study also compared behavioural data for young MSM (aged less than 35 years) and older MSM (> 35 years), and found that younger MSM were more likely to report never previously being tested for HIV and more frequent sexual risk practices, including inconsistent condom use with casual partners.\textsuperscript{111}

Some recent studies have identified factors likely to contribute to increased HIV risk among younger gay men in Australia. A recent nationwide cross-sectional online survey of Australian gay men (n=845) reported that HIV-positive men were significantly younger on average when they first had anal intercourse than HIV-negative men (18.5 vs. 21.3 years, p<0.001), suggesting that gay men initiating anal sex at a younger age are at greater risk of subsequent HIV infection.\textsuperscript{36} Another online survey of sexually active HIV-negative men (n=920) assessed differences between ‘younger’ men (aged 16–26 years, n=459) and ‘older’ men (aged 27 years and over, n=461). Younger gay men reported similar rates of UAI to older men, but their HIV/STI knowledge was poorer and a high proportion (28.3\%) of younger men had never tested for HIV/STIs.\textsuperscript{112} Behavioural surveillance conducted through the GCPS found that younger men
reported rates of UAIC similar to those reported by their older counterparts, but were more likely to report taking the more risky receptive position and were less likely to know their own and their partners’ HIV serostatus.\textsuperscript{113}

Changes in gay communities associated with increasing community assimilation over time have been reported both internationally\textsuperscript{114} and in Australia\textsuperscript{115}. These changes have resulted in age-specific declines in the use of traditional gay social venues and increased use of the internet to meet sex partners, which may had impacts on behavioural surveillance mechanisms.\textsuperscript{35} In addition, these changes present new barriers for reaching and communicating health promotion messages to MSM populations, messages that have previously been delivered through ‘traditional’ gay media (e.g. the gay press, posters in gay venues).

**Sexually Transmissible Infections**

Increases in STIs other than HIV, including syphilis, gonorrhoea and chlamydia, have been reported among MSM,\textsuperscript{33,99} particularly HIV-positive men.\textsuperscript{116,117} In Victoria, syphilis has re-emerged among MSM, with infectious syphilis notifications increasing from 2 in 2000 to 320 in 2009; notifications peaked in 2007, with the majority of these infections occurring among men aged 30 to 49 years.\textsuperscript{118}

This rise in STI diagnoses is likely to be associated with increases in HIV transmissions seen among MSM populations for several reasons.\textsuperscript{119} The presence of other STIs facilitates HIV transmission through direct biological mechanisms.\textsuperscript{120,121} More recently, syphilis infection has been shown to be associated with significant increases in HIV viral load and decreases in the CD4 cell count among HIV infected individuals.\textsuperscript{122} Upward trends in STI diagnoses among MSM\textsuperscript{123,124} have largely coincided with a significant decrease in HIV-associated mortality following the introduction of ART. Increased coverage of ART among HIV infected MSM has corresponded to increases in the number of health and sexually active MSM living with HIV, thus increasing the pool of infected individuals able to transmit HIV.\textsuperscript{125}

**Summary**

Increases in HIV prevalence among MSM are being observed in many developed countries. Increases in sexual risk behaviour, the impact of other STIs and undiagnosed HIV infections are thought to be key contributors these recent increases in HIV.
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Similar trends have been seen in Australia and are attributed to more frequent risky sexual behaviours among gay men, dramatic increases in transmission of other STIs,\(^{33,126,127}\) and a growing pool of well HIV positive MSM who are sexually active.

In addition, the potential impact of undiagnosed infections and a recent shift in the epidemiology of HIV, with younger gay men at increasing risk of HIV and other STIs, may also be facilitating the rise in HIV notifications in Australia.
HIV risk and vulnerability

Multiple and interacting factors impact on an individual’s vulnerability to HIV, including biological, behavioural, environmental (physical, economic, legal and political) and social/cultural factors. This section focuses on behavioural risk factors that contribute to HIV and STI transmissions among MSM in Australia.

According to the STIGMA testing guidelines for Australian MSM, behaviours that classify MSM as high risk for HIV include:

- unprotected anal sex;
- having more than 10 partners in the past six months; and,
- participating in group sex or using recreational drugs during sex.

Previous guidelines have identified additional risk behaviours:

- attending sex-on-premises venues; and,
- seeking partners via the internet.

This section will detail these risk factors individually, and briefly discuss the role that knowledge, attitudes and perception of risk play in informing individuals’ sexual risk practices.

Unprotected Anal Intercourse

Unprotected anal intercourse (UAI) is the major risk factor for the acquisition and transmission of HIV for MSM; in Australia, the reported frequency of UAI among MSM has been increasing in recent years.

The risk of HIV transmission varies by specific behaviours: risk of acquisition per coital act is highest for receptive anal intercourse than insertive anal intercourse. A recent longitudinal cohort study of community-based HIV-negative homosexual men in Sydney estimated per-contact probability of HIV transmission, and reported that receptive UAI with ejaculation was approximately twice as risky as receptive UAI with withdrawal or insertive UAI for uncircumcised men and over 10 times as risky as insertive UAI for circumcised men.
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The risks of HIV acquisition also vary by partner type, with studies reporting that UAI with causal partners is associated with higher HIV risk than UAI with regular partners, particularly with partners who are not known to be HIV-negative.\(^{81, 84, 134, 136, 137}\) Over one-third of men surveyed in the 2011 MGCPs reported UAI with a casual sex partner/s in the past six months, with a significant increasing trend in the frequency of this behaviour.\(^{130, 131}\) HIV-positive men with casual partners were twice as likely to report any UAI with casual sex partners, than HIV-negative men with casual sex partners. However, they were also more likely to disclose their HIV status before sex to any casual partners (80.5%) than HIV-negative men (52.4%).\(^{131}\)

There is increasing evidence in the literature that MSM are seeking out seroconcordant casual partners to reduce the risk of HIV transmission.\(^{138}\) Other reported strategies include ‘negotiated safety’, based on HIV positive men’s undetectable viral load,\(^{139-141}\) and ‘strategic positioning’, based on insertive/receptive position of the HIV positive partner.\(^{142}\) These risk reduction strategies rely on men being aware of their HIV status and the assumptions that men will disclose their status to sexual partners. In Australia, behavioural data suggests that increasing proportions of men are disclosing their HIV serostatus with casual partners, particularly HIV-positive men.\(^{138, 143}\) The effectiveness of risk reduction strategies in the context of undiagnosed HIV and testing frequency is discussed in more detail in the subsequent sections.

Multiple Sex Partners and Group Sex

Multiple sex partners or concurrency of sexual partners (overlapping sexual partnerships) has been identified as an important factor in determining the size of an HIV epidemic and the rate at which HIV spreads.\(^{142, 144-146}\) However, much of this evidence in relation to multiple and concurrent sex partners comes from studies of heterosexual networks, limiting its applicability to MSM populations.\(^{147-151}\)

In Australia, various studies have shown strong links between men reporting multiple sexual partners and increased HIV risk.\(^{108, 143, 152}\) Data from the GCPS show that the proportions of men reporting more than 10 male sex partners in the six months prior to survey has ranged from 26%-30%, fluctuating little over the past decade.\(^{94}\)

Group sex among MSM has been linked to increased HIV risk,\(^{43, 152, 153}\) and in Australia has been associated with the concept of ‘sexual adventurism’ referring to a range of ‘esoteric’ sex practices including fisting, group sex, rimming and the use of sex-on-premises venues (SOPVs).\(^{152}\)
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Recent Australian studies show substantial proportions of MSM report multiple sexual partners and group sex. In the recent ‘PASH Study’, among the 1590 men who reported sex with casual partners in the past six months, 42.3% reported group sex. HIV-positive men were much more likely to report engaging in sexual risk practices with causal partners, including group sex. In the Health in Men (HIM) cohort study of HIV-negative gay men in Sydney, during the most recent sexual encounters with casual partners, UAI events were significantly more likely to have involved group sex than were the events where condoms were used. Findings from TOMS, a cross-sectional study of gay men who engage in group sex, reported high rates (22.4%) of reported UAI with partners of unknown HIV serostatus.

Drug use

Recreational drug use has been implicated in risk behaviour and HIV acquisition. Several studies demonstrate associations between drugs used to heighten sexual arousal or prolong sex, including methamphetamines and amyl nitrate inhalants or ‘poppers’, and sexual risk practices among MSM.

In Australia, the use of illicit drugs and oral erectile dysfunction medications specifically to enhance sexual pleasure has been associated with risk behaviour among gay men. In the ‘PASH Study’, men who had ever engaged in UAIC were more likely to report illicit drug use, in particular the use of amyl nitrate. Similar associations between illicit drug use and group sex were revelled in TOMS, where half the sample reported using illicit drugs at their most recent group sex event. In the 2011 MGCP, 16% of respondents reported using ‘party drugs’ for sex and one in ten men reported engaging in group sex whilst using drugs or after drug use.

There are clear overlapping characteristics of men that report drug use and high-risk sexual behaviours. These men are at heightened risk for HIV and require specific, targeted HIV prevention messages.

Attending sex-on-premises-venues

Sex-on-premises-venues(SOPVs), otherwise known as sex clubs/bathhouses/saunas, have been linked with high risk behaviours such as UAIC and group sex; they provide a ‘risk environment’ for these sexual risk behaviours to take place and attract men that engage in high-risk behaviour.

In the 2011 MGCP, over a third of men reported meeting male sex partners at a gay sauna. Melbourne Victoria, a jurisdiction with the second largest gay population in Australia, has more
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SOPVs than other jurisdictions, with at least 10 in operation in 2007. Data from the ‘Seroconversion Study: Experiences of HIV’ revealed that almost two thirds (59%) of HIV positive men in the study reported having met sex partners at gay SOPVs.

Sex-on-premises-venues attract MSM who engage in high risk behaviours such as UAI with casual partners and group sex; accordingly, they may be an important venue to target HIV prevention or at least a point to reach these men with prevention messages.

Online Partners

The internet has become increasingly popular as a means for meeting sex partners. Online gay dating/chat sites offer anonymity, privacy, and easy access to a large number of potential sex partners. A number of studies have linked high-risk sexual behaviour, increased rates of STI transmission and using the internet to look for sex partners. A recent meta-analysis of online sex-seeking and sexual risk behaviour among MSM, reported that a substantial proportion of MSM use the internet to look for sex partners, and those who do are more likely to engage in unprotected sex.

Although their contribution to HIV and other STI transmission has not been reliably established in Australia, meeting sex partners through the internet and other new media is common among Australian MSM. In MGCPs in 2011, 40.0% of men reported having had sex with men they met through the internet and nearly a quarter (23.6%) said they had used a mobile application like Grindr to meet sex partners. In the ‘Seroconversion Study: Experiences of HIV’ almost three quarters of HIV positive men in the study reported using the internet to meet male sex partners during the six months prior to their HIV diagnosis. The ‘e-male survey’ reported that 70% of men had previously found a casual male sex partner online and 42% had met a ‘male fuck buddie’ online.

Much like SOPVs the internet provides a space for men who engage in high risk sexual practices to meet, however it also represents at an important opportunity to target and deliver HIV prevention messages to MSM. Over a quarter of the men from the ‘e-male survey’ reported that they have searched sexual health information online in the past week.

Knowledge, Attitudes & Perception of Risk

As described earlier, there has been a recent increase in sexual risk behaviours among MSM both internationally and in Australia. There has been much discussion and speculation with regards to the possible drivers of this trend. Age appears to be a factor associated with the
determination of HIV and STI risk among MSM. Data from the US has suggested that young gay men, particularly those found to have an undiagnosed infection, perceive themselves to be at low-risk for HIV despite reporting multiple partners and considerable exposure risks.\(^{80}\) Similarly, younger gay males in Australia have been shown to have lower levels of knowledge of HIV/STIs and report lower levels of testing for HIV/STIs than older men, despite similar rates of UAI.\(^{112}\) Individual risk perceptions are highly variable and how individuals make meaning of the risks they face is a complex process;\(^{170}\) therefore it is difficult to theorise why younger men may perceive themselves to be at lower-risk for HIV than older men.

Changing perceptions of the consequences of HIV infection has also been postulated as a factor contributing to changing risk perceptions among MSM. Australia data has revealed significant associations between risky sexual behaviour and optimism in relation to new HIV treatments.\(^{83}\) More recently, the “HIV Seroconversion Study”\(^{40}\) reported that among gay men who had recently seroconverted, the majority agreed that HIV was no longer a death sentence and is increasingly perceived as a manageable disease. However, when men were asked about their beliefs and attitudes about HIV treatments and transmission, most indicated that they did not agree that recent improvements to HIV treatment have reduced the likelihood of HIV transmission and made them less concerned about HIV.\(^{40}\) The majority of men in the ‘PASH’ study also indicated that they believed they were personally responsible for avoiding HIV and expected that both HIV-positive and HIV-negative men should always use condoms and disclose their HIV status.\(^{37}\) In contrast, recent seroconverters in the ‘PASH Study’\(^{37}\) indicated that they used condoms less often now because of HIV treatments, and that HIV treatments take the worry out of sex. Similar findings have been reported internationally,\(^{82,90,171-173}\) where men generally report agreeing with the belief that they 'perceive less HIV/AIDS threat' as a result of an ‘undetectable’ viral load.

Specific analysis of trends in seroconcordant UAIC and HIV disclosure to sex partners in the ‘HIM: Health in Men” cohort,\(^{44}\) showed that HIV positive men were more likely to report UAIC with causal partners than HIV-negative men, but were also more likely to disclose their status and engage in serosorting with seroconcordant partners.

The effectiveness of risk reduction strategies to reduce HIV transmission risk, including serosorting and negotiated safety, relies heavily on men’s assumed knowledge of their true HIV status and on the level of disclosure of HIV status between partners. A recent analysis of behavioural surveillance data revealed that a high proportion of both HIV-positive and HIV-negative men were serosorting based on an assumption that their sex partner was HIV seroconcordant; rather than actually disclosing their status.\(^{174}\)
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These results highlight the importance of MSM correctly understanding and perceiving their own risks and to undergo regular HIV testing enabling them to know their true HIV status.

Summary

Recent increases in sexual risk behaviour among MSM have been reported across developed counties, including Australia, and have been linked to increases in HIV transmission. A number of drivers of this change have been suggested, including changing-risk perceptions, the use of the internet for meeting sexual partners, optimism towards treatment, and the potential impact and effectiveness of risk reductions strategies.
HIV Prevention for MSM: Moving towards a ‘Combination Prevention’

Recently, the HIV sector has recognised the need for HIV prevention efforts to not only address immediate risk behaviours for HIV acquisition, but also to address the underlying causes of vulnerability to HIV.175 176 ‘Combination Prevention’— a combination of behavioural, structural, and biomedical approaches that are evidence based and framed within a human rights-based approach, appear to offer the best hope for successful prevention.128 177

Biomedical Approaches

With a HIV vaccine still not a reality178-180, a number of other biomedical approaches have been explored.181 To date, on an individual level, condoms use and male circumcision have provided clear evidence that they can reduce HIV risk among MSM.181 182 More recently, there has been much focus on the use of AR as means for prevention.183 184 These three approaches will be the focus of the next section.

Since the beginning of the HIV epidemic, condom use has been promoted as a key prevention measure for HIV transmission.181 185-188 Past studies have highlighted the importance of public health educational programs that support safe sex among HIV infected individuals,189 as key to maintaining the effectiveness of condom use to prevent HIV transmission. However, Australian data suggests that since the advent of ART statements regarding reduced risk of transmission associated with an ‘undetectable vial load’ (the “Swiss Statement”),190 MSM are increasingly negotiating condom use based on viral load status.191 In response and based on mathematical modelling looking at the potential impact of “Swiss Statement” to influence gay men to ‘relax’ their condom use,192 193 the Australasian Society for HIV Medicine along with other HIV peak bodies released a statement which did not support a reduction in condom use for MSM, ‘especially in the context of rising rates of STI’.194

Although there is evidence for the population-level effectiveness of circumcision in high HIV prevalence and heterosexual populations;182 195-197 evidence for its effectiveness in MSM populations is limited. A few observational trials198-201 and one cohort study,202 have provided inconclusive results. Recent reviews203 204 have concluded that male circumcision may be protective among MSM who practice primarily insertive anal sex but the role of male
circumcision overall in the prevention of HIV and other STIs among MSM remains to be determined. Similar findings were reported among the ‘HIM: Health in Men’ cohort; which concluded that overall, circumcision did not significantly reduce the risk of HIV infection; however, circumcision was associated with a significant reduction in HIV incidence among those participants who reported a preference for the insertive role in anal intercourse.\textsuperscript{202}

There has been a recent focus on the use of ART as a preventative measure.\textsuperscript{181} Post-exposure prophylaxis (PEP) involves a 28-day course of ART to HIV-negative individuals following occupational or non-occupational exposure to a person known to be HIV infected or where serostatus of the source is unknown.\textsuperscript{205} Reports on the effectiveness of PEP varies\textsuperscript{106, 184, 206} with recent data from Australia showing significant issues with tolerability, suboptimal adherence and costs which may have limited the use PEP among MSM.\textsuperscript{106} Similar findings have been reported internationally.\textsuperscript{207-210}

Recently the administration of ARVs to HIV-uninfected individuals prior to potential HIV exposure, usually targeting high risk individuals or partners of HIV positive patients, known as Pre-exposure prophylaxis (PrEP), has been suggested as a prevention tool.\textsuperscript{184, 211} As Weber et al. 2010 describes, “This concept represents a paradigm shift in the use of ART, targeting infectious individuals for prevention rather than protecting uninfected exposed populations.”\textsuperscript{184} Despite positive results from a recent multinational study, (iPrEx study)\textsuperscript{212} and the very recent FDA approval of Truvada as PrEP to at-risk MSM,\textsuperscript{213} the use of ART as a prophylaxis for MSM in Australia is likely to be some way off. A recent Australian study exploring the awareness of and willingness of MSM to participate in biomedical HIV prevention trials of rectal microbicides and PrEP, reported that many MSM had little experience and awareness of either interventions; only half reporting they would consider participation in trials using ARVs to prevent HIV infection.\textsuperscript{214}

**Behavioural Approaches**

There have been range of behavioural approaches adopted and interventions trialled to prevent HIV transmission among MSM. They are usually designed to reduce sexual risk behaviours through condom use or risk reduction strategies or promoting access to HIV testing and to treatment.\textsuperscript{215-217} These behavioural approaches include both individual and community-level interventions.\textsuperscript{215}

Recent reviews of individual-level, group-level, and community-level HIV behavioural interventions to reduce sexual risk behaviours among MSM have been shown to be effective; stronger effects have been observed for interventions that teach interpersonal communication skills (such as condom use negotiation), community-level delivery, and include a focus on
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younger populations.\textsuperscript{215-219} Intervention approaches vary, from social cognitive risk reduction interventions, such as one to one or group counselling sessions,\textsuperscript{220-222} to community-level interventions that include peer outreach, small group sessions, and media campaigns designed to diffuse safer sex messages throughout the gay community.\textsuperscript{223 224}

More recently following reports that HIV positive men were adopting risk reduction strategies such as serosorting,\textsuperscript{225-227} negotiated safety and strategic positioning,\textsuperscript{169 228 229}\textsuperscript{,} behavioural interventions to promote such strategies have emerged. However, the effectiveness of such strategies to reduce HIV risk is unclear, largely due to the issue of undiagnosed infections and what this may mean for correct HIV disclosure between sexual partners.\textsuperscript{169 230}

Mass media campaigns as community level interventions have been used as a prevention tool since the early stages of the HIV epidemic.\textsuperscript{231 232} Early campaigns were largely designed to raise awareness and improve knowledge and attitudes towards HIV, whereas more recently their focus is on behaviour change.\textsuperscript{233} Reviews of the effectiveness of such campaigns to prevent HIV have shown varied or weak results.\textsuperscript{231 234-236} In Australia, mass media campaigns have been a key part of the national response to HIV/AIDS since the beginning of the HIV epidemic,\textsuperscript{237-241} however, recent campaigns have shown limited impact on increasing testing rates.\textsuperscript{242} Often there are numerous barriers to rigorous evaluation of mass media campaigns, including the competing need to roll out campaigns quickly, especially in areas with growing epidemics, and the fact that many campaigns are delivered to an entire region or community and therefore do not allow a comparable control group.\textsuperscript{231 243} These barriers have contributed to the lack of rigorous evaluation of mass media campaigns and thus limited evidence for their success.\textsuperscript{243}

Over the past decade, consumer-focused social marketing campaigns have been adopted within the HIV/AIDS sector yielding positive outcomes for MSM.\textsuperscript{231 244-246} These campaigns use traditional marketing techniques to promote behaviour change, including consideration of exchange theory (perceived costs and benefits of change), audience segmentation (messages taking into account the target population’s attitudes, beliefs or behaviours), competition (behavioural options that compete with public health recommendations and services), and the ‘marketing mix’ (known as the four Ps: product, price, place, and promotion).\textsuperscript{247 248} Ensuring the effectiveness of future campaigns and strengthening the evidence base for large scale mass media campaigns remains an important step in helping support behavioural, biomedical and structural prevention strategies.

More recently, the utility of web-based interventions to reach high risk MSM and deliver interactive health promotion interventions has being realised.\textsuperscript{249 250}
A number of recent reviews of the effectiveness of web-based HIV prevention interventions\textsuperscript{249} have revealed a wide range of implementation strategies: outreach and counselling in chat rooms,\textsuperscript{251} online sexual risk assessments,\textsuperscript{253} access to home-based STI testing,\textsuperscript{252} partner notification services,\textsuperscript{255} provision of sexual health education\textsuperscript{257} and programs to promote behavioural risk reduction.\textsuperscript{259} These reviews also report a number of advantages that web based interventions offer over non-web based interventions: timely access to information/intervention, greater convenience for users, increased interactivity and engagement for users, ability to tailor interventions, reduced costs for providers (although initial development costs may be substantial, the costs of maintaining an intervention are marginal), increased user and provider control of the intervention and a level of anonymity afforded by the internet provides a way to reduce stigma and encourage access to interventions by isolated or marginalised groups.\textsuperscript{249} \textsuperscript{250}

MSM populations are increasingly using the internet to meet sex partners and to access health information.\textsuperscript{38} \textsuperscript{40} \textsuperscript{88} \textsuperscript{164} Web-based interventions provide a novel and effective way to deliver HIV prevention interventions.\textsuperscript{261} However, they are not without limitations, including difficulties in minimising attrition or measuring reach and dose. Inconsistent evaluation measures have meant that web-based interventions have shown limited success in terms of cost-effectiveness and their dissemination potential.\textsuperscript{262} \textsuperscript{264}

**Structural Approaches**

Structural approaches are directed primarily at addressing the underlying social, economic, political, and environmental factors associated with risk of HIV.\textsuperscript{265} For this reason, many challenges to the implementation of structural interventions have been reported, including, difficulties in change deeply engrained social and cultural factors such as gender inequality and stigma and discrimination.\textsuperscript{177} \textsuperscript{265} \textsuperscript{266} Often these underlying social, economic, political, and environmental factors are interrelated and require a multi-pronged approach; presenting further evaluation challenges.\textsuperscript{265}

The relationship between structural factors and HIV vulnerability can be complex and variable depending on the setting and population of interest. Focussing specifically on MSM populations, much of the data on structural factors and HIV vulnerability comes from developing regions where MSM face issues of economic (under)development and poverty; mobility, including migration, seasonal work, and social disruption due to war and political instability; and gender inequalities.\textsuperscript{266} \textsuperscript{267}
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In developed countries, structural factors facing MSM populations include, personal factors such as the lack of knowledge and skills; factors pertaining to the quality and coverage of services, such as geographic accessibility; cost/funding or training of staff; societal factors such as social and cultural norms, practices, beliefs; and, laws that stigmatise and discriminate act as barriers to HIV prevention messages and services.268

Australia has been recognised for its successful response to the HIV epidemic in the 1980s and 1990s, particularly for their prevention efforts among people who inject drugs.269 This early success has been largely attributed to supportive national-and state-level policies, the active involvement of affected communities, and the establishment of specific research centres to inform responses.270 Continuing to ensure access to HIV testing and counselling services along with adequate policies and approaches that empower gay men to protect themselves from HIV, remains an important goal for Australia. Specific structural issues in relation to high frequency testing among MSM in Australia will be explored more fully in the subsequent section.

Summary

HIV prevention efforts cannot succeed in the long term without addressing both individual behavioural and biomedical risks along with the underlying drivers of HIV risk and vulnerability. HIV prevention programmes therefore need to move towards more evidence-informed and interconnected approaches with an emphasis on a combination of complimentary strategies, including biomedical, behavioural and structural, to help reduce risk and increase testing.
HIV Testing and Treatment

From the evidence described in the previous sections, HIV prevention for MSM populations needs to focus on reducing the sexual risk practices of MSM and increasing access to testing. HIV testing in high-risk populations is an essential part of Australia’s HIV response. Regular HIV testing in risk populations provides those benefits to both, the individual, by providing timely commencement of ART among those testing positive, and the wider community, by providing opportunities for HIV infected individuals to modify sexual risk behaviours and prevent onward transmission.

This section focusses specifically on the issues of access to HIV testing for MSM in Australia. It begins with a description of Australia’s HIV testing polices and guidelines, then details the testing patterns of Australian MSM and describes direct and indirect barriers to HIV testing. Finally, some strategies to increase testing among MSM populations in Australia are suggested.

HIV testing policies and guidelines in Australia

Principles of HIV Testing in Australia

HIV testing in Australia is directed by the National HIV Testing Policy,271,272 governed by the Department of Health and Ageing, Australian Government, that outlines six basic principles that guide HIV testing, including:

- confidential voluntary testing with informed consent is fundamental to Australia’s HIV/AIDS response;
- testing is of the highest possible standard;
- testing is of benefit to the person being tested;
- testing is accessible to all those at risk of HIV infection;
- testing is critical to understanding the epidemiology of HIV infection in the community; and
- testing is critical to interruption of transmission.

The conventional method for HIV testing referred to in the 2006 National HIV Testing Policy generally involves pre-test counselling, phlebotomy, submission of a serum specimen to a central laboratory for screening with enzyme-linked immunoassay (EIA), and confirmation of repeatedly reactive EIA results with Western blot or immunofluorescence.
Recent changes to the HIV testing policy in 2011\textsuperscript{219} has seen the inclusion of Point-of-Care (PoC) testing and approval of the use of rapid/short incubation tests as a screening test for presumptive HIV infection; with clear restrictions on the use of such testing.

**HIV testing policy**

In the previous 2006 National HIV Testing Policy, the use of HIV rapid tests (referred to as short-incubation tests in the document) was limited to situations where:

- testing is conducted in, or backed up by, a clinical setting;
- testing is conducted under the auspice of a NATA/RCPA Medical Testing accredited laboratory;
- reliable TGA approved short-incubation tests are available;
- high quality information on the tests and their use is available and provided;
- the health worker performing the test is suitably trained in conducting and interpreting the test, and has the skills to provide pre and post-test information/discussion (if conducted outside an accredited laboratory); and
- quality assurance programmes are available to assure ongoing competency of healthcare workers performing the tests.

The availability and use of short-incubation tests (rapid tests) in clinical settings is:

- supported for the rapid identification of HIV-infected individuals to guide clinical decision making;
- in situations where there are difficulties with access to testing and returning for results (e.g. in rural areas or remote communities); and
- in the management of occupational and non-occupational exposure to blood or body fluids.

The use of short-incubation testing by practitioners before minor surgical procedures performed in non-hospital settings is not supported. There are a number of areas of HIV testing policy which appear ambiguous, which are likely to be barriers to TGA approving rapid HIV tests for use in urban clinical or non-clinical settings. For example, the policy states rapid HIV testing is supported:

‘in situations where there are difficulties with access to testing and returning for results (e.g. in rural areas or remote communities or for the Australian Defence Force when in the field).’.
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However for many men in both urban and rural areas there are structural barriers to accessing testing which mean that many men are unable to undergo HIV testing at a frequency recommended in clinical guidelines (these will be further explored in the following section). Depending on the interpretation of the policy, such a situation could be seen as satisfying the above condition and therefore warrant the implementation of rapid testing. The policy also states:

‘Short-incubation testing may also be considered for community-based testing interventions for ‘high risk’ and ‘in a clinical setting or backed up by a clinical setting’;

However no definitions or specific details are provided to allow the sector to appropriately interpret and act under these polices.

In 2011 the Australian Society for Sexual Health Medicine (ASHM) coordinated a revision of the National HIV Testing Policy. The 2011 National HIV Testing Policy included significant changes made to the 2006 Policy, including:

- Change in terminology from pre-test discussion to informed consent;
- Communication of an HIV negative test result;
- Provision of framework for PoC testing; and
- Web-based provision of policy allowing for regular revision and access to related resources (e.g. related policies, operational guidelines, evidence of best practice).

The 2011 policy provides clarity regarding the previously mentioned ambiguities about the provision of PoC tests, and recognises the extensive use of PoC tests internationally. It outlines how rapid/short incubation tests for PoC testing can be used for diagnostic purposes in clinical and non-clinical settings, but is not intended to replace conventional diagnostic testing or to be used for home/self-testing. All PoC testing must be accompanied by a reference test such as a Western blot and the policy clearly outlines steps for conveying the result in the context of point of care testing, such as dealing with indeterminate results and patients who do not return for a confirmatory test. This change in the policy allows rapid testing to be incorporated into both clinical and community-based settings in Australia; once a rapid test has been approved for use.

Regulation of HIV Testing

Therapeutic Goods Administration (TGA)

HIV tests are regulated and approved by the Therapeutic Goods Administration (TGA). TGA have sole regulatory responsibility (under the Therapeutic Goods Act, 1989) for the licensing of
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‘medical devices’, including ‘devices’ such as in-vitro diagnostic products (IVD), otherwise known as short-incubation tests. In licensing a testing device for use in Australia, the TGA limits who can provide tests of a particular class and where the test can be provided.

According to Therapeutic Goods (Medical Devices) Regulations 2002, testing may only be performed by a “health professional”. “Health professional” includes a person who is:

- A medical practitioner, a dentist or any other kind of health care worker registered under a law of a State or Territory; or
- A biomedical engineer, chiropractor, optometrist, orthodontist, osteopath, pharmacist, physiotherapist, podiatrist, prosthetics or rehabilitation engineer.

There are no specific constraints in the Therapeutic Goods (Medical Devices) Regulations 2002 that prohibit the entry of rapid HIV tests into the Australian Register of Therapeutic Goods (ARTG). Applications for inclusion of rapid HIV tests in the ARTG are subject to the same regulatory assessments as other HIV tests to ensure that they meet the required standards of safety and performance. The TGA is however able to put conditions on the entry of a device into the ARTG. In the case of HIV tests, these conditions have been applied in the past to reflect the intent of the National HIV Testing Policy.

To date, there are no rapid tests approved for screening or diagnosis of HIV; however there are currently two rapid POCTs being considered by the TGA.

HIV Testing - Clinical guidelines

The Surveillance and Prevention of Sexually Transmissible Infections in Gay Men Action Group (STIGMA) recommends testing for HIV and other STIs at least annually for all sexually active MSM in Australia, regardless of whether or not they have symptoms. The guidelines also recommend more frequent testing (3-6 monthly) for MSM reporting episodes of unprotected anal sex; more than 10 partners in the last six months; participating in group sex; or using recreational drugs. STIGMA recommends HIV positive MSM are tested three monthly for syphilis as part of their routine HIV monitoring, and people diagnosed with chlamydia and gonorrhoea should be retested at 3 months.

HIV testing trends of Australian MSM

Annual self-reported HIV testing rates among MSM in Australia are consistently high (60%-68%). Recent trends indicate that the proportion of HIV-negative MSM reporting HIV testing in the last 12 months has increased from 54% in 2000 to 60% in 2009. The 2011
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Melbourne Gay Community Periodic Survey (MG CPS)\textsuperscript{131} showed that over 90% of respondents had ‘ever’ been tested, while 71.2% reported having had a HIV test within the previous 12 months. Data from previous four surveys indicate no significant increases in the rate of overall annual HIV testing among MSM since 2001 with declines in number of men reporting ‘never’ tested (9.4%).\textsuperscript{131}

However in a recent national online survey of 3457 MSM in Australia (\textit{e-male survey}),\textsuperscript{38} 23.8% of respondents reported that they had never tested for HIV. Among men who had tested, 31.0% had not tested in the previous 12 months and 9.5% reported that their last test was more than four years ago.\textsuperscript{38} This sample of men was characteristically different from typical GCPS respondents. ‘\textit{e-male}’ participants were typically younger (about a quarter of the sample were aged under 25 years) more bisexually active (almost 20% identified as bisexual and 8% were living with a female partner), 40% were living in rural or regional areas and over a third reported not having gay friends or spending time with gay men.\textsuperscript{38}

Jin et al (2002)\textsuperscript{275} described predictors of recent HIV testing among gay men enrolled in behavioural surveillance surveys across Australia. While an overwhelming majority had ever tested for HIV, just over half had tested recently (in the last 12 months); and between 1996 and 2001 there was decline in recent HIV testing among MSM from 63% to 55%.\textsuperscript{275} Factors associated with recent testing included living in Sydney, younger age, being gay-identifying and gay community-attached, reporting UAI, higher numbers of sexual partners, and having a sexual partner that is HIV-positive. Testing levels were lowest among non gay-identified and non gay community-attached homosexual men.\textsuperscript{275}

More recent analysis of the national behavioural surveillance survey indicated that over the period 2003-2007 testing trends for both HIV and other STIs had stabilised. Among HIV-negative men between 60%-70% reported a HIV test within the last year, slighter higher for STI testing (65%-68%).\textsuperscript{276} Among HIV-positive men, STI testing within the last year was slightly higher again, between 80-85%.\textsuperscript{276} The self-report nature of testing data may also conceal actual HIV and other STI testing rates. A recent study\textsuperscript{277} assessing compliance with recommended HIV testing frequency guidelines among MSM attending primary care clinics in Melbourne, reported that re-testing rates at one year were as low as 35%. While among ‘higher risk’ MSM (those who reported two or more male anal or oral sexual partners in the past six months, attending SOPVs or using the internet to meet sexual partners in the last six months or unprotected anal sex in the past six months), a subgroup where HIV testing is recommended every 3-6 months, re-testing rates within six months were only 15%.\textsuperscript{277} Within the subgroup who reported 11 or more male sexual partners within the past six months re-testing rates within six months were 19%.\textsuperscript{277}
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This study found that independent predictors of HIV re-testing within six months in the higher-risk subset of MSM were reporting 11 or more male sexual partners in the last six months; being born overseas; and having a previous HIV test more than 12 months earlier.\(^{277}\) This analysis included only testing and repeat testing conducted at the individual clinics, so could not rule out repeat testing at other clinics. However, these results are lower than testing rates typically self-reported indicating that self-reported annual testing rates among MSM could be over-estimated.\(^{277}\)

These data highlight key characteristics among MSM that may affect testing rates and risk, and therefore may be useful for targeting of interventions, such as not identifying as gay or being gay-community attached.

**Testing patterns among those diagnosed with HIV**

A review of 2009 NSW HIV diagnoses data\(^{278}\) showed that, of newly diagnosed cases of HIV infection in MSM, 18% had never previously tested whilst only 29% reported having had an HIV test in the previous 12 months. Of newly diagnosed cases among MSM, 37% had evidence of recent infection (i.e. either a negative or indeterminate HIV antibody test or a seroconversion illness in the previous 12 months).\(^{278}\) In addition, 15% of MSM diagnosed were classified as late presenters and already had evidence of progressive disease at time of diagnosis (CD4 count <200 or an AIDS defining illness within three months of HIV diagnosis).\(^{278}\)

This data further demonstrates the potential inaccuracies in relying on self-reported annual testing rates from MSM and highlights the need to focus prevention efforts on increasing testing rates among this population.

Recent epidemic modelling in Australia by Wilson et al. (2009)\(^{73}\) concluded that broad population testing coverage and an increased frequency of testing to detect primary infections and undiagnosed infections is needed to reduce the impact of the HIV epidemic in Australia.\(^{73}\) To reduce HIV infection among MSM, additional effort is needed to decrease the number of men who are engaging in risk behaviours while increasing the number who have recently been tested for HIV.

**Benefits and Barriers to Testing**

**Benefits of HIV testing and treatment**

Increasing access to and the uptake of HIV testing and counselling is critical to decreasing the number of people who are unaware of their infection and remains one of the major challenges.
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Regular HIV testing allows early diagnosis and the provision of clinical care to MSM and timely diagnosis of HIV has clear benefits for both the individual and the population.

For the individual, early diagnosis enables ART to be initiated at an appropriate time point, greatly reducing mortality and morbidity for infected individuals.\(^{279-282}\) On the other hand, individuals diagnosed late with HIV have much poorer health outcomes\(^ {283}\) and attract much greater medical costs.\(^ {284}\)

Early diagnosis also offers important HIV prevention outcomes. Regular testing makes MSM aware of their correct HIV status, helping to reduce HIV infectivity through timely antiretroviral treatment.\(^ {285}\) It also presents clinicians with an opportunity to provide HIV prevention information to patients, and provides the individual with the opportunity to modify their sexual risk behaviours appropriately to prevent further transmission. A recent meta-analysis\(^ {286}\) showed the prevalence of high-risk sexual behaviour is reduced substantially after people became aware of their HIV infection. A number of systematic reviews\(^ {287,288}\) have also shown that testing in combination with pre-and post-test counselling reduces sexual risk behaviours among HIV-positive individuals. A recent meta-analysis of US studies,\(^ {289}\) reported that while HIV-diagnosed MSM protect partners during sexual activity, a sizeable percentage continued to engage in sexual risk practices placing others at risk for HIV infection and increasing their risk of co-infection with other sexually transmitted infections.

Several ecological studies have suggested that community viral loads can be used as a population-level biomarker for HIV transmission risk.\(^ {290-292}\) One study\(^ {290}\) showed a strong population-level association between increasing ART coverage, decreased viral load, and decreased number of new HIV diagnoses per year; supporting the secondary benefit of ART in reducing onward HIV transmission. Three recent studies in the US\(^ {293-295}\) have also shown that increases in earlier treatment and reduced time to virological suppression were associated with reductions in community viral load and was correlated with decreases in newly diagnosed and reported HIV cases. In contrast, two population level studies\(^ {296,297}\) examining the association between taking ART and HIV incidence, found that any benefit of reduced infectivity of those on ART is outweighed by increasing risk of transmission due to sexual risk behaviour. A number of virological studies have documented HIV persistence in semen among men on stable ART with undetectable viral loads,\(^ {298-300}\) which may result in continued shedding of HIV in semen due continued high risk sexual behaviour and high prevalence of STIs and genital inflammation.\(^ {301,302}\)

Further ecological evidence comes from a several recent ecological studies that showed a strong population-level association between increasing ART coverage, decreasing community viral load, and a decrease in the number of new HIV diagnoses.\(^ {290-292}\) Three recent studies in the
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US,²⁹³⁻²⁹⁵ have also shown that increases in earlier treatment and reduce time to virological suppression, have been associated with reductions in the community viral load and correlates with decreased newly diagnosed and reported HIV cases.

Researchers and public health officials in many countries are now calling for mass testing and expanded treatment coverage and modifications to treatment guidelines to start patients on ARVs as soon as they are diagnosed (‘test and treat’).¹³³⁻³⁰⁵ Recent data from observational studies of discordant heterosexual couples where the index partner was treated with ART has provided further evidence supporting the prevention effect of access to testing and early treatment.³⁰⁶⁻³⁰⁷ However for MSM populations, it remains unclear whether increasing coverage of ART can reduce HIV incidence on a population-level when faced with increasing sexual risk behaviour and high rates of undiagnosed HIV infection.

Barriers to Testing

As reported previously, a recent study of HIV testing frequency among MSM attending primary care clinics showed low proportions of MSM adhering to recommended testing guidelines.²⁷⁷ Given these data and the implications of undiagnosed HIV for transmission, it is important to look at the barriers that men face in accessing testing.

Several barriers at the individual, provider and structural levels restrict uptake of HIV testing by MSM. Internationally, a number of studies in developed countries have reported barriers to testing.³⁰⁸⁻³⁰⁹ ⁷⁶⁻³¹⁰ Low perceptions of risk are one of the most commonly reported barriers to testing and are dependent on individuals’ beliefs, attitudes and ability to assess risk. Others common barriers included structural level barriers such as fear of the negative social consequences of a positive diagnosis (stigma, discrimination, rejection), fear of stigma and negative response from healthcare providers; and lack of information about where to get tested.³⁰⁸⁻³⁰⁹

Barriers to HIV testing at the provider level may contribute to missed opportunities to test and hinder efforts to increase HIV testing. Barriers reported largely consist of discomfort when approaching the subject of HIV with patients, lack of training and competence in conducting HIV testing, lack of knowledge on the part of healthcare providers about HIV (prevalence, symptoms, testing policies), and logistical barriers such as cost and time constraints and cumbersome consent procedures.³¹¹⁻³¹²

In Australia, a recent online study (PASH)³⁷ of 2306 Australian gay men reported that 15.2% of men had never been tested for HIV and most of these men who had never been tested believed they were HIV-negative (97.7%). Among men who had never been tested (n=351), by far the
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most common reason given for not having previously tested was the belief that they were at low risk for HIV (60.7%), with nearly half (41.9%) also indicating that they were unsure where to get tested. Other barriers to testing identified by participants that had never been tested included:\(^{37}\):

- difficulties in getting an appointment;
- fear of finding out they have HIV and having to let other people know;
- not wanting to be seen at a sexual health centre;
- difficulties finding a gay-friendly doctor;
- concern about stigma;
- not trusting doctors' confidentiality;
- doctors not bulk billing and associated testing costs; and
- preferring not to know their HIV status.

These men indicated that they would be more likely test if they were being able to obtain a test result at the time of specimen collection (rather than having to return for a follow up appointment to collect test results)(65%), had the availability of home testing (64%), if testing was provided at greater convenience (50%), if they did not need to see a doctor (37%), and if they could test at gay venues (14%).\(^{37}\) The study results indicated the acceptability of rapid tests would not be a barrier to testing among gay men in Australia.

Recent studies that examined the barriers to testing have also reported on the acceptability of rapid testing among gay men in Australia. A study at the Melbourne Sexual Health Centre of 172 community-recruited MSM reported that 64% indicated a preference for rapid oral HIV testing and 74% indicated that if rapid oral HIV testing was available at a clinic they would test for HIV more frequently.\(^{313}\) Support for home-testing was also high among this sample.\(^{313}\)

A recent analysis of data from 1770 HIV-negative and untested MSM participating in a national online survey\(^{314}\) compared men who had never tested for HIV with those who had tested over 12 months ago and those that had tested in the past year. Compared with men tested over 12 months ago, untested men were younger, less educated, less likely to have unprotected anal intercourse with a regular male partner, less likely to have sought advice from a doctor, nurse or community organisation, more likely to expect HIV-negative disclosure, had fewer gay friends and spent more time using social networking sites.

These findings suggest a need to reach younger less –gay community attached men, and that the internet and sex education in schools may be important ways to promote HIV testing to untested MSM.
Where men are getting tested

In Victoria, around one third of MSM diagnosed with HIV/STIs annually have their testing conducted by GPs in ‘low case load’ clinics,\(^{315}\) while ~50% of all HIV cases in Victoria between 2007-2010 were diagnosed at three metropolitan high caseload MSM sexual health clinics.\(^{34}\)

A recent study of 354 randomly selected Victorian GPs indicate that MSM being tested at these clinics may be receiving sub-optimal care and testing frequency in light of findings that showed poor HIV/STI knowledge and practices in this cohort.\(^{316}\) The authors found that:

- although GPs had some knowledge of the primary risk populations for HIV, GPs generally underestimated the prevalence of HIV among MSM and awareness of the increasing notifications of HIV and syphilis among MSM was limited;
- sexual history taking from MSM was limited, with common barriers to sexual history taking including limited time, inadequate training and discomfort/embarrassment on behalf of the GP and perceived on behalf of the patient;
- the thoroughness of the GP HIV risk assessment was often inadequate; and,
- routine and comprehensive HIV and other STI screening was limited and often only done when prompted by the patient.

The study demonstrated that GPs knowledge of current HIV/STI epidemiology was limited and that current clinical practices would likely lead to missed opportunities for sexual health assessments and HIV/STI testing of MSM and other risk populations.

Western Australia’s HIV epidemic varies somewhat from the rest of the country, with lower and declining proportions of MSM transmissions and greater and increasing proportions of heterosexual transmissions compared to other jurisdictions in Australia. Western Australia currently has two sexual health clinics in Perth, based at the Royal Perth Hospital (RPH) and the Freemantle Hospital. These clinics employ three fulltime equivalent (FTE) sexual health physicians, 2.5 FTE nurses providing screening, and one nurse providing counselling and contact tracing services.\(^{317}^{318}\) There are relatively few gay-friendly GPs in Perth. In Western Australia, the Western Australian AIDS Council (WAAC) operates three separate urban peer–based sexual health services in Perth. The services are funded by the WA government and include a fixed–site clinic at the WAAC service, the M Clinic that operates out of a small medical facility in inner Perth and the Sauna Sexual Heath Service, an outreach service located at an inner city Sauna designed to service MSM populations specifically.\(^{317}^{318}\) These three services work in combination (patients attending one service are allowed to attend follow-up appointments at any of the other two services) to provide confidential HIV and STI testing and treatment services for MSM, and offer a wide range of opening hours. A peer-based model is utilised at all services,
which combines peer-educators (usually gay males), and physicians/nurses at each site. Peer educators are primarily responsible for providing risk-assessment and pre and post-test counselling, while the physician/nurses provide testing, treatment and referral. All staff are trained and given ongoing training and supervision. Over the period Jan 2007 - Oct 2010 there were a total of 6,720 STI tests conducted over all three sites. HIV positivity rates ranged from 0.9% – 1.2% and STI positivity results ranged from 1.7% - 10.4%.\textsuperscript{317,318} During 2007–2009, there were 543 occasions of service provided in the sauna service of which 131 (34.1%) were contacts with new clients. Qualitative evaluation questionnaires of clients attending the services found that the peer based community and outreach testing was acceptable to clients. Clients described how the peer based model helped to normalise stigmatised sexualities, provided a space where men could speak freely without having to explain themselves or their relationships, provided restorative benefits of empathy from someone who could understand their situation, and empowered them to expect and ask for appropriate services in the future.\textsuperscript{317,318}

This data, alongside previously reported barriers, highlights the importance of gay friendly sites, the potential need for additional training for health care providers, the acceptability of non-clinic based testing models, and the need to promote services to enhance testing opportunities among MSM.

**Strategies for Improving HIV testing**

Many strategies have been suggested for increasing the uptake of HIV testing.

There is a strong history of mass media campaigns for raising awareness of HIV/STIs and increases HIV testing.\textsuperscript{231,235,319} A Cochrane systematic review of mass media interventions for promoting HIV testing provides strong evidence for the short term effects on the promotion of HIV testing; though effects were mostly not sustained long-term.\textsuperscript{225} While a more recent Cochrane review assessing the impact of social marketing interventions on HIV/STI testing uptake concluded there is limited evidence that multi-media social marketing campaigns can promote HIV testing among MSM in developed countries. The authors did however suggest that a lack of rigorous evaluation study designs prohibited conclusive results and advocated for more rigorous evaluation designs, including long-term impact evaluations and detailed process evaluations, to identify elements of social marketing interventions that are most effective in reaching the target population and changing behaviours.\textsuperscript{245}

In Australia, previous mass media campaigns have shown limited success in increasing testing.\textsuperscript{242} However, a recent evaluation of the National ‘Drama Downunder’ STI campaign targeting gay
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men\textsuperscript{320} demonstrated improved HIV and other STI testing rates throughout the campaign implementation. This is a topic of two of the papers included in this thesis.

Alterative models of testing, as opposed to conventional clinic based testing, such as community-based,\textsuperscript{321} \textsuperscript{322} or outreach testing services,\textsuperscript{323} \textsuperscript{324} have also been proposed to improve testing rates among MSM, as has the provision of rapid testing within such services. Community models of HIV testing for MSM, often using HIV rapid tests, have been utilised widely in the US\textsuperscript{324} and throughout Europe\textsuperscript{325} for over 10 years with the goal of increasing opportunities for people at risk of HIV who may not otherwise have contact with healthcare services. The Centers for Disease Control and Prevention (CDC) in the US recommends that community-based organisations (CBOs) test all at-risk clients;\textsuperscript{326} similarly, the UK National Institute for Health and Clinical Excellence (NICE) has recently recommended delivering HIV testing through outreach services and the provision of rapid point-of-care tests to help increase the uptake of HIV testing to reduce undiagnosed infection and prevent ongoing transmission.\textsuperscript{327} Despite their reported association with risky sex practices and potentially with HIV and other STI transmission, SOPVs are also increasingly being realised as locations to target or reach high-risk or ‘hard-to-reach’ gay men with prevention interventions to reduce risk practices and increase access to testing.\textsuperscript{328} \textsuperscript{332}

Recent technical advances in rapid HIV testing provide a potentially valuable alternative to current testing models. Advantages of rapid testing include: the specimen collection process being non-invasive; results being available within 30 minutes of specimen collection enabling clients to be given their result at that visit; the testing can be undertaken almost anywhere including by non-laboratory operators in non-clinical settings; and attendees only being required to return for a follow up visit if their rapid test is ‘preliminary positive’, which accounts for a small proportion of individuals being tested.\textsuperscript{9} \textsuperscript{333} \textsuperscript{335} Recent reports from laboratories that have implemented fourth-generation assays as screening tests indicate that detection of infected individuals in the seroconversion window period increased, and that these assays enhanced the surveillance of HIV, even in low prevalence areas.\textsuperscript{11} \textsuperscript{336} \textsuperscript{337} A number of studies have also demonstrated positive outcomes of rapid testing at community-based sites;\textsuperscript{338} \textsuperscript{344} yet to date no systematic review of such data exists. Currently there are three trials underway or in planning in Australia that are assessing various outcomes associated with rapid HIV testing in clinical settings, including acceptability, cost-effectiveness and the effect on testing rates.\textsuperscript{345}

Simplifying testing procedures such as less burdensome consent processes and alternatives to pre- and post-test counselling have also been trialled to improve the uptake of HIV testing. Offering verbal consent\textsuperscript{346} and implementing opt-out testing\textsuperscript{347} has been associated with an
increase in HIV testing; while a number of studies have also utilised various approaches for streamlining procedures for communicating results of tests back to clients over the phone or in the post.  

A range of strategies will be required to increase the frequency of HIV testing in high risk MSM in Australia. To encourage frequent testing, greater awareness about the need for more frequent testing through health promotion should be considered, including enhancing men’s awareness of personal risk behaviours in driving testing frequency and the importance of timely diagnosis and treatment for preventing onward transmission. Optimising clinical systems should also be explored. Utilising nurses or peer-educators for testing or using recall systems and electronic prompts to encourage more frequent testing patterns have also been explored both internationally and in Australia. The use of new technologies, including text messaging and computer based-technology have shown positive results in improving clinic attendance and short-term behavioural outcomes. For men who have never tested, it may be worth exploring other alternative testing models in Australia such as community-based sites and the introduction of HIV rapid testing. Unlike many other countries including the U.S, UK, Spain, and New Zealand, Australia does not offer rapid testing as part of HIV screening despite increasing evidence of strong consumer and provider support for this form of testing.

Summary

Encouraging regular HIV and other STI testing is a central part of Australia’s HIV prevention response. Yet, there are several indicators that suggest HIV testing frequency in Australia may be inadequate to reduce the recent increases in HIV diagnoses.

Although, the proportion of Australian MSM that self-report testing for HIV at least once per year appears to be relatively high among selected samples of MSM, there is some evidence to suggest that self-reported and actual testing frequencies may be discrepant. In light of annual HIV testing being recommended as the minimum testing frequency for any sexually active gay man in Australia, meaningful proportions of at-risk MSM appear to be not complying with this recommendation.

Of greater concern is the low reported rate of six-monthly or more frequent testing reported among MSM classified as ‘high-risk’. Given what we know about the impact of undiagnosed infections and primary HIV infection on the continuing HIV epidemic, there is a need to improve testing rates of MSM, particularly those at high risk as outlined in the current STI testing guidelines for MSM. In this light it is perhaps of most importance to understand and respond to
the reasons why MSM are not testing as frequently as recommended. What is clear in the literature is barriers associated with current testing models in Australia are contributing to suboptimal testing rates. Factors such as difficulty in obtaining clinic appointments trust in testing practitioners, cost, convenience and timeliness of test results have been cited as important barriers to testing. These data underpin the concern that MSM in Australia are not being tested frequently enough. Many of these barriers would be reduced if models for HIV testing included rapid testing provided to MSM in community settings.
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Sexual Health Promotion and Evaluation

Health promotion is a central part of programs that aim to effect behaviour change to promote health and wellbeing. As health promotion approaches have evolved, a greater understanding of the complexity of health promotion activities and the corresponding need for more advanced and effective evaluation measures has arisen.

There is a large body of evidence to suggest that health promotion campaigns are an effective prevention strategy for HIV prevention. However, as HIV prevention moves toward more interconnected complimentary strategies (biomedical, risk reduction, testing and condom reinforcement) there has been increased scrutiny of the effectiveness of HIV prevention health promotion strategies focussed on behaviour change and a push to develop more robust evaluations to appropriately assess complex interventions.

A number of key elements have been identified among health promotion interventions that have been shown to be successful in impacting on behaviour change. These include: well designed and carefully planned interventions that have a clear theoretical framework; a strong evidence base; targeted approaches that have been pilot tested to assess feasibility; and clearly defined long-term goals and objectives that are measurable by conventional means. Some of these components will be discussed in greater detail in the following section, however, to help guide the discussion on effective evaluation strategies for health promotion interventions, a basic understanding of the key theoretical frameworks and models that relate to HIV prevention will be covered here.

Theoretical frameworks

Identifying and developing appropriate theoretical frameworks for interventions is often a difficult process, with competing or overlapping theories that may be relevant to the planned intervention. However, developing an intervention-specific theory will help provide an understanding of the process of change that may take place within interventions and the contextual or external factors that may impact on the interventions success. Furthermore, a sound theoretical approach will help guide an effective evaluation by providing a framework to understand individuals’ behaviours and identify weak links in the causal pathway between exposure to health promotion and behaviour change that can then be addressed to improve health promotion effectiveness. There is growing evidence to suggest that interventions...
that are developed and grounded in a strong theoretical framework are more effective than those lacking a theoretical basis. Furthermore, interventions that combine multiple theories may have enhanced impact.\textsuperscript{363, 367, 368}

This section briefly outlines some of the behaviour change theories/models most relevant to HIV prevention among MSM; a) the Health Belief Model, b) the Theory of Reasoned Action and Planned Behaviour, c) the Stages of Change Model/Transtheoretical Model for individual-level behaviour change, d) the Social Cognitive Theory for interpersonal-level behaviour change and e) the Diffusion of Innovations theory for community-level behaviour change. This section will also briefly describe some relevant communication models; Message Effect Theories, Social Marketing and Edutainment.

**Behaviour Change Theories**

**Health Belief Model**

Health Belief Model\textsuperscript{369, 370} was one of the first theories of health behaviour developed in the 1950s’ and proposes that people's beliefs about their risk to a particular health problem/condition, and their perceptions of the benefits of taking action to avoid it, influence their readiness to take action. The beliefs that predict whether individuals will act\textsuperscript{371} include:

- **Perceived Susceptibility**: Individuals’ belief of their vulnerability to a particular health problem, such as MSM reflecting on their own risk behaviours;
- **Perceived Severity**: Individuals’ belief about the severity of the threat posed by a health problem, such as perceived consequences of HIV, a factor that may have diminished over time, particularly since the introduction of combination ART;
- **Perceived Benefits**: Individuals’ belief that there is a course of action that will reduce their susceptibility or minimise the consequences, such as MSM understanding of the benefits of condom use and the suite of other risk reduction practices; and
- **Perceived Barriers**: Individuals’ belief that the benefits gained from taking action will outweigh the costs or barriers, such as that the inconvenience and time taken to be regularly tested providing real and tangible benefits.

This theory suggests that change occurs when people perceive themselves at risk or feel threatened by a health problem and believe that adopting a new protective behaviour will outweigh the perceived costs. However it does not take into consideration potential underlying causes of current behaviours, such as lack of access to services or monetary costs associated with adopting new behaviours (e.g. condoms, testing).\textsuperscript{370} This model has been found to be most
effective for preventative behaviours such as screening and immunisations; and therefore may be suitable for campaigns aiming to increase testing patterns.371

**Theory of Reasoned Action and Planned Behaviour**

The Theory of Reasoned Action and Planned Behaviour,372 originally based on the Theory of Reasoned Action;373 aimed to better understand the relationship between ‘voluntary’ behaviour and attitudes. Over time this theory has developed to include understandings of less voluntary behaviours and takes into account the relationships between beliefs, attitudes and intentions.374 The theory proposes that the joint influence of beliefs, attitudes and intentions and perceived control in affecting behavioural intention are the drivers of behaviour. The theory operates under the assumption that ‘intention’ to act is the most immediate determinant of behaviour and proposes that ‘intention’ to perform a behaviour is a function of attitudes towards the behaviours and perceived beliefs or normative pressure for or against it. The model also assumes all other external factors (e.g. environment, demographics, and socio-economic status) operate through the models constructs and do not have an independent influence on the likelihood that a person will behave a certain way. Campaigns may want to highlight the short-term and negative consequences of not getting regular testing; such as untreated asymptomatic STIs and potential to transmit to others, to help trigger men’s intent to get tested. Recently this model has been used in behavioural risk reduction campaigns, including HIV prevention condom use campaigns.376

**Social Cognitive Theory**

Social Cognitive Theory377 has evolved from social learning theory and centres around a notion of ‘reciprocal determinism’,378 that aims to describe the iterative and ongoing process in which **individual** and **environmental** factors and **human behaviour** influence each other. The theory describes how a range of personal cognitive factors may impact on the likelihood that a person will change a health behaviour, including, self-efficacy, observational learning or modelling, and outcome expectancies.379 Distinct from other behavioural models, this theory emphasises the role of an individual’s own experiences and observations of others and the results of their actions on personal behaviour. It uses four concepts that can be used to guide programme development and behavioural interventions at an interpersonal level: **reciprocal determinism**, **behavioural capability**, **outcome expectations** and **self-efficacy**.379 Social Cognitive Theory has been a popular model for health promotion as it provides comprehensive approach to health promotion and aims to address the underlying determinants of health which often impact on individuals’ ability to act.371 Campaign developers may want to target healthcare providers to
help make services more acceptable for gay men using education campaigns aimed at reducing stigma and discrimination within testing services.

**Transtheoretical/Stages of Change theory**

Stages of Change theory deals with intentional behavioural change and discusses individuals' motivation and readiness to change, describing change as a process rather than an event that is characterised by a series of stages of change. The model’s basic premise is that behaviour change is a process, not an event and has two dimensions; the different stages of change themselves and the process of change relevant to each different stages.

The five basic stages of change include:

- **Pre-contemplation**: Individuals who are not considering change or not consciously intending to change;
- **Contemplation**: Individuals who are considering making a change;
- **Preparation (or Determination)**: Individuals who are determined to change and make a committee to change and begin to prepare for change;
- **Action**: The stage where individuals make the change - initial behaviour change; and
- **Maintenance**: Sustaining the change and achieving the desired health outcomes.

The model describes how people attempting to change behaviour typically cycle through these stages of change. A sixth stage of **termination** has been identified for some behaviours, including addictive behaviours, representing a stage where individuals no longer have the temptation for relapse or to cycle through the stages due to high self-efficacy. This model has been applied to a variety of individual behaviours, as well as to organizational change, and provides a more circular system, where individuals can enter at any stage and can jump stages. This theory suggests that campaigns should be designed to trigger contemplation about the health problem and the specific kind of desirable action that would then help move them up through the stages of change; for example, increasing awareness of individuals vulnerability to HIV infection.

Theories of interpersonal/individual behaviour change largely anticipate changes in behaviour occurring over a period of time. These changes are dependent upon a range of factors including the urgency or importance of the health problem, the cultural and social context of the behaviour and the target population, the personal importance of behaviour change messages, and the scope and strength of message effort.
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**Diffusion of Innovations**

Diffusion of innovations theory focuses on changing communities and encouraging communal action in response to a health problem. It describes the process by which an ‘innovation’, idea, product, or social practice, is communicated through certain channels and spreads through social systems/society. This theory has been used for the systematic study of the adoption of a wide range of behaviours (e.g. condoms use, high risk behaviours). Integral to the diffusion process is the recognition of the ‘innovation’ as new or novel. Diffusion of innovation concepts that are most relevant to HIV prevention have been identified as:

- **Communication Channel**: the means by which a message is transmitted from one person to another;
- **The innovative-decision process**: the stages of diffusion that individuals may pass through; awareness, knowledge, persuasion, adoption, and implementation;
- **Rate of Adoption**: how quickly the innovation will spread;
- **Homophily**: the extent to which people perceive that they are similar to others and so associate and bond with them, will help to determine the rate of adoption;
- **Attribute**: The characteristic of the innovation that people perceive as beneficial/harmful;
- **Adopter categories**: The classification of groups of people based on the relative time it takes for them to adopt the innovation; and
- **Opinion Leaders/Change agents**: People who are respected within communities for their knowledge, reputation or standing and are most likely to influence change.

These elements will depend on a number of variables including, the size, age and socio-economic status of the relevant communities and the level of exposure to media. For a campaign that was aiming to increase uptake of rapid testing among MSM populations, it would be important to identify key change agents (e.g. health care providers, policymakers), early adopters (e.g. young gay men, frequent testers) and use multiple communication channels to ensure adequate coverage of the target audience.

**Communication Models/Techniques**

Also important to the effectiveness of health promotion interventions, particularly mass media campaigns, is the process by which messages are communicated or delivered to the target audience. A detailed review of communication models and techniques is beyond the scope of this thesis. This section will describe briefly the most pertinent to this thesis; Social Marketing, Message Affect Theories and Edutainment.
Social Marketing

Social Marketing is the process of using traditional marketing techniques to promote behavior change for the benefit of both the target audience and society. Social Marketing has been adopted widely within the HIV/AIDS sector. Social marketing has been described not as a theory (despite sharing many elements of the theories described earlier), but more as an approach to promoting health behaviour that focuses specially on behaviour change, not awareness or attitude change, and places the target audience at the centre of the process and assuming the primary role.

Key elements used in social marketing campaigns include:

- **Consumer & Behaviours orientated**: The focus always on the consumer and specially focused on influencing behaviour - this is usually framed around consumer wants and needs;

- **Notion of Exchange**: Influencing behaviour by reinforcing the benefits of change and recognising the costs/consequences associated with that behaviour change;

- **Audience segmentation**: Differentiating target populations into subgroups based on similar wants, needs, lifestyles, beliefs, attitudes or behaviours and targeting messages to these groups;

- **Competition & Positioning**: Understanding the market and the behavioural options that compete with public health recommendations and services, and ensuring that an organisation’s product takes a distinctive place in the consumers mind to increase attractiveness to consumers; and

- **Marketing mix**: The balance between the four Ps:
  - **Product** - the set of benefits associated with the desired behaviour;
  - **Price** - the costs or sacrifice (monetary and non-monetary) exchange for the desired behaviour;
  - **Place** – channels/locations where the product is promoted and supported; and
  - **Promotion** – How information about the product, price, places and their benefits are communicated to consumers.

Another important element to social marketing is consumer research which ideally should be undertaken throughout the various stages of planning and implementation, including the formative stages. Consumer research helps to understand consumers’ attitudes, values, needs and wants that may be barriers to campaign acceptability, and takes into account elements of the surrounding environment that can impact on behaviour. In addition to these formative and process aspects of campaign development and delivery, continual monitoring and
evaluation of campaigns is important for assessing campaign strengths and weaknesses and for measuring impact.247

**Message Effect Theories**

Message effect theories examine and predict how the format and content of messages affect cognitive, attitudinal, emotional and behavioural responses.389 There are a number of message effects theories, including:

- **Fear appeals:** Examines the use of threatening messages to emphasise the physical and social consequences of continuing unhealthy behaviours and have utility in emphasising the severity of the consequences of behaviour.391 392 While fear based campaigns have been used during the HIV/AIDS epidemic, the effectiveness of such campaigns has been inconclusive;393 394

- **Message framing:** Examines the way in which information is presented to individuals; using ‘gain-framed’ messages to emphasise the benefits gained from adopting a health behaviour, and using ‘loss-framed’ messages to emphasise the costs of not adopting a particular behaviour.395 396 Message framing has shown some utility for HIV prevention with positive outcomes seen in areas such as increases in HIV testing;397 398 and

- **Message Tailoring:** The process of creating individualised communications, where data about an individual (rather than an group) and their related health behaviour is used to determine the most appropriate messaging strategy. Message tailoring aims to meet an individual’s needs and thus enhance the individual relevance of health information to increase the likelihood of message engagement and behaviour change.399 400 Tailoring has been used extensively for behavioural HIV prevention purposes with positive results.368 401 402

**Edutainment**

Entertainment-education or ‘Edutainment’, is the process of purposely designing and implementing a media message that both entertains and educates, with the explicit intention of increasing the audience’s knowledge, influencing their attitudes, or changing their behaviour regarding a particular issue.403 Having been first applied unintentionally in a Mexican television show, ‘Edutainment’ has been recently adopted for HIV prevention on television and radio.404-407 The general purpose of entertainment-education programs are to contribute to social change through the use of drama and entertainment for educational purposes. From an entertainment perspective it is important to engage users and maintain their interests to ensure they are exposed to the health promotion messages, while from an educational perspective, the
credibility and relevance of the health messages provided is crucial to acceptance by the target audience.

Singhal et al. (1999)\textsuperscript{403} have identified six factors that determine the effectiveness of entertainment-education, including audience characteristics, organisational factors, the media environment, audience research, program-specific factors, and infrastructural factors. One successful example of edutainment has been ‘Soul City’ in South Africa,\textsuperscript{408} an intervention that combines the production of TV and radio drama series targeting young people with a range of health messages including women’s and children’s rights, HIV/AIDS, TB, and housing. The TV/radio series is supported by an extensive distribution of print materials through newspapers and schools which has enabled the series to achieve high reach and awareness among the target audience. In 1999, the fourth television series of ‘Soul City’ reached 16.2 million South Africans and 79% were aged 16-24 years.\textsuperscript{406,409} Evaluation findings have revealed increased condom use among individual exposed to three or more episodes compared those how had not seen any episodes.\textsuperscript{409} Recently the ‘Soul City’ model has been expanded and adapted to a number of other African countries, including Zambia, Mozambique, Namibia, Malawi and Zimbabwe.\textsuperscript{409}

**Health Promotion Evaluation Approaches**

Within the HIV/AIDS sector, a new understanding of the importance of addressing not only individual behavioural and biomedical risks but the underlying drivers of HIV risk and vulnerability has led to the development of complex and multifaceted prevention interventions (multi-component, multi-location, multi-level).\textsuperscript{362} The rise of these interventions has resulted in the need to evolve strategies to ensure well-designed and rigorous evaluations.\textsuperscript{410-414}

Although many different evaluation structures exits, three main stages of evaluation are well established and should be considered in the evaluation of any health promotion project. These stages are:

- **Formative evaluation** that guides and informs the development and implementation of the project and usually occurs in the development phase. Formative evaluation usually involves key stakeholders and members of the target audience, and aims to determine an interventions acceptability and appeal;\textsuperscript{415}

- **Process evaluation** that aims to evaluate the implementation of the project, including key components of delivery, reach, exposure, and context. Process evaluation usually involves project staff documenting the process of intervention implementation to
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identify areas that can be improved or those that were key to the interventions success, and

- Impact/outcome evaluation that aims to evaluate the short-term impact and long term outcomes of the intervention. Impact/outcome evaluation usually involves an assessment of the intervention’s effect in relation to its aims. Impact/outcome evaluation also tries to demonstrate some association between the intervention and the outcome to reduce the possibility that the observed outcomes were due to chance or other contributing factors.

In 2000, the British Medical Research Council (MRC UK) released a ‘Framework for design and evaluation of complex interventions to improve health’, which has been widely adopted by health practitioners; however this framework has recently received criticism regarding its limited emphasis on non-randomised controlled trials and on the importance of process evaluations. Since 2000, several revised frameworks, criteria and guidelines have been released to provide additional guidance for the development and evaluation of complex interventions in healthcare.

These frameworks largely describe the importance of understanding the intervention components, and their theoretical foundations, and choosing an appropriate evaluation design. An array of evaluation designs is available to health practitioners, categorised into two groups: experimental and non-experimental approaches.

Experimental approaches include individual randomised controlled trials (RCTs), cluster RCTs, stepped wedge designs, preference trials, randomised consent designs and N-of-1 designs. RCTs are considered the gold standard for impact/outcome evaluations as they are the most robust method of preventing selection bias. They involve individuals or groups of people being randomly allocated to intervention or a control and followed over time. Differences in key indicators between the two groups are used to assess intervention impact. However, RTCs are often expensive, resource intensive and require a suitable invention (acceptability of experimentation) and comparative control groups.

Quasi-experimental or non-experimental (observational) designs offer strategies for evaluating interventions where an experimental approach is not feasible. For example, an intervention or its consequences may be irreversible, so it is unethical to be randomised (e.g. smoking vs. non-smoking) or because a large scale implementation is not cost-effective. Quasi- or non-experimental designs do not allocate interventions, but observe groups of individuals that are exposed and unexposed to interventions and compare outcomes. While these designs offer
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cost savings and practicality, they are also open to bias and confounding which may impact on the evaluation outcomes.\textsuperscript{388} Such studies often try to match their intervention groups to reduce the potential impact of confounders.

To strengthen evaluation design, ideally both qualitative and quantitative evaluation methodologies are used across different stages of the project to enhance understandings of the effects of the project.\textsuperscript{310} A range of evaluation methodologies can be used for qualitative and quantitative evaluation. Common quantitative methods include surveys, attendance logs, audit forms, analysis of routinely collected statistics, and mathematical modelling.\textsuperscript{398} Common qualitative methods include focus groups, interviews, case studies, and ethnography.\textsuperscript{388} The choice of evaluation design will depend on the outcome(s) of interest, how well developed the intervention is and the likelihood of selection bias, the size and timing of effect (some behaviour changes take years to occur, requiring a long follow-up time), the resources available (costs), and what is feasible and acceptable to conduct in the context in which the intervention is being delivered.\textsuperscript{362, 418}

Numerous barriers to rigorous evaluation of health promotion interventions exist, including cost, the competing need to roll out new interventions quickly (especially in areas with growing epidemics), and the fact that many interventions are delivered to an entire region or community and therefore do not allow a comparable control group and restricted attribution of effect to a health promotion intervention. In addition, there are difficulties in using secondary and other routinely collected surveillance and survey data to evaluate interventions aimed at behaviour change because of the temporal relationship between indicators of behaviour change, the intervention itself and/or surveillance outcomes, and the potential for external factors (beyond the intervention) to contribute to outcomes of interest.\textsuperscript{424} Combining quantitative and qualitative methods and triangulating data from other sources can strengthen the validity of outcomes and reduce evaluation costs.\textsuperscript{388, 424}

The increasing focus on developing online health promotion interventions\textsuperscript{249, 250, 425} adds even more complexity to evaluation design. Challenges include difficulties in characterising or measuring reach and dosage, and inconsistent evaluation measures, which have largely resulted in limited evidence supporting the success of these web-based interventions in terms of cost-effectiveness and dissemination potential.\textsuperscript{262-264} Although literature about how to evaluate traditional static websites exists, most of this material focuses on evaluating website content and design only.\textsuperscript{426-429} The advent of social media and Web 2.0 applications like social networking sites (SNS), and the speed in which web-based health promotion interventions have been adapted for delivery in these new spaces,\textsuperscript{430} has resulted in calls for the development of
new and more robust evaluation strategies to keep up with the changes in technology. Additional dimensions to evaluating Web 2.0 interventions have been suggested, including measuring user interactions, assessing the utility of functions to support interactions, and assessing the quality and credibility of the content. Given the lack of published examples of evaluations of interventions delivered on SNS, it is important to trial new evaluation strategies and adapt methods from other fields (e.g. information systems) to assess which evaluation approaches and methodologies will best serve the intervention.

Summary

Evaluation is necessary to determine the effectiveness of health promotion, and refine and improve health promotion methods and strategies. A strong theoretical understanding of how interventions affect change can help inform both the design of health promotion interventions and their evaluation. Evaluations of health promotion interventions are commonly designed around the three stages of formative, process and impact/outcome evaluation and ideally involve both quantitative and qualitative methods. Consideration must also be given to the acceptability and feasibility of the intervention, and an evaluation design that suits the target intervention is vital.

New evaluation methods have been proposed to address some of the limitations of current evaluation tools in appropriately assessing interventions being delivered in new spaces such as SNS. Trialling new evaluation strategies and adapting methods from other fields may provide more robust evaluation approaches and methodologies that best fit novel health promotion interventions delivered through new media channels and provide meaningful evaluation data.
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Thesis Rationale

Increasing rates of HIV transmission among MSM are being observed in many developed countries. In Australia, increasing rates of HIV transmission among MSM have been attributed to increases in risky sexual behaviours and increases in the prevalence of other STIs. There is also recent evidence of a shift in the epidemiology of HIV and risk behaviours within MSM populations in Australia; with increases in HIV/STI diagnoses among younger MSM.

Undiagnosed HIV infection has been identified as a key factor impacting on HIV transmissions among MSM in other countries. Data on undiagnosed HIV in Australia are limited, yet recent mathematical modelling suggests that undiagnosed HIV makes a substantial contribution to increasing HIV transmission. Given the jurisdictional differences seen in recent HIV/STI diagnoses among MSM, it is important to assess jurisdictional differences in undiagnosed HIV rates to understand their potential impact in the Australian HIV epidemic. Increasing the frequency of HIV and other STI testing among high-risk MSM is an important step towards the detection of primary infections and undiagnosed infections and slowing the HIV epidemic in Australia.

Although previous health promotion initiatives targeting MSM have focused on HIV and other STI testing, it is important for future initiatives to adapt (in message and delivery) to changes in HIV epidemiology and risk within MSM populations. Numerous barriers to frequent testing have been identified previously, including low risk perception, difficulties getting an appointment, the requirement for multiple clinic appointments for specimen collection and for receiving results, and difficulties in finding a gay-friendly doctor.

It is critical that Australia’s HIV prevention response continues to be informed by sound epidemiological evidence and that interventions effectively encourage and provide supportive environments for MSM to reduce sexual risk behaviours and increase rates of testing.

Thesis Aims

This thesis consists of a literature review (in this chapter) and six manuscripts which have been published, or submitted for publication, in peer-reviewed scientific journals.

The general aims of the research described in this thesis were to understand HIV risk among MSM, to identify current barriers to testing and provide insights into interventions that will reduce HIV transmission risk among MSM in Australia.
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The specific aims of the thesis research were to:

- estimate HIV prevalence and prevalence of undiagnosed HIV infection among MSM in Victoria;
- examine predictors of HIV and undiagnosed infection;
- assess the effectiveness of current health promotion initiatives and investigate new methods to engage and reach gay men and other MSM; and
- explore alternative forms of testing and delivery models to increase access to HIV and other STI testing among MSM.
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Chapter 2: Impact of Undiagnosed HIV on the Australian Epidemic

Introduction

The recent increases in new diagnoses of HIV infection among MSM seen in most jurisdictions in Australia\(^3\) have resulted in an increased scrutiny of Australia’s surveillance systems to identify potential causes. This first chapter looks at the limitations of the current HIV epidemiological approaches in Australia and the potential impact of undiagnosed infections on HIV epidemiology.

The ‘Suck it and See’ Study was designed to estimate HIV prevalence and undiagnosed infection among a community sample of MSM by combining behavioural surveys with field based HIV testing techniques. This methodology allowed the identification of correlates of both diagnosed and undiagnosed HIV infection and the assessment of the risk profiles of each group.

Due to the novelty of the HIV testing techniques the study was accompanied by a small social marketing campaign to help raise awareness of the study within the participating venues and through the local gay community (Appendix 6).

The study presented in this chapter represents the following published paper:

## Declaration for Chapter Two

### Declaration by candidate

In the case of Chapter Two, the nature and extent of my contribution to the work was the following:

<table>
<thead>
<tr>
<th>Nature of contribution</th>
<th>Extent of contribution (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study design, data collection and analysis, results interpretation, manuscript preparation and review</td>
<td>75%</td>
</tr>
</tbody>
</table>

The following co-authors contributed to the work. Co-authors who are students at Monash University must also indicate the extent of their contribution in percentage terms:

<table>
<thead>
<tr>
<th>Name</th>
<th>Nature of contribution</th>
<th>Extent of contribution (%) for student co-authors only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Margaret Hellard</td>
<td>Study design, manuscript conception, preparation and review</td>
<td>N/A</td>
</tr>
<tr>
<td>Kim Wilson</td>
<td>Study design, laboratory work and manuscript review</td>
<td>N/A</td>
</tr>
<tr>
<td>Rebecca Guy</td>
<td>Study design, manuscript preparation and review</td>
<td>N/A</td>
</tr>
<tr>
<td>Mark Stoove</td>
<td>Study design, results interpretation, manuscript conception, preparation and review</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Candidate’s Signature: [Signature]

Date 29/05/2012
Declaration by co-authors

The undersigned hereby certify that:

(1) the above declaration correctly reflects the nature and extent of the candidate’s contribution to this work, and the nature of the contribution of each of the co-authors.

(2) they meet the criteria for authorship in that they have participated in the conception, execution, or interpretation, of at least that part of the publication in their field of expertise;

(3) they take public responsibility for their part of the publication, except for the responsible author who accepts overall responsibility for the publication;

(4) there are no other authors of the publication according to these criteria;

(5) potential conflicts of interest have been disclosed to (a) granting bodies, (b) the editor or publisher of journals or other publications, and (c) the head of the responsible academic unit; and

(6) the original data are stored at the following location(s) and will be held for at least five years from the date indicated below:

<table>
<thead>
<tr>
<th>Location(s)</th>
<th>Centre for Population Health, Burnet Institute</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Signatures</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Margaret Hellard</td>
<td>29/05/2012</td>
</tr>
<tr>
<td>Kim Wilson</td>
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</tr>
<tr>
<td>Rebecca Guy</td>
<td>29/05/2012</td>
</tr>
<tr>
<td>Mark Stoove</td>
<td>29/05/2012</td>
</tr>
</tbody>
</table>
Chapter Two

High rates of undiagnosed HIV infections in a community sample of gay men in Melbourne, Australia.

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2. Department of Epidemiology and Preventive Medicine, Monash University, Melbourne, Victoria, Australia
3. The Nossal Institute for Global Health, The University of Melbourne, Melbourne, Victoria, Australia
4. National Serology Reference Laboratory, Melbourne, Australia
5. Faculty of Medicine, National Centre in HIV Epidemiology and Clinical Research, Sydney, New South Wales, Australia
Abstract

Objectives: Undiagnosed HIV infections contribute disproportionately to the HIV epidemic. We estimated diagnosed and undiagnosed HIV prevalence and associated characteristics among gay men in Melbourne, Australia.

Methods: Gay men attending gay social venues completed a cross-sectional survey with oral fluid collection for HIV testing in 2008. We calculated HIV and undiagnosed HIV prevalence with associated 95% confidence intervals (CI). Undiagnosed HIV infections were men who reported being HIV negative or unaware of their status but tested HIV positive. $\chi^2$ tests and logistic regression were used to examine associations between participant characteristics and HIV status; diagnosed positive, undiagnosed positive and negative.

Results: Among 639 men, 61 (9.5%, 95%CI: 7.4%-12.1%) tested HIV positive. Of these 61 men, 19 (31.1%, 95%CI: 19.9%–44.3%) were classified as undiagnosed HIV positive. Of these 19 men, 31.6% reported never being tested for HIV and 36.8% tested in the past 12 months, 80.0% reported having group sex and 31.6% reported 10 or more sex partners in the past six months, and 53.9% reported inconsistent condom use with casual partners. Being classified as undiagnosed HIV positive was associated with recruitment from sex-on-premises venues (OR 3.0; 95% CI 1.0-9.1) and being less confident in knowing their HIV status (OR 3.0; 95% CI 1.0-9.1).

Conclusion: Almost a third of HIV-positive men were unaware of their HIV status, and of these men a large proportion engaged in high risk behaviours. Our findings highlight the need for additional strategies to encourage more frequent HIV testing among men at high risk of HIV infection.
Introduction

In Australia, more than 65% of newly diagnosed HIV infections are among gay men\textsuperscript{1,2}. Despite high self-reported annual testing rates (~60%)\textsuperscript{3} and a reduction in community viral loads among those on antiretroviral therapy (ART)\textsuperscript{4}, Australia has witnessed substantial increases in newly diagnosed HIV infections over the past decade\textsuperscript{2}. A recent study assessing compliance with HIV testing frequency guidelines among gay men attending primary care clinics in Melbourne reported annual re-testing rates among those recommended for annual testing as low as 35%, indicating that self-reported testing rates among gay men could be over-estimated\textsuperscript{5}.

People who are unaware of their HIV infection (undiagnosed HIV positive) are considered to contribute disproportionately to HIV transmissions due, in part, to ongoing sexual risk practices and high viremia at HIV seroconversion\textsuperscript{6}. Recent epidemic modelling of HIV in Australia estimates that approximately 31% of new HIV infections are transmitted by the estimated nine percent of gay men with undiagnosed HIV\textsuperscript{6}. Regular HIV testing is likely to reduce HIV transmissions by providing timely access to treatment and suppression of viral load\textsuperscript{7-9} and through the modification of sexual risk behaviours\textsuperscript{10}.

We report HIV prevalence and the proportion of undiagnosed HIV infection in a community-recruited sample of gay men in Melbourne, Australia. We compare risk and health-seeking behaviours of men with diagnosed HIV, undiagnosed HIV and HIV-negative men.

Methods

Setting
Melbourne is the capital of Victoria, Australia, a jurisdiction with the second largest gay population in Australia\textsuperscript{11}. Melbourne’s gay community venues consist largely of gay social venues (bars/clubs) and sex-on-premises venues (SOPV), with at least 10 SOPVs in operation in 2007\textsuperscript{12}.

Study design
Using a facility-based sampling method\textsuperscript{13}, a convenience sample of gay men were recruited from gay community social venues (three bars/clubs and four SOPVs chosen by popularity and location) in Melbourne over the month of June 2008. Locations and times of the week were chosen to maximise recruitment (Friday and Saturday nights for bars/clubs; Thursday, Friday, Saturday and Sunday evenings for SOPVs). A social marketing campaign preceded data collection to enhance participation and raise awareness about the novel specimen collection.
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Men were approached by trained field researchers and invited to participate. The inclusion criteria were anyone aged 18 years or over, who self-identified as gay or had sex with another man in the past five years and was able to provide verbal informed consent. Consenting men self-completed a questionnaire and provided an oral fluid specimen using the OraSure collection kit (Technologies, Inc., Bethlehem, Pennsylvania, USA) according to the manufacturer’s instructions. HIV test results were not provided to participants because HIV oral fluid testing is not registered in Australia for screening purposes. Researcher recruitment logs recorded how many men were approached to participate.

Questionnaire

The questionnaire was adapted from the instrument used in the annual Melbourne Gay Community Period Surveys (MGCPSS) which includes questions on sexual relationships, sexual risk practices (number of partners, partner type, knowledge of partners’ HIV status), HIV and other STI testing, self-reported perceived HIV status, gay community social attachment and demographics. Additional questions included for this study were confidence about knowing HIV status and acceptability of oral fluid specimen collection.

HIV testing

HIV testing was undertaken at the National Serological Reference Laboratory (NRL) using an anti-HIV-1 IgG antibody capture ELISA (GACELISA) using the method developed by Parry et al. An internal validation study of the GACELISA at NRL demonstrated 100% sensitivity (95%CI: 95.0-100.0) and 100% specificity (95%CI: 95.0-100.0%) upon repeat testing as per the test protocol. All specimens testing positive by the HIV-1 EIA were confirmed by Western blot.

Statistical analysis

Questionnaires and oral fluid specimens were matched by a numeric unique identifier. HIV prevalence was calculated from the biological test result. An undiagnosed HIV infection (undiagnosed HIV positive) was defined as a positive biological test result from any man self-reporting as HIV-negative or who had never had a HIV test or was unsure of their HIV status. HIV prevalence and the prevalence of undiagnosed HIV with 95% confidence intervals were calculated.

χ² tests were used to determine associations between undiagnosed HIV positive, diagnosed HIV positive, and HIV negative men with participant characteristics and sexual risk behaviours. Univariate logistic regression was used to determine associations between self-reported HIV negative men (undiagnosed HIV positive and HIV negative) and participant characteristics and sexual risk behaviours.
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Data analysis was performed using Stata 10.1 (StataCorp, Texas, USA)\textsuperscript{16}. A cut off of p<0.05 was used for all statistical tests.

Ethics approval was obtained from the Victorian Department of Health Human Research Ethics Committee and the Monash University Standing Committee on Ethics in Research Involving Humans.

Results

Sample
1027 men were approached to participate and 639 men (62.2\%) completed a questionnaire that could be matched to an oral fluid sample (three questionnaires could not be matched to an oral fluid sample).

Most participants (57.0\%) were recruited from SOPVs and 43.0\% from bars/clubs. Median age of the participants was 35 years (range: 18-75 years), 73.7\% were born in Australia, 88.5\% reported residing in metropolitan Melbourne, 83.8\% were in full-time employment and 53.5\% had completed tertiary education (Table 1).

HIV prevalence
Of the 639 men, 61 provided specimens that were HIV positive, equating to a HIV prevalence of 9.5\% (95\%CI 7.4\%-12.1\%). HIV prevalence was 6.9\% (95\%CI 4.2\%-10.6) at bars/clubs and 11.5\% (95\%CI 8.4\%-15.3) at SOPVs. HIV prevalence was highest among those aged 40-49 years (17.3\%) and lowest among men aged 18-29 years (2.6\%).

Undiagnosed HIV positive prevalence
Of the 61 men testing HIV positive, 19 were unaware of their positive HIV status, providing an undiagnosed HIV positive prevalence estimate of 31.1\% (95\%CI 19.9\%-44.3\%)(Table 1).
Table 1. Characteristics of HIV-negative men, HIV positive men with diagnosed infections and HIV positive men with undiagnosed HIV infections, based on oral fluid test result.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Negative (n=578)</th>
<th>Undiagnosed positive (n=19)</th>
<th>Diagnosed positives (n=42)</th>
<th>Total (n=639)</th>
<th>( \chi^2 ) significance</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recruitment site</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bars/clubs</td>
<td>256 (44.3)</td>
<td>4 (21.0)</td>
<td>15 (35.7)</td>
<td>275 (43.0)</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>SOPVs</td>
<td>322 (55.7)</td>
<td>15 (79.0)</td>
<td>27 (64.3)</td>
<td>364 (57.0)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sexual Identity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Gay/homosexual</td>
<td>482 (83.5)</td>
<td>16 (84.2)</td>
<td>39 (92.9)</td>
<td>537 (84.2)</td>
<td>0.41</td>
<td></td>
</tr>
<tr>
<td>Bisexual</td>
<td>72 (12.5)</td>
<td>2 (10.5)</td>
<td>1 (2.4)</td>
<td>75 (11.8)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>23 (4.0)</td>
<td>1 (5.3)</td>
<td>2 (4.8)</td>
<td>26 (4.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age group (years)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-29</td>
<td>190 (34.1)</td>
<td>3 (16.7)</td>
<td>2 (5.0)</td>
<td>195 (31.7)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30-39</td>
<td>167 (30.0)</td>
<td>8 (44.4)</td>
<td>6 (15.0)</td>
<td>181 (29.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>40-49</td>
<td>124 (22.3)</td>
<td>5 (27.8)</td>
<td>21 (52.5)</td>
<td>150 (24.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>50+</td>
<td>76 (13.7)</td>
<td>2 (11.1)</td>
<td>11 (27.5)</td>
<td>89 (14.5)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Median age (years)</td>
<td>35 (35)</td>
<td></td>
<td>45 (35)</td>
<td></td>
<td>&lt;0.001 †</td>
<td></td>
</tr>
<tr>
<td>Country of birth</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>410 (73.6)</td>
<td>11 (61.1)</td>
<td>32 (80.0)</td>
<td>453 (73.7)</td>
<td>0.32</td>
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</tr>
<tr>
<td>Other</td>
<td>147 (26.4)</td>
<td>7 (38.9)</td>
<td>8 (20.0)</td>
<td>162 (26.3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Anglo-Australian</td>
<td>308 (55.3)</td>
<td>9 (50.0)</td>
<td>22 (55.0)</td>
<td>339 (55.1)</td>
<td>0.91</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>249 (44.7)</td>
<td>9 (50.0)</td>
<td>9 (45.0)</td>
<td>276 (44.9)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Secondary or less</td>
<td>158 (28.6)</td>
<td>9 (50.0)</td>
<td>10 (25.6)</td>
<td>177 (29.0)</td>
<td>0.10</td>
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<td>Further/Vocational</td>
<td>95 (17.2)</td>
<td>1 (5.6)</td>
<td>11 (28.2)</td>
<td>107 (17.5)</td>
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</tr>
<tr>
<td>Degree/postgraduate</td>
<td>300 (54.3)</td>
<td>8 (44.4)</td>
<td>18 (46.2)</td>
<td>326 (53.5)</td>
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</tr>
<tr>
<td>Variable</td>
<td>Negative (n=578)</td>
<td>Undiagnosed positive (n=19)</td>
<td>Diagnosed positives (n=42)</td>
<td>Total (n=639)</td>
<td>( \chi^2 ) significance</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>------------------</td>
<td>----------------------------</td>
<td>---------------------------</td>
<td>---------------</td>
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</tr>
<tr>
<td>Employment status</td>
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</tr>
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<td>Employed (Full/Part Time)</td>
<td>467 (84.3)</td>
<td>17 (94.4)</td>
<td>28 (71.8)</td>
<td>512 (83.8)</td>
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<tr>
<td>Unemployed*</td>
<td>87 (15.7)</td>
<td>1 (5.6)</td>
<td>11 (28.2)</td>
<td>99 (16.2)</td>
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<td></td>
</tr>
<tr>
<td>No. sex partners (in past 6 months)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 or less</td>
<td>404 (71.1)</td>
<td>13 (68.4)</td>
<td>19 (46.3)</td>
<td>436 (69.4)</td>
<td>0.004†</td>
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<tr>
<td>More than 10</td>
<td>164 (28.9)</td>
<td>6 (31.6)</td>
<td>22 (53.7)</td>
<td>192 (30.6)</td>
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<td></td>
</tr>
<tr>
<td>UAI with casual partner (in past 6 months)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>296 (67.9)</td>
<td>8 (47.1)</td>
<td>12 (34.3)</td>
<td>316 (64.8)</td>
<td>&lt;0.001†</td>
<td></td>
</tr>
<tr>
<td>Occasionally/Often</td>
<td>140 (32.1)</td>
<td>9 (52.9)</td>
<td>23 (65.7)</td>
<td>172 (35.3)</td>
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<td></td>
</tr>
<tr>
<td>Any group sex‡ (in past 6 months)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>296 (54.4)</td>
<td>6 (33.3)</td>
<td>11 (28.2)</td>
<td>313 (52.1)</td>
<td>0.002†</td>
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<tr>
<td>Yes</td>
<td>248 (45.6)</td>
<td>12 (66.7)</td>
<td>28 (71.8)</td>
<td>288 (47.9)</td>
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</tr>
<tr>
<td>HIV status of current regular partner</td>
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<td></td>
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</tr>
<tr>
<td>Negative/Don’t know</td>
<td>562 (97.7)</td>
<td>19 (100.0)</td>
<td>29 (69.1)</td>
<td>610 (95.9)</td>
<td>&lt;0.001†</td>
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<tr>
<td>Positive</td>
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<td>0 (0.0)</td>
<td>13 (31.0)</td>
<td>26 (4.1)</td>
<td></td>
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<tr>
<td>Disclose of HIV status to casual partners before sex*</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>None</td>
<td>216 (51.1)</td>
<td>7 (43.7)</td>
<td>9 (26.5)</td>
<td>232 (49.1)</td>
<td>0.02†</td>
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</tr>
<tr>
<td>Some/ All</td>
<td>207 (48.9)</td>
<td>9 (56.3)</td>
<td>25 (73.5)</td>
<td>241 (50.9)</td>
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<td>Any STI test (other than HIV) in past 12 months</td>
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<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>No</td>
<td>121 (23.2)</td>
<td>4 (23.5)</td>
<td>1 (2.8)</td>
<td>126 (21.9)</td>
<td>0.02†</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>401 (76.8)</td>
<td>13 (76.5)</td>
<td>35 (97.2)</td>
<td>449 (78.1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIV testing history</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No, Never tested</td>
<td>136 (24.4)</td>
<td>6 (31.6)</td>
<td>0 ( - )</td>
<td>142 (23.0)</td>
<td>0.47(a)</td>
<td></td>
</tr>
<tr>
<td>Yes, ever tested</td>
<td>422 (75.6)</td>
<td>13 (68.4)</td>
<td>40 (100.0)</td>
<td>475 (77.0)</td>
<td></td>
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</tr>
</tbody>
</table>
### Chapter Two

<table>
<thead>
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<th>Variable</th>
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<th>Total (n=639)</th>
<th>$\chi^2$ significance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reported HIV test results (if ever tested)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIV-negative</td>
<td>418 (72.3)</td>
<td>13 (68.4)</td>
<td>4 (9.5)</td>
<td>435 (91.6)</td>
<td>0.72 (a)</td>
</tr>
<tr>
<td>HIV-positive</td>
<td>4 (0.7)</td>
<td>0 (0.0)</td>
<td>36 (85.7)</td>
<td>40 (8.4)</td>
<td></td>
</tr>
<tr>
<td><strong>Recent HIV testing (in the 12 months prior to the survey)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In the past 12 months</td>
<td>288 (75.2)</td>
<td>7 (53.8)</td>
<td>25 (73.5)</td>
<td>320 (74.4)</td>
<td>0.08 (a)</td>
</tr>
<tr>
<td>&gt; 12 months ago</td>
<td>95 (24.8)</td>
<td>6 (46.2)</td>
<td>9 (26.5)</td>
<td>110 (25.6)</td>
<td></td>
</tr>
<tr>
<td><strong>Reason for not testing in the 12 months prior to the survey</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Always practise safe sex</td>
<td>33 (39.3)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>33 (35.5)</td>
<td>-</td>
</tr>
<tr>
<td>Consider myself at low risk of HIV</td>
<td>25 (29.8)</td>
<td>2 (40.0)</td>
<td>0 (0.0)</td>
<td>27 (29.0)</td>
<td></td>
</tr>
<tr>
<td>Problems finding time to get tested</td>
<td>3 (3.6)</td>
<td>1 (20.0)</td>
<td>0 (0.0)</td>
<td>4 (4.3)</td>
<td></td>
</tr>
<tr>
<td>Afraid to know if I was HIV positive</td>
<td>8 (9.5)</td>
<td>2 (40.0)</td>
<td>0 (0.0)</td>
<td>10 (10.8)</td>
<td></td>
</tr>
<tr>
<td>Simply had not thought about it</td>
<td>8 (9.5)</td>
<td>0 (0.0)</td>
<td>0 (0.0)</td>
<td>8 (8.6)</td>
<td></td>
</tr>
<tr>
<td>Other**</td>
<td>7 (8.3)</td>
<td>0 (0.0)</td>
<td>4 (100.0)</td>
<td>11 (11.8)</td>
<td></td>
</tr>
</tbody>
</table>

Unknowns excluded from table  † $p$-value < 0.05  *Unemployed include Pensioner/Social Security Benefits and other. ** other included being in a monogamous relationship, being too lazy, and being HIV positive. (a)-Diagnosed HIV-positive men are excluded from this $\chi^2$ test as, by definition, all have been tested. † can include regular partner.
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Characteristics of undiagnosed HIV positive cases

Of the 19 undiagnosed HIV positive men, six (31.6%) reported no HIV testing history, six (31.6%) reported their last HIV test as more than 12 months ago and seven (36.8%) reported a HIV test in the past 12 months (Table 1). Almost a third of men (31.6%) with undiagnosed HIV reported more than 10 sex partners and over half (52.9%) reported unprotected anal intercourse (UAI) with casual partners in past six months. The majority (80.0%) reported group sex in the past six months. Almost two thirds (63.1%) of undiagnosed HIV positive men reported being ‘very confident’ or ‘confident’ in knowing their HIV status (Table 2).

Comparison of HIV undiagnosed cases with diagnosed and HIV-negative men

\(\chi^2\) analyses showed HIV negative men and those with undiagnosed HIV (median age = 35 years) were significantly younger than diagnosed HIV positive men (median age = 45 years) (p-value <0.01). No significant differences in socio-demographics, recruitment site or HIV testing history were detected between HIV undiagnosed, diagnosed and HIV-negative men (Table 1).

There was a significant association between recent sexual risk behaviours and HIV undiagnosed, diagnosed and HIV-negative men. Higher rates of UAI with casual partners (p<0.001) and group sex (p=0.002) were reported by HIV undiagnosed and diagnosed men compared to HIV negative men (Table 1). Diagnosed HIV positive men were significantly more likely to report a STI test within the past 12 months (p=0.02), having more than 10 sex partners in the past six months (p=0.004), having a HIV positive regular sex partner (p<0.001) and disclosing their HIV status to casual partners (p=0.02), compared to HIV negative and undiagnosed positive men (Table 1).

Predictors of undiagnosed HIV positive infection

Univariate analyses showed that men with undiagnosed HIV infection were more likely be recruited from SOPVs (OR 3.0, 95%CI 1.0–9.1) and more likely to report being unsure of their HIV status (very/confident vs. unsure) (OR 4.4, 95%CI 1.7–11.7), compared to negative men (Table 2). Undiagnosed HIV positive men in our sample were also more likely to report group sex in the past six months (OR 2.4, 95%CI 0.9–6.5) and having tested for HIV more than 12 months ago (OR 2.6, 95%CI 0.9–7.9), both close to significance (Table 2).
Table 2. Reported sexual risk behaviours of HIV-negative men compared to men with undiagnosed HIV infections.

<table>
<thead>
<tr>
<th>Variable</th>
<th>OR* (95%CI)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recruitment Site</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bars/clubs</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>SOPVs</td>
<td>3.0 (1.0 - 9.1)</td>
<td>0.05†</td>
</tr>
<tr>
<td>Age group (years)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 40</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>≥40</td>
<td>1.1 (0.4 – 3.0)</td>
<td>0.80</td>
</tr>
<tr>
<td>Country of birth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>1.8 (0.7 – 4.7)</td>
<td>0.24</td>
</tr>
<tr>
<td>No. sex partners (in past 6 months)*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 or less</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>More than 10</td>
<td>1.1 (0.4 – 3.0)</td>
<td>0.80</td>
</tr>
<tr>
<td>UAI with casual partner (in past 6 months)*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Occasionally/Often</td>
<td>1.6 (0.5 – 4.9)</td>
<td>0.43</td>
</tr>
<tr>
<td>Any group sex (in past 6 months)‡*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>2.4 (0.9 – 6.5)</td>
<td>0.09</td>
</tr>
<tr>
<td>HIV status of current regular partner</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative/Don’t know</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Disclose of HIV status to casual partners before sex*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some/All</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>0.7 (0.3 – 2.0)</td>
<td>0.57</td>
</tr>
<tr>
<td>HIV testing history</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No, Never tested</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Ever Tested</td>
<td>0.7 (0.3 – 1.9)</td>
<td>0.47</td>
</tr>
<tr>
<td>Recent HIV testing history (if ever tested)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In the past 12 months</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>&gt; 12 months ago</td>
<td>2.6 (0.9 – 7.9)</td>
<td>0.09</td>
</tr>
<tr>
<td>How confident are you of knowing your own HIV status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Confident/ Very Confident</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Unsure/No Idea</td>
<td>4.4 (1.7–11.7)†</td>
<td>&lt;0.01†</td>
</tr>
<tr>
<td>Any STI test (other than HIV) in past 12 months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>1.0 (0.3 – 3.1)</td>
<td>0.97</td>
</tr>
</tbody>
</table>

*In the past 6 months ‡ can include regular partner CI, confidence interval OR* Unadjusted Odd Ratio † p-value < 0.05
Discussion

This is one of the first studies in Australia to assess HIV and undiagnosed HIV prevalence using a biological sample, and the first to examine the characteristics of HIV negative, HIV positive and undiagnosed HIV positive gay men. Among social venue-recruited gay men, we found a HIV prevalence of 9.5%, of which 31.1% had undiagnosed HIV infections. Men with undiagnosed HIV reported higher risk behaviours and less frequent HIV testing compared to HIV negative men, however due to small numbers of undiagnosed infections and the associated limitation on multivariate analysis, these results should be interpreted cautiously. In addition, while our sample may not be representative all gay men\(^{11}\), recruitment protocols are likely to have provided a sample representative of gay men most at risk of HIV\(^{17}\).

HIV prevalence in our study is similar to that reported in the only other Australian HIV prevalence study (8.8%)\(^{18}\) and similar to recent self-reported estimates from behavioural surveillance (6-12%)\(^{1.19}\). Our undiagnosed HIV estimate is higher than reported by Birell et al (2010) (19.5%) and much higher than estimated in recent HIV modelling (9%)\(^{5}\). Although our sample would be considered high-risk compared to other Australian studies\(^{3,6,18}\) due to the proportion of SOPV recruited men, sample demographics and sexual risk behaviours are largely comparable.

HIV prevalence in this study is comparable with those in the UK (4.4-9.1%)\(^{20,21}\), and lower than in the US (12.1-19%)\(^{22,23}\), and our undiagnosed HIV estimate sits within the wide range reported internationally (20-77%)\(^{20,21,24,26}\). The large variation in estimates of undiagnosed infection is likely due to different study designs and varying access to primary health care and testing in gay male populations.

While the small number of undiagnosed HIV infections in this study limits generalisation, the high rates of sexual risk behaviours reported by this group is a concern. Although diagnosed HIV-positive men reported the most risky sexual practices, there was evidence of risk–reduction strategies, including sero-sorting; almost a third reported HIV-positive regular partners and the majority (74%) reported disclosing their HIV status to causal partners before sex.

Comparatively, just over half of the men with undiagnosed HIV infection reported disclosing their HIV status to casual partners before sex; which most likely did not reflect their true HIV status.

Australia testing guidelines recommend annual testing for sexually active gay men and more frequent testing (3-6 monthly) for men at ‘high risk’\(^{27}\). These recommended testing frequencies
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applied to a large proportion of our sample, but most reported much lower testing rates. Although self-reported annual HIV testing rates among gay men in Australia are high (60%-70%)\textsuperscript{3,19,28} compared to other countries (e.g., ~40.0% in the UK\textsuperscript{29}), our findings suggest that HIV testing rates may be insufficient to limit the impact of undiagnosed HIV on transmissions among Australian gay men. In our sample, past 12 months HIV testing rates (74%) were comparable with reports from recent behavioural surveys\textsuperscript{19}, but considerably lower (54%) among those with undiagnosed HIV. Although this difference fell marginally short of statistical significance and require cautionary interpretation, the participant-centred (e.g., risk perception) and structural barriers to recent testing nominated by both HIV negative and undiagnosed men (see Table 1) are consistent with other studies\textsuperscript{30-32}. A recent study assessing compliance with recommended HIV testing guidelines among gay men attending clinics in Melbourne showed the proportions of attendees adhering to recommended annual re-testing (all sexually active gay men) was only 35% and recommended six-monthly re-testing (‘high risk’ gay men) was only 15%\textsuperscript{5}. Combined, these findings highlight the need to address barriers to testing among gay men in Australia.

There are several limitations associated with this study. First, the recruitment strategy may have resulted in selection bias. Our recruitment protocol replicated only the venue-based recruitment for the MGCPS. We did not recruit at the gay fair day or ‘Midsumma Carnival’, which constitutes approximately two-thirds of MGCPS respondents. This limits direct comparisons between the two samples, with the MGCPS potentially more representative of the broader gay community. However, WHO behaviour surveillance guidelines recommend targeting sub-populations where most new infections are concentrated\textsuperscript{33}. Given the places gay men report meeting sex partners\textsuperscript{19,30}, social venue recruitment is likely to better represent those most at risk of HIV, and better placed to meet the study aims. Sexual identification of our study participants (84% gay, 12% bisexual, 4% other) also better reflects homosexually active men recently diagnosed with HIV in Australia (90% gay, 7% bisexual, 3% other)\textsuperscript{17} compared with population surveys (70% gay, 26% bisexual, 4% other)\textsuperscript{14}. Second, there may have been reporting bias; a small number of participants (n=4) self-reporting being HIV positive but returning a negative test. The reason for this is unclear but could reflect incorrect survey completion, question misinterpretation, a belief they really were HIV positive or the false negative test result (unlikely given the documented test performance)\textsuperscript{15,35}. Third, the small sample size of undiagnosed infections restricted statistical power and precluded multivariate analysis. However, this study has provided the basis for a planned National study that will yield significantly more outcomes.

In conclusion, almost a third of HIV positive gay men in our study were unaware of their HIV status and these men reported high risk behaviours and less than ideal testing rates. These new
data contributes to our understanding of potential drivers of HIV transmission among gay men in Australia and demonstrate a need to enhance HIV testing strategies, particularly more frequent testing in high risk gay men in Australia.

**Acknowledgements**

We acknowledge the assistance of Sue Best from the National Serology Reference Laboratory with planning and providing assistance with the testing protocol. We also would like to acknowledge the help of the project advisory committee, particularly that of Garrett Prestage for guiding the planning and implementation of the study.

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Chapter 3: Counting Matters: Discrepancy between self-reported & test detected HIV

Introduction

Findings from the ‘Suck it and See’ Study described in the previous chapter have highlighted some of the limitations with the Australia’s current approach to estimating HIV prevalence through self-report measures. Self-report measures of HIV prevalence collected through surveys of MSM are likely to under-estimate true HIV prevalence as self-reported HIV status is affected by testing patterns and a subset of men with HIV infection may not be aware of their positive HIV status at the time of the survey. Similar community-based HIV prevalence studies internationally have demonstrated wide discrepancies between self-reported and biological HIV status\(^7\)\(^43\). Using data from the ‘Suck it and See’ Study, this chapter aims to explore in more detail the discrepancy between men’s self-reported HIV status and their biological test result and the subsequent limitations of the current HIV epidemiological approaches in Australia. The paper draws attention to some the weaknesses of current HIV surveillance systems in Australia that affect the validity of prevalence estimates and cannot provide estimates of undiagnosed infections. This study subsequently provides a framework for future HIV surveillance mechanisms to incorporate biological samples into behavioural surveillance allowing the continual monitor estimates for HIV and undiagnosed HIV in Australia.

The study presented in this chapter represents the following published paper:

Declaration for Chapter Three

Monash University

Declaration by candidate

In the case of Chapter Three, the nature and extent of my contribution to the work was the following:

<table>
<thead>
<tr>
<th>Nature of contribution</th>
<th>Extent of contribution (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study design and management, data collection and analysis, results interpretation, manuscript preparation and review</td>
<td>75%</td>
</tr>
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The following co-authors contributed to the work. Co-authors who are students at Monash University must also indicate the extent of their contribution in percentage terms:

<table>
<thead>
<tr>
<th>Name</th>
<th>Nature of contribution</th>
<th>Extent of contribution (%) for student co-authors only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Margaret Hellard</td>
<td>Study design, manuscript conception and review</td>
<td>N/A</td>
</tr>
<tr>
<td>Rebecca Guy</td>
<td>Study design, manuscript preparation and review</td>
<td>N/A</td>
</tr>
<tr>
<td>Kim Wilson</td>
<td>Study design, laboratory work and manuscript conception</td>
<td>N/A</td>
</tr>
<tr>
<td>Mark Stoove</td>
<td>Study design, manuscript conception, preparation and review</td>
<td>N/A</td>
</tr>
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</table>

Candidate’s Signature [Signature]  Date 29/05/2012
Chapter Three

Declaration by co-authors

The undersigned hereby certify that:

(7) the above declaration correctly reflects the nature and extent of the candidate’s contribution to this work, and the nature of the contribution of each of the co-authors.

(8) they meet the criteria for authorship in that they have participated in the conception, execution, or interpretation, of at least that part of the publication in their field of expertise;

(9) they take public responsibility for their part of the publication, except for the responsible author who accepts overall responsibility for the publication;

(10) there are no other authors of the publication according to these criteria;

(11) potential conflicts of interest have been disclosed to (a) granting bodies, (b) the editor or publisher of journals or other publications, and (c) the head of the responsible academic unit; and

(12) the original data are stored at the following location(s) and will be held for at least five years from the date indicated below:

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<th>Location(s)</th>
<th>Centre for Population Health, Burnet Institute</th>
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<th>Date</th>
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<td>Rebecca Guy</td>
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<td>Kim Wilson</td>
<td>29/05/2012</td>
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<tr>
<td>Mark Stoove</td>
<td>29/05/2012</td>
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Chapter Three
The difference in self-reported and biological measured HIV prevalence – implications for HIV prevention.

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Abstract

In Australia, HIV prevalence estimates among gay men have been mainly based on self-reported HIV status collected in annual behavioural surveys. We measured biological HIV prevalence among gay men in Melbourne, Australia, using a facility-based sampling method. We calculated HIV prevalence and used logistic regression to assess correlates of a positive HIV test. A total of 639 gay men were recruited, completed a survey, and provided oral fluid for HIV testing from seven venues in 2008. The median age of the participants was 35 years (range: 18-75 years). Overall biological HIV prevalence was 9.5% (95% CI 7.5%-12.0%) compared with 6.3% (95% CI 4.5%-8.4%) for self-reported HIV positive status. We found a significant discrepancy between test-detected biological and self-report HIV status in our study, with 19 men (31.1%) unaware of their HIV infection. These results highlight the importance of repeatable biological estimates to inform and evaluate HIV prevention strategies.
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Introduction

In Australia, men who have sex with men (MSM) account for more than 65% of newly diagnosed and 85% of newly acquired HIV infections each year. Over the past decade there has been a steady increase in the annual number of newly acquired HIV infections among MSM, from 667 in 2001 to 909 cases in 2009. Similar trends have been observed in Melbourne the capital of Victoria, Australia, a jurisdiction with the second largest gay population in Australia. The rise in HIV diagnoses has been attributed to more risky sexual behaviours among gay men and dramatic increases in other sexually transmitted infections (STIs) including syphilis, gonorrhoea and chlamydia, that are known to increase HIV transmission risk.

In Australia, HIV prevalence estimates among gay men have been mainly based on self-reported HIV status collected in annual behavioural surveys; recent prevalence estimates among MSM are reported between 5-9%. However, such surveys are likely to under-estimate HIV prevalence as self-reported HIV status is affected by testing patterns and a subset of men with HIV infection who may not be aware of their positive HIV status at the time of the survey.

Internationally, studies among MSM have demonstrated wide discrepancies between self-reported and biological HIV status.

The collection of biological samples to estimate HIV prevalence alongside unlinked anonymous behavioural surveys is widely used as a surveillance tool throughout Europe, the US and Africa. Finger-prick blood and oral fluid specimens were the preferred method of specimen collection among recent studies, offering advantages over venous blood samples; being less invasive, less costly, easier to handle and, for those offering rapid testing, can provide participants with results at the point-of-care. The use of such devices in community settings is ideal for the routine and periodic estimation of HIV prevalence. Such measurement is important for determining burden of disease, evaluating prevention initiatives and for modelling epidemic trajectories. In this paper, we estimate test detected HIV biological-prevalence among gay men using oral fluid HIV testing and compare this to self-reported HIV status. We also explore correlates of a HIV infection.

Methods

Setting

Melbourne, Australia, a jurisdiction with the second largest gay population in Australia.

Melbourne’s gay community venues consist largely of gay social venues (bars and clubs) and
sex-on-premises venues (SOPV) (including gay saunas), with at least 10 SOPVs in operation in 2007.

Study design
In June 2008 a cross-sectional sample of gay men was recruited through seven gay community venues in inner city Melbourne; four SOPVs and three gay bars and clubs. Using a facility-based sampling method, a convenience sample of gay men were recruited on specific days and times of the week to maximise attendance numbers and participation rates. Locations and times of the week (time-location-sampling) were chosen to maximise recruitment (Friday and Saturday nights for bars/clubs; Thursday, Friday, Saturday and Sunday evenings for SOPVs). Recruitment was preceded by a social marketing campaign to raise awareness about the survey and the novel nature of specimen collection.

Men were approached at the venues by trained field researchers and invited to participate. The study inclusion criteria were anyone aged 18 years or over, who self-identified as gay or had sex with another man in the past five years and able to provide verbal informed consent. Consenting men self-completed a questionnaire and provided an oral fluid specimen onsite at the venues using the OraSure collection kit (OraSure Technologies, Inc., Bethlehem, Pennsylvania, USA) according to the manufacturer’s instructions. Individual HIV test results were not provided to participants because oral fluid testing for HIV infection is not registered in Australia for screening or diagnostic purposes. Given that participants were not able to benefit from receiving their test result at the point-of-care, study recruitment cards were provided that included the study website address containing details of where men could access free HIV testing or telephone counselling. Researcher recruitment logs recorded how many men were approached to participate and aimed to capture reasons for non-participation.

Questionnaire
The questionnaire was adapted from the instrument used in the Melbourne Gay Community Period Surveys (MGCPS). The MGCPS is an annual behavioural survey among gay men which captures information about demographics, sexual self-identity, gay community social attachment, sexual relationships, sexual practices with regular and casual partners, knowledge of partners’ HIV status, self-reported perceived HIV status and HIV/STI testing history. The sexual behaviour questions related to the past six months, and HIV/STI testing the past year. We included additional questions regarding confidence about knowing HIV status and acceptability of oral fluid specimen collection, which asked “How comfortable have you found the collection of saliva in this study?” and “Would you participate in future Melbourne Gay Community Periodic Surveys if a saliva specimen was collected?“.
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HIV testing

Oral fluid specimens were tested for HIV by the National Serology Reference Laboratory (NRL) using an anti-HIV IgG antibody capture ELISA (GACELISA) based on the method developed by Parry et al. An internal validation study of the GACELISA at NRL demonstrated a sensitivity of 100% (95%CI: 95.0-100.0) and specificity of 100% (95%CI: 95.0-100.0%) upon repeat testing as per the testing protocol. The HIV status of all specimens testing repeatedly positive by the HIV-1 EIA test were confirmed using an oral-fluid based Western blot.

Statistical analysis

The questionnaires and oral fluid specimens were matched by a numeric unique identifier. Men were asked whether they had sex with any casual male partner/s in the past 6 months (yes/ no) and if they ‘never’, ‘occasionally’ or ‘often’ engaged as a receptive or insertive partner in anal intercourse with a condom, without a condom with ejaculation, and without a condom with withdrawal before ejaculating, in the last six months. From this we constructed a variable of unprotected anal intercourse with casual partners (UAIC) (no casual partner, no anal intercourse, no UAIC, any UAIC). Men were also asked about how many of their friends were gay or homosexual men (none, a few, some, or most) and how much of their free time is spent with gay or homosexual men (none, a little, some, a lot). From these, we constructed a variable of ‘social engagement with gay men’ (lower, moderate, extensive) based on a matrix of the above two questions.

HIV prevalence estimates were calculated from the biological test result and also self-reported HIV status, and 95% confidence intervals were calculated for all estimates using binomial standard formulas. To assess the concordance in classification of HIV status by self-report and test detected measures, we used a matched McNemar’s test. Univariable and multivariable logistic regression models were used to identify factors independently associated with both self-reported and test-detected HIV status. For the multivariable analysis a backward stepwise method was used. Data analysis was performed using Stata 10.1 (StataCorp, Texas, USA). A cut off of p<0.05 was used for all statistical tests.

Ethics approval was obtained from the Victorian Department of Health Human Research Ethics Committee and the Monash University Standing Committee on Ethics in Research Involving Humans.
Results

Sample
In the study, 1027 men were approached to participate and 639 men (62.2%) completed a questionnaire that could be matched to an oral fluid sample (three questionnaires could not be matched to an oral fluid sample). Participants were recruited from the seven gay community venues (57.0% from four SOPVs and 43.0% from three bars and clubs). The median age of the participants was 35 years (range: 18-75 years). The majority of participants (70.1%) were born in Australia, 89.1% reported residing in metropolitan Melbourne, 75.9% were in full-time employment and 51.0% had completed tertiary education. The majority of men reported their sexual identity as homosexual (84.2%) or bisexual (11.8%) and were either extensively engaged (42.4%) or moderately engaged with the gay community (38.6%) (Table 1). Men’s sexual risk behaviours, HIV testing history, and STI testing history are summarised in Table 2 by self-reported and test detected HIV status.

HIV prevalence – test detected
Of the 639 men, 61 provided specimens that were HIV positive (9.5%, 95% CI 7.5%-12.0%). HIV prevalence increased significantly with increasing age up until age 50 and then fell slightly; 2.6%, 7.7%, 17.3% and 14.6% in 18-29, 30-39, 40-49 and 50+ year olds, respectively (Table 1). In univariable analyses, test detected HIV positive status (n=61) was significantly associated with being recruited from SOPVs, older age, receiving ‘a pension/social security benefits’ or being unemployed, reporting knowing someone with HIV, reporting having a HIV positive current regular partner, high risk sexual practices (multiple sexual partners, UAIC, group sex) and infrequent HIV and STI testing (Table 3). HIV prevalence was highest among men reporting areas of residence in rural or regional Victoria (16.7%) compared to metropolitan Melbourne (9.5%) and other/interstate (6.7%), however this difference was not significant (Table 1). Multivariable logistic regression showed independent associations between a positive HIV result and being older (≥40 years), reporting UAIC in the past six months, reporting group sex with regular and/or casual partners in the past six months and reporting having HIV positive regular partner, after adjusting for recruitment site and residential location (Table 3).
Table 1. Demographics and engagement with gay men by self-report HIV status and test detected HIV result (n=639)

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Self-report HIV Status</th>
<th>HIV Status</th>
<th>Test Detected HIV Status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>HIV+/Total</td>
<td>(%)</td>
<td>HIV+/Total</td>
</tr>
<tr>
<td><strong>Recruitment site</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bars/Clubs</td>
<td>14 / 257</td>
<td>5.5</td>
<td>19 / 275</td>
</tr>
<tr>
<td>SOPVs</td>
<td>26 / 360</td>
<td>7.2</td>
<td>42 / 364</td>
</tr>
<tr>
<td><strong>Age group (years)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-29</td>
<td>2 / 193</td>
<td>1.0</td>
<td>5 / 195</td>
</tr>
<tr>
<td>30-39</td>
<td>6 / 180</td>
<td>3.3</td>
<td>14 / 181</td>
</tr>
<tr>
<td>40-49</td>
<td>21 / 150</td>
<td>14.0</td>
<td>26 / 150</td>
</tr>
<tr>
<td>50+</td>
<td>11 / 87</td>
<td>12.6</td>
<td>13 / 89</td>
</tr>
<tr>
<td>Median age</td>
<td>45 / 36</td>
<td></td>
<td>44 / 36</td>
</tr>
<tr>
<td><strong>Country of birth</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>32 / 448</td>
<td>7.1</td>
<td>43 / 452</td>
</tr>
<tr>
<td>Other</td>
<td>8 / 162</td>
<td>4.9</td>
<td>15 / 162</td>
</tr>
<tr>
<td><strong>Residential location</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metropolitan Melbourne</td>
<td>35 / 520</td>
<td>6.7</td>
<td>50 / 524</td>
</tr>
<tr>
<td>Rural &amp; Regional Victoria</td>
<td>2 / 18</td>
<td>11.1</td>
<td>3 / 18</td>
</tr>
<tr>
<td>Interstate/Other</td>
<td>2 / 45</td>
<td>4.4</td>
<td>3 / 45</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anglo-Australian</td>
<td>23 / 336</td>
<td>6.9</td>
<td>31 / 339</td>
</tr>
<tr>
<td>Other</td>
<td>17 / 274</td>
<td>6.2</td>
<td>27 / 276</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary or less</td>
<td>11 / 176</td>
<td>6.3</td>
<td>19 / 177</td>
</tr>
<tr>
<td>Further / Vocational</td>
<td>9 / 106</td>
<td>8.5</td>
<td>12 / 107</td>
</tr>
<tr>
<td>Degree/postgraduate</td>
<td>19 / 324</td>
<td>5.9</td>
<td>26 / 326</td>
</tr>
<tr>
<td><strong>Employment</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed (Full/Part Time)</td>
<td>27 / 508</td>
<td>5.3</td>
<td>45 / 512</td>
</tr>
<tr>
<td>Unemployed*</td>
<td>5 / 77</td>
<td>6.5</td>
<td>5 / 77</td>
</tr>
<tr>
<td>Pensioner/social security benefits</td>
<td>7 / 22</td>
<td>31.8</td>
<td>7 / 22</td>
</tr>
<tr>
<td><strong>Sexual identity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homosexual / Bisexual</td>
<td>39 / 594</td>
<td>6.6</td>
<td>58 / 612</td>
</tr>
<tr>
<td>Other **</td>
<td>1 / 23</td>
<td>4.3</td>
<td>3 / 26</td>
</tr>
<tr>
<td><strong>Social engagement with gay men</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low /Moderate</td>
<td>18 / 356</td>
<td>5.1</td>
<td>34 / 364</td>
</tr>
<tr>
<td>Extensive</td>
<td>21 / 257</td>
<td>8.2</td>
<td>26 / 268</td>
</tr>
<tr>
<td><strong>Knowing someone with HIV</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>8 / 220</td>
<td>3.6</td>
<td>12 / 221</td>
</tr>
<tr>
<td>Yes</td>
<td>32 / 325</td>
<td>9.9</td>
<td>42 / 328</td>
</tr>
<tr>
<td><strong>Acceptability of oral fluid testing</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uncomfortable / Very Uncomfortable</td>
<td>4 / 42</td>
<td>9.5</td>
<td>4 / 43</td>
</tr>
<tr>
<td>Comfortable / Very Comfortable</td>
<td>35 / 561</td>
<td>6.2</td>
<td>53 / 565</td>
</tr>
</tbody>
</table>

Unknowns excluded from table CI, confidence interval; OR, Unadjusted Odd Ratio; † p-value < 0.05. *Unemployed includes: unemployed, students and other. **Other includes: heterosexual, open-minded, sexual, undefined/unlabelled. ¥ Social Engagement is a summary variable made up of matrix of two questions, namely ‘Proportions of friends that are gay’ and ‘Time is spent with gay or homosexual men’.
HIV prevalence – self report

Of the 639 men, 40 men reported being HIV positive corresponding to a HIV self-report prevalence of 6.3% (95% CI 4.5%-8.4%), however four returned a negative HIV test result. HIV prevalence increased significantly with increasing age up until age 50 and then fell slightly; 1.0%, 3.3%, 14.0% and 12.6% in 18-29, 30-39, 40-49 and 50+ year olds, respectively (Table 1). For self-reported HIV positive status (n=40), univariable analyses showed similar correlates to those found for test detected HIV, although HIV was no longer significantly associated with being recruited from SOPVs (Table 4). Multivariable logistic regression showed independent associations between a self-reported HIV positive status and being older (aged 40 years and over), reporting UAIC in the past six months, reporting having a HIV positive regular partner and reporting any STI testing in the past 12 months, after adjusting for recruitment site and residential location (Table 4).

Comparisons between test-detected HIV status and self-reported HIV status

When we examined HIV prevalence according to the two outcome measures (self-reported vs. test detected), the prevalence of self-reported HIV (6.3%) was 1.5 times lower overall than test detected HIV prevalence (9.5%). According to the matched McNemar’s test there was a significant misclassification of HIV status through self-report (p-value <0.01). The overall lower prevalence of HIV by self-report compared to test detected was consistent across most characteristics (Table 1 & Table 2), with a few exceptions. Self-reported and test detected HIV results, were discrepant among those who reported being born outside Australia, those not identifying as homosexual or bisexual, and those reporting not having recently (in the past 12 months) tested for STIs or ever tested for HIV. Comparing the two multivariable logistic regression models, the two models were largely comparable. However, discrepant from self-reported HIV status, test detected HIV status was 1) not associated with recent STI testing (in the past 12 months); 2) associated with group sex with any partner; and 3) less strongly associated other UAIC and with older age.
Table 2. Reported sexual risk behaviours, HIV testing history, STI testing history by self-report HIV status and test detected HIV result (n=639)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Self-reported HIV+Total (40 / 639) (%)</th>
<th>Test Detected HIV+Total (61 / 639) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. sex partners (in past 6 months)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 or less</td>
<td>16 / 422</td>
<td>32 / 436</td>
</tr>
<tr>
<td>More than 10</td>
<td>23 / 188</td>
<td>28 / 192</td>
</tr>
<tr>
<td>Look for sex on the internet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>11 / 151</td>
<td>12 / 152</td>
</tr>
<tr>
<td>Occasionally / Often</td>
<td>24 / 364</td>
<td>36 / 367</td>
</tr>
<tr>
<td>Sex with regular partner in past 6 months ¥</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>23 / 326</td>
<td>34 / 340</td>
</tr>
<tr>
<td>UAI with regular partner ¥ (in past 6 months)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>7 / 126</td>
<td>15 / 132</td>
</tr>
<tr>
<td>Occasionally / Often</td>
<td>15 / 185</td>
<td>18 / 192</td>
</tr>
<tr>
<td>Group sex with regular partner (in past 6 months)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>5 / 146</td>
<td>12 / 153</td>
</tr>
<tr>
<td>Yes</td>
<td>14 / 86</td>
<td>15 / 90</td>
</tr>
<tr>
<td>Relationship with current regular partner</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Monogamous relationship</td>
<td>1 / 61</td>
<td>1 / 61</td>
</tr>
<tr>
<td>Open relationship‡</td>
<td>8 / 199</td>
<td>15 / 125</td>
</tr>
<tr>
<td>Several regular male partners*</td>
<td>3 / 26</td>
<td>4 / 26</td>
</tr>
<tr>
<td>HIV status of current regular partner</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td>3 / 142</td>
<td>11 / 143</td>
</tr>
<tr>
<td>Positive</td>
<td>9 / 18</td>
<td>8 / 18</td>
</tr>
<tr>
<td>Don’t know</td>
<td>1 / 57</td>
<td>2 / 57</td>
</tr>
<tr>
<td>Sex with casual partner in past 6 months ¥</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>35 / 496</td>
<td>52 / 511</td>
</tr>
<tr>
<td>UAI with casual partner ¥ (in past 6 months)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>10 / 305</td>
<td>20 / 316</td>
</tr>
<tr>
<td>Occasionally / Often</td>
<td>25 / 168</td>
<td>32 / 172</td>
</tr>
<tr>
<td>Group sex with casual partner (in past 6 months)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>6 / 219</td>
<td>13 / 222</td>
</tr>
<tr>
<td>Yes</td>
<td>29 / 256</td>
<td>38 / 259</td>
</tr>
<tr>
<td>None</td>
<td>8 / 227</td>
<td>15 / 231</td>
</tr>
<tr>
<td>Disclose of HIV status to casual partners</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some</td>
<td>19 / 157</td>
<td>23 / 158</td>
</tr>
<tr>
<td>All</td>
<td>8 / 83</td>
<td>11 / 83</td>
</tr>
<tr>
<td>Disclose of HIV status by casual partners</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>9 / 239</td>
<td>18 / 243</td>
</tr>
<tr>
<td>Some / All</td>
<td>25 / 230</td>
<td>32 / 232</td>
</tr>
<tr>
<td>Received PEP in the past 6 months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>37 / 551</td>
<td>52 / 555</td>
</tr>
<tr>
<td>Yes</td>
<td>2 / 29</td>
<td>3 / 29</td>
</tr>
<tr>
<td>Any STI test in past 12 months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1 / 140</td>
<td>7 / 140</td>
</tr>
<tr>
<td>Yes</td>
<td>36 / 446</td>
<td>48 / 449</td>
</tr>
<tr>
<td>Ever had a HIV Test²</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>0 / 142</td>
<td>6 / 142</td>
</tr>
<tr>
<td>Yes</td>
<td>40 / 475</td>
<td>53 / 475</td>
</tr>
<tr>
<td>If Yes to ever had a HIV test</td>
<td></td>
<td></td>
</tr>
<tr>
<td>In the past 12 months</td>
<td>28 / 320</td>
<td>32 / 320</td>
</tr>
<tr>
<td>HIV testing history**</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Between 1-4 yrs ago</td>
<td>3 / 74</td>
<td>6 / 74</td>
</tr>
<tr>
<td>More than 4 years ago</td>
<td>7 / 36</td>
<td>9 / 36</td>
</tr>
</tbody>
</table>

Unknowns excluded from table, CI, confidence interval; OR* Unadjusted Odd Ratio; † p-value < 0.05, ¥ not mutually exclusive; ‡ Open relationship refers to either/both my partner & I have casual sex with other men; * several male regular partners refers to more than one regular male partner ** based on last HIV antibody test, exclude those never tested.
Table 3. Correlates of HIV Infection: Univariable and multivariable logistic regression model of factors related to test detected HIV status (n=639)

<table>
<thead>
<tr>
<th>Self-Report Survey Data</th>
<th>Univariable OR (95% CI)</th>
<th>Multivariable Adjusted OR &amp; (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recruitment site</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bars/clubs</td>
<td>1.0</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>SOPVs</td>
<td>1.8 (1.0 – 3.1)†</td>
<td>1.3 (0.6 – 2.6)</td>
<td>0.49</td>
</tr>
<tr>
<td>Residential location</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Metropolitan Melbourne</td>
<td>1.0</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Other*</td>
<td>1.0 (0.4 – 2.4)</td>
<td>0.9 (0.3 – 2.4)</td>
<td>0.82</td>
</tr>
<tr>
<td>Age group</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 40 years</td>
<td>1.0</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>&gt;=40 years</td>
<td>3.7 (2.1 – 6.5)†</td>
<td>2.7 (1.4 – 5.2)†</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Employment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed (Full/Part Time)</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployed**</td>
<td>0.7 (2.8 – 1.9)†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pensioner/social security benefits</td>
<td>4.8 (1.9 – 12.5)†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knowing someone with HIV</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>2.6 (1.3 – 5.0)†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. sex partners (in past 6 months)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 or less</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>More than 10</td>
<td>2.2 (1.3 – 3.7)†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>UAI with casual partner (in past 6 months)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1.0</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>3.6 (2.1 – 6.3)†</td>
<td>3.0 (1.6 – 5.6)†</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Group Sex with any partner (in past 6 months)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1.0</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>2.0 (1.6 – 5.1)†</td>
<td>2.1 (1.0 – 4.2)†</td>
<td>0.04</td>
</tr>
<tr>
<td>HIV status of current regular partner (in past 6 months)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative/Don't know</td>
<td>1.0</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>Positive</td>
<td>11.7 (5.1 – 26.7)†</td>
<td>10.0 (3.7 – 26.7)†</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>HIV testing history</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>In the past 12 months</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 12 months ago</td>
<td>1.4 (0.7 – 2.6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never tested</td>
<td>0.4 (0.2 – 0.9)†</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any STI test in past 12 months</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>2.9 (1.1 – 7.4)†</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Unknowns excluded from table. CI, confidence interval; OR, Unadjusted Odd Ratio; † p-value < 0.05 ¥ Adjusted OR for recruitment site and area of residence. Other include Rural/Regional Victoria, Interstate and other. **Unemployed includes: unemployed, students and other. ***Group sex with regular and/or casual partners. ****Men without a regular partner were classified as Negative/Don’t know. Ω Hosmer-Lemeshow goodness-of-fit test.
Characteristics of undiagnosed HIV positive cases

Of the 61 men testing HIV positive, 36 men self-reported as HIV-positive (four of the men self-reporting as HIV-positive returned a HIV-negative test results), 19 self-reported as HIV-negative, with six men did not report their HIV status at all. Of these 19 undiagnosed HIV positive men, six (31.6%) reported no HIV testing history, six (31.6%) reported their last HIV test as more than 12 months ago and seven (36.8%) reported a HIV test in the past 12 months. Almost a third of men (31.6%) with undiagnosed HIV reported more than 10 sex partners and over half (52.9%) reported unprotected anal intercourse (UAI) with casual partners in past six months. The majority (80.0%) reported group sex in the past six months. Almost two thirds (63.1%) of undiagnosed HIV positive men reported being ‘very confident’ or ‘confident’ in knowing their HIV status.
Table 4. Correlates of HIV Infection: Univariable and multivariable logistic regression model of factors related to self-reported HIV Status (n=639)

<table>
<thead>
<tr>
<th>Self-Report Survey Data</th>
<th>Univariable OR (95% CI)</th>
<th>Multivariable Adjusted OR ¥ (95% CI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recruitment site</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bars/clubs</td>
<td>1.0</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>SOPVs</td>
<td>1.3 (0.7 – 2.6)</td>
<td>1.3 (0.5 – 3.3)</td>
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</tr>
<tr>
<td><strong>Residential location</strong></td>
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<td>1.0</td>
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<tr>
<td>Other*</td>
<td>1.0 (0.3 – 2.7)</td>
<td>0.8 (0.2 – 3.7)</td>
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<td><strong>Age group</strong></td>
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<td>&lt; 40 years</td>
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<td>1.0</td>
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<tr>
<td>&gt;=40 years</td>
<td>7.1 (3.2 – 15.7) †</td>
<td>8.0 (3.0 – 21.1) †</td>
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<tr>
<td><strong>Employment</strong></td>
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<td>Employed (Full/Part Time)</td>
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<tr>
<td>Unemployed**</td>
<td>0.7 (0.3 – 1.9)</td>
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<tr>
<td>Pensioner/social security benefits</td>
<td>4.8 (1.9 – 12.5) †</td>
<td></td>
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<tr>
<td><strong>Knowing someone with HIV</strong></td>
<td></td>
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<tr>
<td>No</td>
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<tr>
<td>Yes</td>
<td>2.9 (1.3 – 6.4) †</td>
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<td><strong>No. sex partners</strong> (in past 6 months)</td>
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<td>10 or less</td>
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<tr>
<td>More than 10</td>
<td>3.5 (1.8 – 6.9) †</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>UAI with casual partner</strong> (in past 6 months)</td>
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<td></td>
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<td>6.5 (2.8 – 15.3) †</td>
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<tr>
<td>Yes</td>
<td>4.0 (1.8 – 8.5) †</td>
<td></td>
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</tr>
<tr>
<td><strong>HIV status of current regular partner</strong></td>
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<td></td>
<td></td>
</tr>
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<tr>
<td>Positive</td>
<td>20.9 (8.8 – 49.4) †</td>
<td>26.7 (7.5 – 95.8) †</td>
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</tr>
<tr>
<td><strong>HIV testing history</strong></td>
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</tr>
<tr>
<td>In the past 12 months</td>
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<td></td>
</tr>
<tr>
<td>&gt; 12 months ago</td>
<td>1.1 (0.5- 2.4)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never tested</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Any STI test in past 12 months</strong></td>
<td></td>
<td></td>
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<td>No</td>
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</tr>
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<td>12.2 (1.7 – 89.8) †</td>
<td>10.8 (1.4- 83.7)</td>
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Goodness of fit=0.9993Ω

Unknowns excluded from table, *Other include Rural/Regional Victoria, Interstate and Other **Group sex with regular and/or casual partners ***Men without a regular partner were classified as Negative/Don’t know. CI, confidence interval; OR, Unadjusted Odd Ratio; †p-value < 0.05 ¥ Adjusted OR for recruitment site and area of residence, Ω Hosmer-Lemeshow goodness-of-fit test.
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Discussion

This is the first study to assess biological HIV prevalence among gay men in social and sex venues in Melbourne, Australia. Test detected biological HIV prevalence was 9.5% (95% CI 7.5-12.0), while self-reported HIV prevalence was 6.3% (95% CI 4.5%-8.4%). We found a significant discrepancy between test detected biological and self-report HIV status in our study, with 19 men (31.1% of all men testing positive for HIV) unaware of their HIV infection. Men with undiagnosed HIV commonly reported high risk sexual behaviour for the transmission of HIV and infrequent HIV testing patterns. Although numbers were small, we noted that the discrepancy in prevalence was more pronounced among particular participants and independent correlates of HIV varied across self-reported and test detected HIV status. While our sample may not be representative all gay men ² and may be considered high-risk given the proportion of SOPV recruited men, sample demographics and sexual risk behaviours are largely comparable with other Australian studies ⁹¹¹²⁴. Recruitment protocols were also likely to have provided a sample representative of gay men most at risk of HIV ²⁵ and better placed to meet the study aims.

The test detected biological HIV prevalence of 9.5% is similar to that reported in the only other community-based HIV prevalence study conducted among gay men in Australia (8.8%)¹¹ and in the UK (9.1%) ²⁶, though slightly lower than studies in the US (12.1% - 19%) ¹6²⁷. The self-report prevalence of 6.3% in our study is consistent with previous HIV prevalence estimates in Australia based on self-report surveillance data which vary between ~5-10% ⁹²⁸²⁹. Despite a high proportion of men accurately self-reporting their HIV status, 31% (19/61) of HIV positive participants in this study were unaware of their infection. Importantly undiagnosed HIV infections are known to contribute disproportionately to new transmissions ⁹ and pose a serious threat to the effectiveness of sero-sorting strategies for reducing HIV transmission ³⁰. However, given the relatively small numbers of undiagnosed infections in this study (n=19), results should be interpreted cautiously. This study provided useful data on the prevalence and characteristics of undiagnosed infection that can only be captured by the addition of a biological outcome to behavioural surveillance data. Such data can be used to target men who may be more likely to have undiagnosed HIV with initiatives to promote regular testing and prevent secondary transmissions.

In the context of a HIV prevalence estimate approaching 10% in this sample and continuing high rates of other STIs in this population ¹, further consideration of the effectiveness of current HIV testing as prevention approaches in Australia is warranted. Current Australian testing guidelines recommend HIV testing annually for sexually active gay men and more frequent testing (3-6 monthly) for men at ‘high risk’³¹. Despite these recommended testing frequencies applying to a
large proportion of our study sample, most men reported much lower than the recommended testing rates with only 52% reporting recent (within the past 12 months) HIV testing. Although previous self-reported annual HIV testing rates among gay men in Australia are high (60%-70%)\(^24\)\(^ {32,33}\) compared to other countries (e.g., ~40.0% in the UK\(^ {34}\)), our findings suggest that current HIV testing rates may be insufficient to limit the impact of undiagnosed HIV on transmissions among Australian gay men.

A range of strategies should be considered to address self-perceived and structural barriers\(^ {35}\) to testing and increase the frequency of HIV testing among gay men in Australia. Greater awareness of the need for more frequent testing through health promotion should be considered, including enhancing awareness of personal risk profiles in driving testing frequency. Optimising clinical systems should also be explored such as utilising nurses or peer-educators for testing or using recall systems and electronic prompts to encourage more frequent testing patterns. The use of new technologies, including text messaging\(^ {36}\) and computer based-technology\(^ {37}\) have shown positive results in improving clinic attendance and short-term behavioural outcomes. For men who have never tested, it may be worth exploring other testing models such as community-based sites\(^ {38}\) and HIV rapid testing\(^ {39}\). Unlike many other countries\(^ {38}\)\(^ {40,41}\), Australia does not offer rapid testing as part of HIV screening despite increasing evidence of strong consumer and provider support for this form of testing\(^ {42,43}\).

The collection of oral fluid specimens alongside behavioural surveys was well received with a participation rate of over 60%, similar to the annual Gay Community Periodic Surveys which do not include oral fluid testing\(^ {21}\), demonstrating a high degree of acceptability of community-based biological prevalence testing in this population. Nearly all participants reported they were ‘comfortable’ or ‘very comfortable’ with having an oral fluid sample collected for HIV testing and over 90% of participants reported that they would participate in future MCGPS if oral fluid specimens were collected. These findings suggest that it would be feasible to incorporate oral fluid specimen collection in future behavioural surveys or similar community-recruited studies. HIV testing using finger-prick and oral fluid specimen collection for estimating HIV prevalence among MSM has been widely adopted in the U.S\(^ {16}\) and throughout Europe\(^ {14}\), Africa\(^ {44}\) and Asia\(^ {45}\), to enhance surveillance systems and the accuracy of HIV estimates.

The findings in this study are subject to several limitations. The recruitment strategy and sampling method may have resulted in selection bias, thus limiting the representativeness of this sample and the generalisability of the results. Our recruitment protocol replicated only the venue-based recruitment for the MGCPS. We did not recruit at the gay fair day or ‘Midsumma Carnival’, which constitutes approximately two-thirds of MGCPS respondents. This contributed
to the higher proportion of men recruited at SOPVs compared to gay bars/clubs and thus somewhat limits direct comparisons between the two samples; although demographically the samples are very similar\textsuperscript{21,33}. But in relation to the aims of this study, given the places gay men report meeting sex partners\textsuperscript{33,35}, social venue recruitment is likely to better represent those most at risk of HIV. Reporting bias may have affected data collection; a small number of participant’s (n=4) self-reported they were HIV positive but returned a negative HIV test. The reasons for this are not clear but could relate to incorrect form completion, misinterpretation of the question, a belief that they really were HIV positive or the test result was a false negative (although unlikely given the well documented high performance of the test)\textsuperscript{22,46}. Responder bias may have also have affected data collection however, given that individual test results were not provided back to participants and, as written researcher logs and verbal feedback from recruiters suggest, only a very small proportion of men approached chose not to participate because of oral fluid specimen collection, we believe this was minimised. As the paper-based surveys were self-administered, there is no way to definitively verify men’s self-reported HIV status. This study did provide some advantages over current self-report HIV prevalence estimates in Australia; oral fluid testing provided non-invasive specimen collection allowing the measurement of the true HIV prevalence among this population in an acceptable manner.

**Conclusions**

HIV prevalence in Australian MSM remains high. Self-report HIV prevalence under estimates actual prevalence, with over 30% of HIV positive MSM in this study being unaware of their status. These data add greatly to our understanding of the HIV epidemic in Australia, by providing information about self-reported vs. test detected HIV prevalence and factors associated with HIV infection. These results also highlight the importance of ongoing HIV prevention programs to encourage regular testing to reduce high transmission rates, and also to ensure that HIV biological testing is undertaken in conjunction with community based surveys about HIV to improve HIV surveillance in Australia.
Chapter Three

Acknowledgements

We acknowledge the assistance of Sue Best from the National Serology Reference Laboratory with planning and providing assistance with the testing protocol. We also would like to acknowledge the help of the project advisory committee, particularly that of Garrett Prestage for guiding the planning and implementation of the study.

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Chapter Three

References


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Chapter Three

43. Lee D, Fairley C, Cummings R, Bush M, Read T, Chen M. Men who have sex with men prefer rapid testing for syphilis and may test more frequently using it. Sex Transm Dis 2010;37(9):557-8.


Chapter Three
Chapter Four

Chapter 4: Impact Evaluation of a ‘Testing’ Mass Media Campaign

Introduction

Alongside increases in HIV diagnoses, Australia has seen increases in diagnoses of other STIs including, syphilis, gonorrhoea and chlamydia among MSM; particularly among HIV-positive men. The interplay between STIs and HIV transmission is now well documented; bacterial infections are implicated in HIV transmission through direct biological mechanisms. 

Recent modelling of Australian HIV and STI surveillance data conclude that broad population testing coverage and an increased frequency of testing to detect primary HIV infections and undiagnosed infections is needed to reduce the impact of the HIV epidemic in Australia. This modelling also highlighted the likely significant contributions of STIs to HIV transmissions in MSM. While recent observations that younger MSM are increasingly being diagnosed with HIV and other STIs (Appendix 3) suggests a need for the diversification of health promotion strategies.

In response, a National STI campaign was launched in 2007 aiming to increase awareness of rising STIs among MSM populations and encourage regular testing. In Victoria, the Drama Downunder campaign received additional funding from the State Government for an extensive mainstream media component which included billboard advertisements and advertisements in busy public locations such as tram stops, train stations, bus stops as well as on trams, trains and buses.

This chapter describes an impact evaluation of the Victorian implementation of the Drama Downunder campaign. The evaluation utilised a triangulation of data sources, including serial cross-sectional online survey data and routinely collected surveillance data.

The study presented in this chapter represents the following published paper:
Chapter Four

Declaration for Chapter Four

Monash University

Declaration by candidate

In the case of Chapter Four, the nature and extent of my contribution to the work was the following:

<table>
<thead>
<tr>
<th>Nature of contribution</th>
<th>Extent of contribution (%)</th>
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<tr>
<td>Study design and management, data collection and analysis, results interpretation, manuscript preparation and review</td>
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The following co-authors contributed to the work. Co-authors who are students at Monash University must also indicate the extent of their contribution in percentage terms:

<table>
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<th>Name</th>
<th>Nature of contribution</th>
<th>Extent of contribution (%) for student co-authors only</th>
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<tr>
<td>Margaret Hellard</td>
<td>Study design, results interpretation, manuscript review</td>
<td>N/A</td>
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<td>Rebecca Guy</td>
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<td>Carol El-Hayek</td>
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<td>Maelenn Goulliou</td>
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<td>Jason Asselin</td>
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<tr>
<td>Mark Stoove</td>
<td>Study design, data collection and analysis, results interpretation, manuscript preparation and review</td>
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Candidate’s Signature

Date 29/05/2012
Declaration by co-authors

The undersigned hereby certify that:

(13) the above declaration correctly reflects the nature and extent of the candidate’s contribution to this work, and the nature of the contribution of each of the co-authors.
(14) they meet the criteria for authorship in that they have participated in the conception, execution, or interpretation, of at least that part of the publication in their field of expertise;
(15) they take public responsibility for their part of the publication, except for the responsible author who accepts overall responsibility for the publication;
(16) there are no other authors of the publication according to these criteria;
(17) potential conflicts of interest have been disclosed to (a) granting bodies, (b) the editor or publisher of journals or other publications, and (c) the head of the responsible academic unit; and
(18) the original data are stored at the following location(s) and will be held for at least five years from the date indicated below:

| Location(s) | Centre for Population Health, Burnet Institute |

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Stop the Drama Downunder: A social marketing campaign increases HIV/STI knowledge and testing in Australian gay men

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Abstract

Introduction: Since 2000, notifications of HIV and other sexually transmissible infections (STIs) have increased significantly in Australian gay men. We evaluated the impact of a social marketing campaign in 2008-2009 aimed to increase health-seeking behaviour and STI testing and enhance HIV/STI knowledge in gay men.

Methods: A convenience sample of 295 gay men (18-66 years of age) was surveyed to evaluate the effectiveness of the campaign. Participants were asked about campaign awareness, HIV/STI knowledge, health seeking behaviour and HIV/STI testing. We examined associations between recent STI testing and campaign awareness. Trends in HIV/STI monthly tests at three clinics with a high case load of gay men were also assessed. Logistic and Poisson regressions and $\chi^2$ tests were used.

Results: Both unaided (43%) and aided (86%) campaign awareness was high. In a multivariable logistic regression, awareness of the campaign (aided) was independently associated with having had any STI test within the past six months (PR=1.5; 95% CI=1.0-2.4). Compared to the 13-months before the campaign, clinic data showed significant increasing testing rates for HIV, syphilis and chlamydia among HIV-negative gay men during the initial and continued campaign periods.

Conclusion: These findings suggest that the campaign was successful in achieving its aims of increasing health seeking behaviour, STI testing and HIV/STI knowledge among gay men in Victoria.
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Introduction

Like many developed countries, in Australia there has been a substantial increase in new HIV diagnoses among men who have sex with men (MSM) over the past decade. Australia has a highly concentrated HIV epidemic, where each year MSM account for more than 65% of newly diagnosed and 85% of newly acquired HIV infections. There are however geographical differences in the HIV epidemiology across Australia. Victoria, with the second largest gay population in Australia, has seen the most rapidly increasing HIV epidemic. In parallel there has been a rapid re-emergence of the syphilis epidemic in MSM in Victoria.

The rise in HIV notifications in Victoria has been attributed to increases in sexual risk behaviour, increasing rates of other sexually transmitted infections (STIs) such as infectious syphilis and gonorrhoea and lack of resources to sustain health promotion and other prevention activities. Furthermore, although annual HIV testing rates are high in gay men, STI testing rates are lower, and despite guidelines recommending highly sexually active men undergo HIV/STI testing every 3-6 months, only a small proportion do so, leaving a substantial window where onward transmissions can occur.

In response there has been considerable investment in new HIV/STI prevention initiatives in Victoria in recent years, including multiple large-scale social marketing campaigns. Consumer focussed social marketing campaigns using traditional marketing techniques to promote behaviour change have been widely adopted within the HIV/AIDS sector. Key elements used in social marketing campaigns include, exchange theory (perceived costs and benefits of change), audience segmentation (messages take account of the target population’s attitudes, beliefs or behaviours), competition (behavioural options that compete with public health recommendations and services), and the ‘marketing mix’ known as the four Ps: product, price, place, and promotion.

Often there are numerous barriers to rigorous evaluation of social marketing campaigns, including the competing need to roll out campaigns quickly, especially in areas with growing epidemics, and the fact that many campaigns are delivered to an entire region or community and therefore do not allow a comparable control group. Alternative designs such as cohort studies, can provide strong inferences about a campaigns success, however, these can be costly, difficult to implement and require lengthy follow-up. More recently, ‘public health triangulation’, a process through which secondary data from multiple sources can be reviewed and utilised for monitoring and evaluating public health interventions, has received support.
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In February 2008 the ‘Drama Downunder’ social marketing campaign was launched in Victoria and aimed to increase health-seeking behaviour and testing rates in gay men, and raise HIV/STI awareness and knowledge. We assessed the impact of the campaign by establishing an online cohort of gay men and analysed HIV and other STI testing data from high caseload clinics before, during and after the campaign.

Methods

The Campaign

In February 2008, the Victorian AIDS Council/Gay Men’s Health Centre (VAC/GMHC) launched the Drama Downunder (DDU) campaign which aimed to; increase access to diagnosis, treatment and care of STIs; improve HIV/STI awareness and knowledge; and, in the long term, minimise the transmission and morbidity of STIs in gay and other homosexually active men.

The campaign was informed by formative research\(^{15}\) which revealed that, whilst well informed about HIV prevention, gay men were less knowledgeable about STIs more generally. The formative research also indicated that campaign messages delivered through ‘traditional’ gay media (e.g., gay press, posters in gay venues) were increasingly discounted as ‘old’ information. The campaign was designed to target a largely ‘diffuse’ gay population over a disperse geographical area (inner metropolitan Melbourne region) and subsequently employed tools of mainstream advertising as well as gay media and included multiple advertising channels (i.e., print and radio advertisement, printed resources, outdoor advertisements, public events and banner advertising on gay dating sites). Such an approach was novel for gay men’s prevention in Australia. The campaign also utilised innovative methods for dissemination and engaging the target audience, including novel campaign resources (e.g., fridge magnets, drink holders, underwear) and camping specific events (e.g., ‘Drama Down-underwear’ show) to encourage community engagement with the campaign. The materials included images and brief messages designed to be ‘light-hearted’ to capture the attention of the target audience (Figure 1) with referral to the website (www.thedramadownunder.info) for more detailed information.

In Phase I of the campaign (February 2008-February 2009), approximately 566 public display points were established including bus/train/tram interiors and stations and public billboards, and approximately 54,632 print resources were distributed. The development and implementation budget for the campaign was estimated at $411,755 with the majority spent on advertising ($339,145). It is also important to note that funding for DDU continued after Phase I,
with similar Phase II (March 2009 - May 2010), and Phase III (June 2010 - June 2011) implementations.

Figure 1: Drama Downunder Campaign posters.

Campaign Evaluation

The campaign was evaluated using four key indicators: campaign awareness; HIV/STI knowledge; health seeking behaviour and HIV/STI testing. Online surveys and routinely collected testing data from high caseload MSM clinics were used to provide these indicators.

Cross-sectional Data

Design

An online cohort of gay men, with rolling recruitment was established to monitor and evaluate the impact of the various HIV/STI prevention initiatives funded in 2007/2008. Men were surveyed at regular intervals (3-6 monthly) beginning September 2008, and remains ongoing. Men aged 18 years or over who self-identified as gay or homosexually active in the past five years and were able to provide informed consent were enrolled. The cohort utilised multiple recruitment methods, including recruitment at gay community venues, gay community events, participants from a recent community based HIV prevalence study (which utilised a facility-based sampling method, again recruiting from gay community social venues) and snowballing (existing cohort participants could refer their gay community peers for inclusion in the cohort).

The surveys included an online participant information and consent form and asked about participant demographics, exposure to gay media, gay community attachment, a series of questions about campaign awareness and knowledge of various prevention initiatives (including the DDU campaign), sexual health knowledge, health seeking behaviour, HIV/STI testing patterns, and the extent to which they believed various prevention activities had impacted on their health seeking behaviour and HIV/STI testing patterns. Campaign awareness was assessed both unaided (if participants were able to recall correctly specific campaign messages without prompts) and aided (prompted by a campaign image). Surveys were linked by a unique code to
allow individuals in the cohort to be identified and matched over time, enabling cross-sectional and/or longitudinal analyses of the data. Survey completion took approximately 15-20 minutes and participants were reimbursed $30 for completing each survey round.

**Analysis**

Men recruited into the cohort between September 2008 and April 2009 and who completed an online survey in any of the three survey rounds were eligible for inclusion in this analysis. Across the three survey time points a total of 295 men completed 483 surveys (S1 n=74, S2 n=167 and S3 n=242). Individuals’ first survey was extracted and analysed cross-sectionally (S1 n=74, S2 n=105 and S3 n=116). Median knowledge scores (percentage of knowledge questions answered correctly) were calculated from 15 sexual health knowledge questions. We examined associations between campaign awareness and key characteristics using \( \chi^2 \) tests for categorical variables or Wilcoxon Mann-Whitney test for median knowledge scores. Consistent with the primary aim of the campaign to increase STI testing, multivariable logistic regression was used to examine associations between campaign awareness and STI testing in the past six months while controlling for demographic and sexual behaviour covariates. Backward elimination techniques were employed.

**Clinic data**

**Design**

Routinely collected HIV, syphilis and chlamydia testing data from January 2007 to March 2010 were extracted from the Victorian Primary Care Network for Sentinel Surveillance on BBVs and STIs (VPCNSS), using data from three metropolitan high caseload MSM clinics that diagnosed ~50% of all HIV cases in Victoria between 2007-2010. The methodology for the VPCNSS has been described in detail elsewhere\(^ \text{16} \). These three clinics are considered ‘gay-friendly’ services; they are responsible for delivering the bulk of primary clinical care to HIV infected patients and a substantial proportion of testing, prevention advice and education to HIV-negative gay men locally. The clinics follow the Sexually Transmissible Infection Testing Guidelines for MSM\(^ \text{17} \), which recommend testing for HIV and other STIs at least once a year for all MSM, regardless of whether or not they have symptoms, and 3-6 monthly testing for MSM reporting specific high risk behaviours.

**Analysis**

Time series analysis using linear regression was used to assess trends in monthly HIV, syphilis and chlamydia testing in HIV-negative men across January 2007-March 2010. Poisson regression
was used to determine differences in the rate of change in monthly HIV, syphilis and chlamydia tests (incidence rate ratio – IRR) before the campaign (January 2007-January 2008), during initial campaign period (Phase I, February 2008-February 2009) and during the continued campaign period (Phase II, March 2009-March 2010). As previously mentioned, as Phase II (March 2009 - May 2010) of the DDU campaign continued on directly on from Phase I (February 2008-February 2009) a true post-campaign period was not possible to construct. Instead, we have chosen to use a continuation of the campaign as a comparison group rather than a true post-campaign period.

Ethics
Ethics approval was obtained from the Victorian Department of Health Human Research Ethics Committee and the Monash University Standing Committee on Ethics in Research Involving Humans.

Results

Survey population
A convenience sample of 295 gay men (18-66 years of age) completed online surveys between September 2008 and April 2009. Participants were predominantly recruited through gay community venues (56%), gay events (21%) and snowballing (22%). The majority of respondents identified as gay or homosexually active (96%), were born in Australia (79%), had completed tertiary studies (72%) and resided in Metropolitan Melbourne (97%) (Table 1). Over half the men reported reading the gay press (57%), visiting gay venues (67%) and using online gay dating sites on a regular basis (at least monthly) (55%) (Table 1).
### Table 1. Sample demographics, exposure to gay media and interaction with gay community, HIV/STI testing history and campaign recognition, recall and health-seeking behaviour of online sample.

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Total n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sexual Identity</strong></td>
<td></td>
</tr>
<tr>
<td>Gay/Homosexual</td>
<td>270 (96.1)</td>
</tr>
<tr>
<td><strong>Median age (range) years</strong></td>
<td>30 (18-66)</td>
</tr>
<tr>
<td>Australia-born</td>
<td>223 (79.4)</td>
</tr>
<tr>
<td><strong>Completed higher education</strong>*</td>
<td>160 (71.7)</td>
</tr>
<tr>
<td><strong>Resides in metropolitan Melbourne</strong></td>
<td>286 (97.0)</td>
</tr>
<tr>
<td><strong>HIV Negative/ Don’t know</strong></td>
<td>232 (78.6)</td>
</tr>
<tr>
<td><strong>HIV-Positive</strong></td>
<td>26 (8.8)</td>
</tr>
<tr>
<td><strong>Exposure to gay media &amp; interaction with gay community</strong></td>
<td></td>
</tr>
<tr>
<td>Read the gay press (at least monthly)</td>
<td>169 (57.3)</td>
</tr>
<tr>
<td>Attend gay community events (at least monthly)</td>
<td>61 (20.7)</td>
</tr>
<tr>
<td>Visit gay venues - bars/clubs/SOPVs (at least monthly)</td>
<td>197 (66.8)</td>
</tr>
<tr>
<td>Use online gay dating sites (at least monthly)</td>
<td>163 (55.3)</td>
</tr>
<tr>
<td><strong>HIV/STI Testing History</strong></td>
<td></td>
</tr>
<tr>
<td>Any STI testing in the past 6 months</td>
<td>165 (62.0)</td>
</tr>
<tr>
<td>HIV test in the past 6 months</td>
<td>122 (47.7)</td>
</tr>
<tr>
<td>HIV test in the past 12 months</td>
<td>169 (66.0)</td>
</tr>
<tr>
<td>Where do you usually go for HIV/STI testing/sexual health check-up</td>
<td></td>
</tr>
<tr>
<td>Sexual health clinic</td>
<td>87 (30.0)</td>
</tr>
<tr>
<td>Gay-friendly GP clinic</td>
<td>109 (37.3)</td>
</tr>
<tr>
<td>Mainstream GP clinic</td>
<td>64 (21.9)</td>
</tr>
<tr>
<td>Other****</td>
<td>11 (3.8)</td>
</tr>
<tr>
<td>Have never been tested for HIV/STI</td>
<td>21 (7.2)</td>
</tr>
<tr>
<td><strong>Unaided Campaign Awareness</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Aided DDU campaign awareness</strong></td>
<td></td>
</tr>
<tr>
<td>Where did you see this campaign image:</td>
<td>n=255</td>
</tr>
<tr>
<td>In print</td>
<td>202 (79.2)</td>
</tr>
<tr>
<td>Posters/postcards</td>
<td>110 (43.1)</td>
</tr>
<tr>
<td>Billboards</td>
<td>131 (51.4)</td>
</tr>
<tr>
<td>Outdoor Adverts**</td>
<td>147 (57.7)</td>
</tr>
<tr>
<td>Sexual Health Clinics</td>
<td>71 (27.8)</td>
</tr>
<tr>
<td>Venues (bars/clubs/SOPVs)</td>
<td>106 (41.6)</td>
</tr>
<tr>
<td>Public Events***</td>
<td>56 (22.0)</td>
</tr>
<tr>
<td><strong>Did this campaign prompt you to ...</strong></td>
<td></td>
</tr>
<tr>
<td>Discuss HIV/STI testing/transmission with GP</td>
<td>40 (16.5)</td>
</tr>
<tr>
<td>Discuss HIV/STI testing/transmission with Peers</td>
<td>60 (24.7)</td>
</tr>
<tr>
<td>Visit a sexual health clinic</td>
<td>40 (16.5)</td>
</tr>
<tr>
<td>Visit a GP clinic</td>
<td>36 (14.8)</td>
</tr>
<tr>
<td>Search for further sexual health information</td>
<td>53 (21.8)</td>
</tr>
<tr>
<td>Visit the specific DDU campaign website</td>
<td>55 (21.6)</td>
</tr>
<tr>
<td><strong>Median Knowledge Score (Out of possible 15 questions)</strong></td>
<td>10 (50.0)</td>
</tr>
</tbody>
</table>

* Higher Education includes Tertiary diploma / Trade Certificate and University degree of CAE **Outdoor adverts includes interior of buses, trams and at bus shelters, trams stops and train stations. *** Public events include. **** Other includes tertiary hospital, student health, Sauna; † p-value < 0.05 test for trend (non-linear)
Campaign awareness

Cross-sectional Data

The majority of the sample (86%) were aware of the DDU Campaign, 43% spontaneously recalled the DDU campaign when asked to list any five sexual health campaigns/campaign messages that they were aware of (unaided awareness), and an additional 45% recognised the campaign (aided awareness) when shown an campaign image. Among those aware of the campaign, campaign images were most commonly seen in the print media (79%), on billboards (51%) and outdoor advertisements (i.e., bus shelters, train stations) (58%). When prompted with a campaign image (with the campaign message blocked out) almost half (49%) were able to correctly recall at least one campaign message and the majority found the campaign visually appealing (63%). In univariable analyses, campaign awareness was significantly associated with reading the gay press on a regular basis (at least monthly), having had an STI test in the past six months, and reporting metropolitan postcode (Figure 2).

In a multivariable analysis, men aware of the campaign were significantly more likely to read the gay press on a regular basis (PR=1.2; 95%CI=1.1-1.3) and report more than five sexual partners in the past six months (PR=1.1; 95%CI=1.1-1.2).

Figure 2. Key demographics, health seeking behaviours and sexual health knowledge compared between participants aware and unaware of the DDU campaign.

Participants were classified as aware of the campaign if they could recall the campaign (aided or unaided); all other participants were classified as unaware of the campaign. *STI includes Gonorrhoea, Chlamydia and Syphilis **PEP is Post-exposure Prophylaxis, † p-value < 0.05
HIV/STI knowledge

Cross-sectional Data
Median sexual health knowledge score was not significantly different between participants aware (Median Score=10) or unaware (Median Score =9) of the campaign (p=0.14). However, men aware of the campaign were more like to correctly answer questions relating to increasing rates of syphilis over the past six years (56% vs. 43%, p<0.01), treatment of gonorrhoea, chlamydia and syphilis (83% vs. 71%, p=0.10) and pre-exposure prophylaxis (56% vs. 43%, p<0.14)(Figure 2).

Health seeking behaviour

Cross-sectional Data
Among men aware of the campaign, 16% reported that the campaign had directly prompted them to discuss HIV/STI testing and transmission with their GP and 25% with their peers; 15% reported that the campaign had directly prompted them to visit a General Practitioner (GP) clinic and 17% visit a sexual health clinic. Over a fifth of respondents reported that the campaign had directly prompted them to search for sexual health information (22%) or visit the DDU campaign website (22%) (Table 1).

HIV/STI testing

Cross-sectional Data

Correlates of STI testing in the past six months

Of those aware of the campaign, 62% reported an STI test in the past six months compared to 44% of men unaware of the campaign (Figure 2). In the multivariable logistic regression, awareness of the campaign (aided) was independently associated with having had any STI test within the past six months (PR=1.6; 95%CI=1.0 -2.4) (Table 2).
Chapter Four

<table>
<thead>
<tr>
<th>Variable</th>
<th>Any STI test*</th>
<th>Adj PR for (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes n (%)</td>
<td>No n (%)</td>
</tr>
<tr>
<td>Sexual Risk Behaviour</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Campaign Awareness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>14 (8.5)</td>
<td>18 (17.8)</td>
</tr>
<tr>
<td>Unaided</td>
<td>75 (45.5)</td>
<td>45 (44.6)</td>
</tr>
<tr>
<td>Aided</td>
<td>76 (46.1)</td>
<td>38 (37.6)</td>
</tr>
<tr>
<td>Median Knowledge Score (Score of &gt;10 out of 16)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>88 (54.0)</td>
<td>69 (69.0)</td>
</tr>
<tr>
<td>Yes</td>
<td>75 (46.0)</td>
<td>31 (31.0)</td>
</tr>
<tr>
<td>UAI** with casual partner in past 6 months</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>106 (64.2)</td>
<td>82 (81.2)</td>
</tr>
<tr>
<td>Yes</td>
<td>59 (35.8)</td>
<td>19 (18.8)</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>30 years or less</td>
<td>71 (44.7)</td>
<td>50 (53.2)</td>
</tr>
<tr>
<td>&gt; 30 years</td>
<td>88 (55.4)</td>
<td>44 (46.8)</td>
</tr>
<tr>
<td>Country of Birth</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>126 (79.3)</td>
<td>75 (79.8)</td>
</tr>
<tr>
<td>Other</td>
<td>33 (20.8)</td>
<td>19 (20.2)</td>
</tr>
</tbody>
</table>

*p in the past 6 months, **UAI- Unprotected anal intercourse; Adj PR, Adjusted Prevalence Ratio; † p-value < 0.05

Clinic data

Over the whole analysis period (between January 2007 and March 2010), 18,328 HIV, 18,855 syphilis and 18,749 chlamydia tests were conducted among HIV negative MSM attending the three high caseload VCPSS clinics (Table 3). Across the 36 month analysis period; there was a significant increase in the average monthly number of tests for HIV (p<0.01), syphilis (p<0.01) and chlamydia (p=0.01) (Figure 3). In the continued campaign period compared to the pre-campaign period there was, on average, an increase of 110 HIV, 122 syphilis and 119 chlamydia tests per month among HIV negative MSM attending the three high caseload clinics (Table 3). There was an increase in the total number of tests across the pre-campaign, initial campaign and continued-campaign period (Table 3).

Although STI testing rates increased before the campaign, Poisson regression demonstrated accelerated rates of increase in testing during the initial and the continued campaign periods (Table 3). Compared to the pre-campaign period, significant increases in testing rate for HIV (17%; p<0.01), syphilis (19%; p<0.01) and chlamydia (15%; p<0.01) were observed during the initial campaign period, and for HIV (27%; p<0.01), syphilis (29%; p<0.01) and chlamydia (28%; p<0.01) during the continued campaign period (Table 3).

Figure 3. Monthly HIV, syphilis and chlamydia tests and among HIV-negative males attending three medical clinics 2007–2010.
Table 3. Number of HIV, syphilis and chlamydia tests and among HIV-negative males attending three medical clinics across the pre-campaign, initial campaign and continued-campaign periods, 2007–2010.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No Total tests</td>
<td>Average No. tests per month</td>
<td>IRR</td>
</tr>
<tr>
<td>HIV</td>
<td>5328</td>
<td>410</td>
<td>1.0</td>
</tr>
<tr>
<td>Syphilis</td>
<td>5413</td>
<td>416</td>
<td>1.0</td>
</tr>
<tr>
<td>Chlamydia</td>
<td>5460</td>
<td>420</td>
<td>1.0</td>
</tr>
</tbody>
</table>

† p-value < 0.05 *Poisson regression comparing initial campaign period with pre-campaign period and **Poisson regression comparing continued-campaign period with pre-campaign period.
Discussion

This evaluation has demonstrated that ‘Drama Downunder’ campaign awareness was high, and two data sources showed some evidence of increased testing throughout the campaign periods, although causality cannot be assumed. Awareness of the DDU campaign was significantly associated with increases in STI testing in past six months and increases in knowledge of sexual health issues. Furthermore, ecological clinic data showed accelerated rates of HIV and other STI testing at metropolitan Melbourne high caseload MSM clinics during the initial-campaign and continued-campaign periods compared to the pre-campaign period. Although the combination of multiple data sources is a strength of this evaluation, the lack of longitudinal survey data beginning prior to campaign commencement and a reliance on routinely collected testing data with no control group means that the observed changes in testing patterns of HIV, syphilis and chlamydia among gay men cannot be directly attributed to the campaign.

High levels of campaign awareness among the target population, both unaided (43%) and aided (86%) up to 14 months following the launch of campaign suggests the campaign was effectively promoted. Levels of campaign awareness reported in this evaluation are higher than previously reported in Australia for other sexual health promotion campaigns\textsuperscript{18-20}, yet similar to successful HIV/STI prevention campaigns targeting gay men internationally\textsuperscript{11,21}. Such high levels of campaign reach may be attributed to the use of multiple channels including mainstream media and traditional gay media, emphasising the important relationships between the target audience and the channel selection\textsuperscript{22}. High exposure frequency and engagement with the campaign material is an important strategy for a successful HIV prevention campaign\textsuperscript{12,22} and were part of the guiding principles underpinning the DDU campaign design. In this evaluation, a high proportion of participants reported repeated exposure to campaign material, were able to recall specific campaign messages, and found the campaign visually appealing.

Survey data suggested that the campaign increased knowledge, prompted participants to seek sexual health information and encouraged HIV/STI testing. The multivariable analysis showed campaign awareness was associated with recent STI testing, and clinic data provided further ecological-level evidence showing steady increases in testing patterns among HIV-negative MSM during the initial and continued campaign period. Annual behavioural surveillance data across the same period (2007-2010) reported more comprehensive STI testing among HIV-negative men, with significant increases in all types of STI testing\textsuperscript{23}. Despite the already high rates of annual HIV/STI testing previously reported in Australia\textsuperscript{24}, the increase in STI/HIV testing reported in this study represents a significant change to gay men’s testing patterns with the potential to reduce rates of HIV/STI transmissions. Evaluations of two other social marketing
campaigns in the US (‘Dogs are Talking’ and ‘Healthy Penis’) have demonstrated similar associated increases in syphilis testing among gay men.11,25

It is important to note that increasing trends in HIV, syphilis and chlamydia testing among MSM reported in clinic data were evident in the period prior to the campaign implementation, although testing rates accelerated during and following the campaign period. Other factors may have been influencing gay men’s HIV/STI testing patterns prior and during the campaign periods. The increase prior to the campaign potentially reflects enhanced patient and clinician awareness about STI testing in response to an increasing syphilis epidemic since 2002, and the release and promotion of testing guidelines specifically for MSM in 200526. Alternatively, around the same time, there were two other social marketing campaigns being implemented, the ‘Protection’ campaign, (Jan–September 2008), which was designed to address issues related to risk factors in settings of unprotected anal intercourse with casual settings, and the ‘GoTest’ Syphilis Campaign (October 2007–June 2008) which was designed to raise awareness of the syphilis outbreak in Melbourne, targeting a core group of highly sexually active men. Unlike DDU which utilised mainstream advertising (including, advertisements in at train stations, bus stops, on trams and on large billboards in busy public locations), these campaigns targeted specific sub-groups of the gay community and utilised ‘traditional’ gay media channels for advertising (including gay magazines, gay radio, adverts in gay venues and peer education), thus limiting their potential campaign reach. Both these campaigns may have had impact on HIV/STI testing patterns of the target population, thus confounding our associations between the DDU campaign awareness and increasing HIV/STI testing rates.

One of the long-term aims of DDU was to reduce STI transmission. Enhanced Victorian surveillance data that includes MSM status is available for HIV, infectious syphilis and gonorrhoea notifications. These data show the annual number of infectious syphilis notifications in MSM declined from 315 cases in 2008, 320 in 2009 to 204 in 2010, while gonorrhoea notifications among MSM have increased 370, 495, 749.27 HIV notifications among MSM have remained relatively stable; 181 in 2008, 193 in 2009 and 178 in 2010.27 Explanations for divergent trends in syphilis, gonorrhoea and HIV notifications include the differentiating background prevalence or transmission risks per event for the respective diseases,28 the curable nature of STIs compared with HIV (with testing facilitating treatment), and proactive strategies to integrate syphilis testing into HIV management checks.29

The strengths of this evaluation was the combination of multiple data sources, which included cross-sectional assessments of key indicators by campaign exposure for survey data, and a before and after analysis design utilising time-series analysis for clinic data.
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There are also some limitations. The timing of the evaluation (funded in April 2008) meant that it was not possible to collect true baseline survey data from the cohort prior to campaign implementation, which limited our ability to assess causality between the campaign and the measured outcomes. The short evaluation period (nine months), the short intervals between surveys (4-5 months), and our sample size in early survey waves limited our ability to conduct a true longitudinal analysis of campaign awareness and its impact on knowledge, health seeking behaviours and STI testing. Our venue-based and snowball sampling approach also means that observations are not truly independent and may have introduced biases affecting campaign recognition. Our sample also may not be representative of all gay men; however, sample demographics are largely comparable with a national Australian gay men’s study\(^\text{30}\). In addition, as with any surveys (online, face-to-face) there may have been some reporting bias. The evaluation also included analysis of routinely collected testing data from high caseload clinics which was not tailored for the purpose of campaign evaluation, and, as with any ecological data, limits the attribution of causality. Consultation data was also not available from the clinics and thus clinician versus patient motivated testing could not be determined. Finally, in relation to the clinic data, during the campaign period one of the sentinel clinics was unable to take on new patients for a short time period due to capacity constraints, however increases in patient presentations were observed in other clinics. It is also important to note that funding for DDU continued after Phase I, with similar Phase II (March 2009 - May 2010), and Phase III (June 2010 - June 2011) implementations.

Our evaluation suggests DDU social marketing campaign engaged the target audience, increased their awareness and knowledge of HIV/STIs and led to increased health-seeking behaviours including seeking testing for STIs. The DDU campaign represented the largest campaign specifically addressing STIs among gay men yet undertaken in Victoria. The high levels of campaign recognition and recall of campaign messages along with positive feedback about the campaign indicated strong acceptance of the campaign by the gay community and highlighted the importance of formative research to develop campaigns that will appeal and resonate with the target audience.

Acknowledgements

We also would like to acknowledge the help of the project advisory committee for guiding the planning and implementation of the study.

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References


Chapter Four

Chapter Five

Chapter 5: Characteristic of successful HIV/STI testing campaign

Introduction

As health promotion approaches have evolved, a greater understanding of the complexity of health promotion activities and the corresponding need for more advanced and effective evaluation measures has arisen\(^{15}\). Furthermore, greater emphasis on combination approaches to HIV prevention\(^{128}\) has led to increased scrutiny of the effectiveness of health promotion strategies focussed on behaviour change. This has included a push to develop more robust evaluations to appropriately assess complex interventions and identify effective and ineffective components of an intervention.\(^{360-362}\) There is also recognition of the need to underpin health promotion with for strong theoretical frameworks to develop and evaluate interventions. A firm theoretical grounding can also provide an understanding of individuals’ behaviours, including the motivations and contextual factors that may impact on behaviour.

Following from the evaluation of the success of the DDU campaign, this chapter uses qualitative focus group data collected as part of the DDU evaluation to provide a more in depth understanding of men’s response to the campaign and identify key components of the campaign that resulted in the campaign’s success or that may require improvement.

The study presented in this chapter represents the following submitted paper.

# Declaration for Chapter Four

## Monash University

### Declaration by candidate

In the case of Chapter Four, the nature and extent of my contribution to the work was the following:

<table>
<thead>
<tr>
<th>Nature of contribution</th>
<th>Extent of contribution (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study design and management, data collection and analysis, results interpretation, manuscript preparation and review</td>
<td>80%</td>
</tr>
</tbody>
</table>

The following co-authors contributed to the work. Co-authors who are students at Monash University must also indicate the extent of their contribution in percentage terms:

<table>
<thead>
<tr>
<th>Name</th>
<th>Nature of contribution</th>
<th>Extent of contribution (%) for student co-authors only</th>
</tr>
</thead>
<tbody>
<tr>
<td>Margaret Hellard</td>
<td>Study design, manuscript review</td>
<td>N/A</td>
</tr>
<tr>
<td>Jason Asselin</td>
<td>Study design, manuscript review</td>
<td>N/A</td>
</tr>
<tr>
<td>Colin Batrouney</td>
<td>Study design, manuscript review</td>
<td>N/A</td>
</tr>
<tr>
<td>Peter Higgs</td>
<td>Data Analysis, manuscript review</td>
<td>N/A</td>
</tr>
<tr>
<td>Mark Stoove</td>
<td>Study design, data collection and analysis, results interpretation, manuscript preparation and review</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Candidate’s Signature: [Signature]  
Date 29/05/2012
Declaration by co-authors

The undersigned hereby certify that:

(19) the above declaration correctly reflects the nature and extent of the candidate’s contribution to this work, and the nature of the contribution of each of the co-authors.
(20) they meet the criteria for authorship in that they have participated in the conception, execution, or interpretation, of at least that part of the publication in their field of expertise;
(21) they take public responsibility for their part of the publication, except for the responsible author who accepts overall responsibility for the publication;
(22) there are no other authors of the publication according to these criteria;
(23) potential conflicts of interest have been disclosed to (a) granting bodies, (b) the editor or publisher of journals or other publications, and (c) the head of the responsible academic unit; and
(24) the original data are stored at the following location(s) and will be held for at least five years from the date indicated below:

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<thead>
<tr>
<th>Location(s)</th>
<th>Centre for Population Health, Burnet Institute</th>
</tr>
</thead>
</table>

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<tr>
<th>Signatures</th>
<th>Date</th>
</tr>
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<tr>
<td>Margaret Hellard</td>
<td>29/05/2012</td>
</tr>
<tr>
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<tr>
<td>Peter Higgs</td>
<td>30/05/2012</td>
</tr>
<tr>
<td>Mark Stoove</td>
<td>29/05/2012</td>
</tr>
</tbody>
</table>
No Drama: Using Social Marketing Techniques to improve the delivery of HIV/STI mass media campaigns.

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²Department of Epidemiology and Preventive Medicine, Melbourne, Vic, Australia;

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Abstract

Introduction: Since 2000, notifications of HIV and other sexually transmissible infections (STIs) have increased significantly in Australian gay men. We qualitatively examined gay men’s impressions of a national social marketing campaign to identify key campaign characteristics that affected knowledge and awareness of HIV/STIs, health-seeking behaviour change and community dialogue.

Methods: This paper presents findings from six evaluation focus groups held with 49 participants over 2008-2009. Participants were recruited through an online cohort of gay men. Transcripts of audio recordings were analysed and coded using thematic analysis.

Results: Participants readily recalled the campaign and correctly identified the theme as encouraging regular sexual health checks. Participants found campaign messages acceptable, valuing the humour, light-hearted nature and informal language used in the campaign. A busy broadcast schedule and the use of mainstream media channels, in particular outdoor advertisements, were perceived as crucial to campaign success. Participants believed these elements increased campaign reach and engagement and helped normalise sexual health testing. Participants reported limited health-seeking behaviour change, but suggested campaigns were successful in reminding them to get regular sexual health checks.

Conclusions: Campaign style, language and broadcast schedule are factors relevant to the success of future mass media sexual health campaigns targeting gay men.
Introduction

Like many developed countries, Australia has experienced substantial increases in rates of new HIV diagnoses among men who have sex with men (MSM) over the past decade; this has occurred alongside increasing rates of other sexually transmitted infections (STIs) such as syphilis and gonorrhoea. Recent local data also suggests a shift in the epidemiology of HIV within gay male populations, with younger gay men being diagnosed with HIV and other STIs at an increasing rate. Behavioural surveillance data also suggests that gay men initiating anal sex at a younger age are at greater risk of subsequent HIV infection.

As part of the HIV and other STI prevention response there has been considerable investment in new HIV/STI prevention initiatives in Australia, including a suite of the large-scale social marketing campaigns. Pivotal to the success of social marketing is rigorous market research. In combination with strong theoretical frameworks incorporating behaviour change, message effect and information processing theories, market research provides program planners with an understanding of how individuals’ beliefs, attitudes, values and their surrounding environment can impact on behaviour and identify barriers to campaign acceptability. In addition to these formative and process aspects of campaign development and delivery, continual monitoring and evaluation of campaigns are important for assessing campaign strengths and weaknesses and for measuring impact. However, numerous barriers to rigorous evaluation of social marketing campaigns exist, with most evaluations conducted under budget and time constraints, with limited access to baseline data and/or control groups. Combining quantitative and qualitative methods and triangulating data from other sources can strengthen the validity and reduce evaluation costs evaluation.

As part of the National roll out of the campaign beginning in 2007, Victoria launched the ‘Drama Downunder’ (DDU) social marketing campaign in February 2008. The quantitative evaluation of the campaign, which triangulated survey data with available surveillance data, suggested that the campaign was successful in achieving its aims of increasing health seeking behaviour, STI testing and HIV/STI knowledge among gay men in Victoria. Here we present evaluation findings from qualitative focus groups designed to examine the characteristics of the social marketing campaign to better understand what elements of the campaign appealed most to the gay men and had the most impact.
Methods

‘Drama Downunder’: Campaign Development and Implementation

In February 2008, the Victorian AIDS Council/Gay Men’s Health Centre (VAC/GMHC) launched the Drama Downunder (DDU) campaign which aimed to; increase access to diagnosis, treatment and care of STIs; improve HIV/STI awareness and knowledge; and, in the long term, minimise the transmission and morbidity of STIs in gay and other homosexually active men. Campaign development and implementation has been described previously.13

Using a social marketing approach, DDU was informed by local behavioural surveillance which revealed a significant proportion of gay men do not test regularly or undergo comprehensive HIV/STI testing and have low knowledge around STIs. Gay men participating in formative focus groups reported that previous campaigns relying on ‘traditional’ gay media (i.e. gay press, posters in gay venues) had less traction and were increasingly discounted as ‘old’ information and that new messages needed to be delivered into the mainstream for maximum impact. Consequently campaign developers utilised humour and positive imagery along with mainstream media channels to reach and engage gay men on this issue. This was a deliberate attempt to engage the target audience and present sexual health information and testing as straightforward and undemanding and move away from previous sexually explicit and anodyne or fear-based approaches.

The campaign relied heavily on outdoor advertisements with ~566 public display points including, billboards, train stations and tram stops, but was also delivered through gay media with ~54,632 print resources distributed. The accompanying campaign website (www.thedramadownunder.info) provided comprehensive information on STIs and service locations, and featured interactive components including a free SMS reminder service for sexual health checks and an anonymous email or SMS partner notification service. Phase I of the campaign ran from February 2008-February 2009, with the development and implementation budget for the campaign estimated at $411,755 with the majority spent on advertising ($339,145). Example messages that were combined with associated imagery include, “Stop the Drama Downunder! Get a sexual health check today!” and “There’s not always a smoking gun! You can have a sexually transmitted infection without symptoms” and “Sexual Health Checks, No Drama! Get a sexual health check today!”(Figure 1).
The Campaign Evaluation

As part of a larger mixed-methods evaluation, focus group discussions were carried out and analysed alongside prospectively collected online survey data and routine HIV/STI surveillance data. This qualitative evaluation aimed to provide in-depth contextual data on the acceptability and effectiveness of the campaign to better understand what elements of the campaign appealed most to the gay men and had the most impact. Focus groups were scheduled approximately six-monthly to follow each scheduled survey round. We report findings under the main themes that emerged from the focus groups and discuss them in relation to campaign awareness and recognition, community dialogue, health seeking behaviours and uptake in HIV/STI testing.

Identification and Recruitment

Focus group participants were purposively recruited from online survey participants that consented to be contacted for further evaluation. Invitations to focus groups were based on survey responses, including two age-specific focus groups, a younger gay male group (aged 25 years and under) and older gay male group (aged 40 years and over). This purposive focus group sampling aimed to ensure that the evaluation was informed by detailed and in-depth responses from a broad range of gay community participants. Survey recruitment details are described elsewhere. A total of forty nine gay men participated in six focus groups between May 2008 - November 2009.

Data collection

Focus groups ran for approximately 90 minutes and participants received verbal explanation of what participation involved and signed participant information and consent forms. Participants were reimbursed AUD $40 for their time and travelling expenses. Following initial discussion
about campaign awareness, participants were presented with campaign images and prompted for comment on content, format and style/language, the broadcasting schedule and campaign delivery, and their perceptions of the intended target audience. Participants were asked if the campaigns messages were relevant to them and their peers, and if the messages affected their sexual health knowledge, behaviour and community dialogue.

**Data Management and Analysis**

All discussions were audio recorded and transcribed. Transcripts were coded for key themes and recurring elements. Transcripts were read and reviewed multiple times by author AP before analysis commenced. Thematic analysis was used, with data coded under one or more themes.

**Ethics**

Ethics approval for focus groups was obtained from the Victorian Department of Health Human Research Ethics Committee and the Monash University Standing Committee on Ethics in Research Involving Humans.

**Results**

Of the ninety-nine participants who indicated interest in participating in a focus group, forty-nine (49%) attended one of the six focus groups. The size of each focus group ranged from four to ten participants and participant median age was 33 years (range 21-66 years). The main themes emerging from the focus groups are summarised in Table 1.

**Table 1: Key Themes emerging from qualitative focus groups with gay men.**

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Campaign Penetration

Discussion related to DDU campaign penetration could be broadly categorised into three main themes; campaign approach and content, broadcast schedule and delivery and audience segmentation.

Theme One: Campaign Approach and Content

A number of subthemes related to campaign approach and content emerged; including the clarity and relevance of the messages, humour and use of positive imagery and an absence of portrayals of the consequences of HIV/STI infection.

Message Clarity

The majority of participants could recall the campaign and clearly articulate key messages. A few participants remarked on the simple language used in the campaigns that made it easy for them to understand the message.

“There is the one that’s everywhere, the guy in the white undies, with the fire, big fire flames. The message is to get tested more often and I thought that was a good one”

“It’s very simple, direct. Usually it’s him in his underpants with a big word next to him, like Syphilis or something. So it’s pretty hard not to notice it as a sexual health campaign.”

Message Relevance

Most participants agreed that the campaign messages were both personally relevant and relevant to other gay men.

“Yeah- we’ve been in a stable relationship for 10 years and we still look at these things and think they still apply to us. If it doesn’t affect us directly it still affects our peers and people around us.”

Older gay participants reported that campaign messages were less useful for more ‘experienced’ gay men and more relevant to young gay males who may not have previously been exposed to these kinds of messages.

“Maybe cos we’re gay men that are relatively experienced in years, and we know ‘what the message is’ so perhaps we don’t read it with the same eye for detail as maybe someone newer on the scene might.”
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Humour and Positive Imagery

Participants commonly discussed how humour and a lack of explicit sexual images in the campaign gave it a light-hearted feel, allowing them to engage with the campaign without feeling guilty about their testing patterns and encouraging them to be pro-active about testing.

“The silliness of it is kind of fun, is more light-hearted and not so confronting.”

“It’s kind of tells me not to take it too seriously ... Like don’t sweat it, don’t be nervous about a sexual health check ... just do it and don’t think twice about it.”

The majority found the campaign images visually appealing and discussed how distinctive this campaign was from other sexual health campaigns because it didn’t use overtly sexual images. There was a general consensus that the over-use of sexual imagery in gay magazines and in venues meant that these campaigns were potentially ignored and dismissed as either advertisements for gay chat sites or pornography sites or disregarded as old information.

“The image grabs you attention ... I noticed it in MCV [gay community print media] ... It kind of jumped out and stayed in my mind.”

“Campaigns these days are looking too much like everything else, like lifestyle advertising. The message gets lost, the image gets lost.”

“To me it’s more like a case of Hard Selling vs. Soft Selling. Graphic images may sink into some peoples mind a little bit easier than others, some people find graphic images too confronting and just shut off. So that’s why you get campaigns like DDU- to me it’s done tastefully. It gets the message across but it doesn’t utilise graphic images.”

Consistent with the diversity in preferences for a “hard” vs. “soft” sell described above, a few participants suggested that the lack of overt sexual imagery resulted in them not initially identifying the campaign as a sexual health campaign, only after they had seen the campaign a few times did they notice DDU as a sexual health message.

“All the bus stops adverts with the guy in burning undies. I didn’t quite understand and I thought it was an underwear ad at first...”

Participants also noted the positive campaign imagery helped empower people to act or change their behaviour unlike fear campaigns that aimed to scare people into changing behaviour.

“I think it’s a good thing that they’re positive cos it pulls you in comfortably without you being fearful... gives you those messages without you being afraid.”
“Negative advertising doesn’t work... you send a negative message and you don’t empower people... You scare them but you won’t influence.”

Lack of portrayal of consequences

Endorsement of positive imagery was not universal. Some participants expressed concern regarding the lack of emphasis on the consequences and possible long-term effects of HIV/STIs.

“... there is a lot of positive imagery... in the 80’s there was a lot of negative advertising and that advertising seems to have died away. So now there is lots of positive imagery that comes out and maybe that doesn’t make you think so much about the negative consequences.”

“There are no implications, like ‘here you are bed ridden with diarrhoea for days on end’, like this is what will happen.”

Men suggested that this lack of portrayal of the consequences of HIV/STIs misrepresented the risks associated with getting infected and felt that it was important that campaigns like DDU address or dispel misconceptions about HIV/STIs and educate men regarding the possible consequence of getting infected, particularly younger gay males.

“... there is this myth that it’s not a death sentence anymore with medication, but I had a HIV positive housemate in the UK and he was a slave to his medication.”

“One of the keys to the alcohol or drink driving ads or smoking ads is that they inform you and they’re still giving you the information about how to avoid the consequences”

“... maybe there’s a misconception out there, just because he’s a 23-24, muscle, really beautiful, Greek statue doesn’t mean that he can’t be HIV positive.”

A number of participants described how their perceptions of HIV were informed largely by knowing someone with HIV. This was described as vital to their understanding of the consequences of HIV and made them more vigilant about safe sex.

“The sexy pictures are obviously getting all of our attention but it’s not until you see the consequences or you know someone with HIV that it brings it home ...”

“When I was in my early twenties, I lived with a group of people who were in their mid 30s... they all had HIV and few of them died but that experience has stayed with me but to have been told that there is a HIV morning after pill, I wonder what the message is for other people.”
Theme Two: Broadcast Schedule and Delivery

Participants often described the location in which they saw the campaign and other elements related to the broadcasting schedule and campaign delivery.

Location and Frequency

Participants identified a wide range of locations/formats where they recalled seeing the campaign, most commonly the outdoor advertisements, with many participants reporting having seen the campaign on multiple occasions.

“The Drama Down Under- it’s really common, at train stations.”

“I see it every day, tram, train, billboards.”

“Yeah more on train, trams, buses, MCV (gay street magazine).”

Development of messages over time

A number of participants also noted different versions of the campaign, recognising a development of the campaign messages over time. They commented that changes in campaign messages made them notice the campaign and kept the campaign fresh in their mind.

“Cos you basically see that ad like everyday, if not 3-5 times a day ... there are usually different ads, you’ve seen them before but they change.”

“There is a new one where the bum is at the front and twisted and the body of the torso is facing outwards... it’s new in terms of I hadn’t seen it before and then I thought maybe it’s a series.”

Theme Three: Audience Segmentation

Discussion of campaign style, messages and delivery also included discussion of the campaigns’ target audience and how campaign delivery through mainstream media possibly represented a ‘mainstreaming’ of the gay community and of sexual health campaigns.

Target Audience

When participants were prompted, many identified the campaign target audience as not just the gay community but men more broadly, and some participants considered the campaign as targeting the whole community, including heterosexual males and females.

“I think it has a broader appeal, cos it’s advertised on trams stops, bus stations and billboards and he’s more generic, not necessarily gay.”
“Everybody – not just men, I think men and women”

“I think that it was designed specifically for the gay community but incidentally it happens to also speak to people who aren’t [gay].”

Some older participants’ believed the campaign targeted younger gay men due to the young model in the campaign and the messaging. They perceived young men as more naive, with a low level of knowledge about sexual health and the consequences of HIV or STI infection.

“Mainly younger guys cos it’s a bit more light-heated, it’s not so serious and is it’s not so graphic.”

“I think that it’s good to have a younger guy model cos young people have less information, their less informed, they haven’t been around and been exposed to all the scare campaign back in the 80’s. Teenagers are starting to come out, they’re new to the scene, haven’t been sexually active as much, they might be thinking it’s just another STD that I can get treated for”

**Mainstreaming of sexual health campaigns**

Participants discussed the very public locations of campaign materials as representing a ‘mainstreaming’ of sexual health campaigns; and identified this as a possible effect of a perceived ‘mainstreaming’ of the gay community.

“I used to only see this kind of campaign in SOPVs [sex on premises venues], saunas of gay venues/pubs and now you’re seeing it everywhere. When you have stuff in the gay press or just at gay venues, there are only so many people who are going to see that, so it’s great to see that out and about.”

“Yeah – I think it’s the breaking down or the normalisation of the gay community, so there isn’t that sort of ‘This this is the gay area’ ‘This is the straight area.’ Being gay is getting, or it is normal now.”

Most men perceived this as a positive by helping frame HIV and sexual health as a community issue rather than just a gay men’s issue.

“I think it’s important that it doesn’t only target gay, cos straight people get infected as well. Cos it reinforces the idea, that HIV is only for gay men.”

“I think they’re more effective than trying to single out one particular group or sexual preference… by putting one up at a bus stop you’re actually reaching everyone. I don’t know if targeting works in general advertising anymore.”
Impact of Campaign

Focus group discussions about the impact of the campaign were guided by the campaign aims and are grouped here under the following three themes; knowledge, behaviour and community dialogue about sexual health.

**Theme One: Knowledge and Information**

There was general consensus among participants that campaign was not necessarily providing new information but rather raising awareness of HIV/STIs as a reminder of the importance of regular sexual health testing.

**Reminder and raising awareness**

Participants described how the campaigns like these were more useful in raising awareness about HIV/STIs and acting as a reminder about the importance of regular sexual health checks.

“Campaigns like this make you more aware of not just HIV/AIDS but also STIs ... promote people to get tested every now and then, just so there are safe.”

“It’s actually a reminder ... it makes you think about it. Sometimes you just wait for a visual sign to get checked, so these campaigns are good to remind you to get checked anyway.”

Although most men acknowledged that they considered themselves knowledgeable about HIV, they did admit that there were areas of sexual health where they were less knowledgeable.

“A lot of people don’t know what syphilis is, what gonorrhoea is, know how long it lasts, know what to look for. Or about PEP [Post-exposure prophylaxis] also, I think it 72hrs of cut-off time but not everyone will know that.”

**Theme Two: Behavioural Change**

Comments related to behaviour emerged out of direct questioning of campaign impact and also through discussions of the content and style of campaign messages.

**Direct effects**

There was some disagreement among participants about the direct effects of such a campaign. Most participants believed that campaign impact was limited to raising awareness rather than any direct effect on behaviour. While a few participants reported that the campaign had resulted in them visiting the campaign website, most men were unsure if campaigns like the DDU influenced decision making and changed behaviours as exemplified in the quotes below.
“Raising awareness- yes. Changing behaviour- No.”

“Yes- ideally you get tested every six months if you are sexually active ... Whether that’s from a campaign – I’m not sure. It could have some influence in my decision making but not sure.”

“It prompted me to go the website and find out more about syphilis and other stuff.”

Normalising sexual health testing
Participants commonly described how the campaign helped change their attitude towards testing by normalising sexual health testing.

“Last time I went to get an STI check up, I felt a lot more confident and comfortable, and that was since I’d seen the campaign. It was a more normal thing to do.”

“I think it’s breaking it down and making it a lot more laid back that it’s just something that you go and do every six months ... that’s just something that someone does.”

“And it normalises getting tested and sexuality.”

Theme Three: Community Dialogue
Most participants agreed that DDU was unlikely to prompt discussions, because sexual health was not something they usually discussed with friends. Some men described how, in the rare event when discussions about sexual health did occur, they were usually in response to or in connection with a recent event, surrounding themself or a friend, such as in someone having unprotected sex.

“I don’t think it’s a hush-hush topic but the popularity has died off. If I am to discuss it with my friends again, it’s only when something has happened. Like my friend had sex without a condom the other day and it scared me to talk about it but in general no.”

“The only time I ever talk about it was when a friend got HIV, and that was the only time in our circle of friends that it was discussed. And it was like, shit, this is a friend, so you think that could have been me.”

However, some noted that the use of public locations made discussion more likely.

“I would say the through the ads in MCV and with billboards at train stations, you’re probably more prompted to talk to someone cos you’re actually there with someone.”
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“I actually had a conversation that was prompted by the DDU Campaign; while we were standing by the train station. He was one of those guys who never used to think about it and he was telling me about how much more aware of it he was these days. Which I think has been partly due to this advertising.”
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Discussion

A lack of rigorous evaluation of HIV mass media campaigns have resulted in mixed evidence for their effectiveness of improving knowledge, attitudes and behaviours. This qualitative evaluation provides detail about what elements of DDU potentially drove the successful outcomes reported previously, and identifies ways in which campaigns could be improved. As the field of HIV prevention moves toward more interconnected approaches with an emphasis on a combination of complimentary strategies (biomedical, risk reduction, testing and condom reinforcement), strengthening the evidence base for large scale mass media campaigns is an important step in helping support behavioural, biomedical and structural prevention strategies. Therefore it is critical to go beyond simply quantitatively measuring campaign recognition and recall and resultant behaviour change, to include generating more detailed understandings of the features that appeal to target audiences to inform refinement of campaigns and the development of new initiatives.

Implications for Campaign Developers

Focus group data from this study suggest that the humorous approach and positive messaging of the DDU campaign was effective in the area of STI awareness and helped to reach and engage gay men, on a topic that is often perceived as ‘old’ information by this group, where previous campaigns have failed. Our focus group data also supports the use of mainstream media along with the humorous style and imagery used for the DDU campaign. The campaign appeared to normalise sexual health and reached beyond the ‘gay community’ to those less ‘gay community attached’, such as younger men, and potentially bisexual- and heterosexually-identified men; however this evaluation did not specifically collect data from all these populations. This element may become more pertinent for future HIV/STI prevention campaigns, given the recent shift in epidemiological and behavioural data demonstrating younger gay men as emerging key risk groups.

The use of humour and fear in message framing are examples of common techniques used to influence how messages produce changes in knowledge, attitudes and behaviours. One potential limitation of the campaign’s ability to impact on behaviour change identified through this evaluation was the limited portrayal of consequences associated with not getting tested. While some men did appreciate that positive messages and imagery were being used to help counter previous fear-based or heavily sexualised campaigns, most men agreed that highlighting the negative consequences associated with not getting tested was also important. This was considered particularly relevant for younger gay men who were perceived as being less
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informed about HIV/STIs and less cognisant of their personal risk. The challenge here is for campaign developers to find the right approach for their particular target group. Two recent sexual health testing campaigns implemented in San Francisco (‘Healthy Penis’; Montoya et al. 27) and Los Angeles (‘Stop the Sores’; Plant et al. 28) also utilised social marketing principles to develop and deliver their campaigns. Using a mix of positive and negative messaging as part of their ‘exchange theory’; the evaluations showed that the campaigns both encouraged syphilis testing and effectively conveyed the negative consequences of not getting tested 27,28.

Another potential limitation of the DDU campaign identified by participants was its limited ability to create or prompt community dialogue. People’s own risk perceptions are highly variable and how they make meaning of the risks they face is a complex process5; yet two important pathways that help build people’s concept of risk are representation through mass media and discussions with peers 30. Encouraging community dialogue or interpersonal communication on these topics disseminates messages further and helps the target audience to internalise and process messages and their understandings of risk 29,31,32. New communication technologies, including social media and Web 2.0 applications found in social networking sites (SNS), may have an important role to play here. SNS acts as an ‘open communication’ channel between users, fostering social interactions and helping create online communities33 and allowing greater user-generated content34. Furthermore, SNS functionality supports tailored health communication7, enabling customised interventions to be delivered to individuals or subgroups based on their health care needs and/or preferences. Such innovation would enhance the relevance of health information which has been shown to facilitate behaviour change7. The popularity of SNS (i.e. Facebook, Twitter), and online gay SNS/dating sites (i.e. Gaydar, Manhunt, Grindr), have prompted calls for health-related interventions, including health promotion campaigns, to be delivered within these spaces 35,36. Campaign developers, should consider how different media channels and communication technologies may help to increase engagement and facilitate dialogue between peers to encourage active participation in discussing, assessing and managing sexual risks.

Anti-smoking campaigns 24,37 are examples of approaches that have been successful in portraying both the specific health risks and the health benefits of behaviour change. They have also been quick to take advantage of new communication technologies, with a number of trials delivering tailored interactive web-based interventions 38,39 and SMS based interventions40,41 for smoking cessation, yielding positive results. However, it should be acknowledged that smoking cessation campaigns have been accompanied by complimentary strategies, including effective structural supports (e.g. subsidised smoking cessation programs, support services/interventions) and government legislation (e.g. health warnings on cigarette packets,
tax increases, smoke-free legislation). Sexual health campaign developers should continue to explore new ways to engage their audience and deliver tailored health promotion messages that may increase the chances of effective behaviour change. Yet, just as important is the need for mass media campaigns to be accompanied by complimentary approaches, including biomedical (e.g. ARV, PEP), behavioural (e.g. risk reduction strategies, testing and condom reinforcement) and structural (e.g. community-based testing models, rapid HIV testing).

This evaluation had some limitations. Participants who were recruited to the focus groups had completed an online survey and consented to be contacted again. Thus they may not be representative of all individuals who were exposed to the campaigns and there may be some bias in their responses due to their participation in the online survey. Participants who did not engage with the campaigns may have been less likely to be retained within the study and less likely to participate in the focus groups. However, participants were instructed at the outset of the discussion that we wished to receive all feedback (both positive and negative) and were prompted about possible negative opinions. Additionally, recall bias may have an impact on study results as participants were asked to recall any impact of the campaigns on their behaviour over the past 3-12 months.

In a separate quantitative evaluation of the DDU campaign, results showed significant increases in recent STI testing and knowledge of sexual health issues among survey participants, and routine HIV/STI surveillance data showing significant increases in testing rates for HIV, syphilis and chlamydia among HIV-negative gay men throughout the campaign period providing evidence for campaign effectiveness. Results from this study revealed that a strong brand, a busy broadest schedule, simple language and a light-hearted approach were key to campaign success and warrant consideration in future health promotion campaigns. Yet new ways to continue to engage men with sexual health, particularly younger gay males, should be considered. Together, the findings from both quantitative and qualitative studies strongly suggest that the DDU campaign was effective in raising awareness of the HIV/STIs and reiterating the importance of regular testing for gay men.
Acknowledgements

We also would like to acknowledge the help of the project advisory committee for guiding the planning and implementation of the study.

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References


Chapter Five
Chapter 6: The New Frontier: Developing & Delivering Sexual Health Promotion through Social Networking Sites

Introduction

As outlined in Chapter One and Five, web-based interventions, and more recently social networking sites, offer a novel setting to deliver sexual health promotion to a large number of MSM. However, the limited number of previously published examples of health interventions in this setting creates challenges for intervention implementation.

Evaluation findings from Chapter Five emphasised the need to diversify media channels and styles of presentation of health promotion messages to ensure future campaigns reach men who are less gay community-attached.

This chapter presents a mixed-method evaluation of the ‘Queer as F**K’ project, which trialled the delivery of sexual health promotion via SNS to gay men. The evaluation assessed the extent to which SNS can reach and engage gay and bisexual men and improve their knowledge and attitudes to sexual health, and to provide recommendations for others developing health promotion interventions in this space.

The study presented in this chapter represents the following submitted paper.
Declaration for Chapter Two

Monash University

Declaration by candidate

In the case of Chapter Six, the nature and extent of my contribution to the work was the following:

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<tr>
<td>Study design and management, data collection and analysis, results interpretation, manuscript preparation and review</td>
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The following co-authors contributed to the work. Co-authors who are students at Monash University must also indicate the extent of their contribution in percentage terms:

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<th>Name</th>
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<tr>
<td>Margaret Hellard</td>
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Candidate’s Signature

Date 29/05/2012

Declaration by co-authors
Chapter Six

The undersigned hereby certify that:

(25) the above declaration correctly reflects the nature and extent of the candidate's contribution to this work, and the nature of the contribution of each of the co-authors.
(26) they meet the criteria for authorship in that they have participated in the conception, execution, or interpretation, of at least that part of the publication in their field of expertise;
(27) they take public responsibility for their part of the publication, except for the responsible author who accepts overall responsibility for the publication;
(28) there are no other authors of the publication according to these criteria;
(29) potential conflicts of interest have been disclosed to (a) granting bodies, (b) the editor or publisher of journals or other publications, and (c) the head of the responsible academic unit; and
(30) the original data are stored at the following location(s) and will be held for at least five years from the date indicated below:

| Location(s) | Centre for Population Health, Burnet Institute |

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Queer as F**k: Reaching and Engaging Gay Men in Sexual Health Promotion through Social Networking Sites

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Abstract

**Background:** The popularity, interactivity and capacity to create and engage communities underpins the potential of social networking sites (SNS) as a platform for health promotion. However, few health promotion interventions using SNS have been trialled and even fewer rigorously evaluated. 'Queer as F**k' (QAF) began as pilot project in 2010 to deliver sexual health promotion via short ‘webisodes’ on SNS to gay men. We present a process evaluation covering the first three series of QAF.

**Methods:** Adapting evaluation methods from the health promotion, information systems and creative spheres, this process evaluation incorporated online usage statistics, interviews informed by user diary-scrabooks, and user focus groups to assess intervention reach and engagement.

**Results:** During series one to three (April 2010 to April 2011) 32 webisodes were posted on the QAF Facebook and YouTube pages. These webisodes attracted over 30,000 views, ranging from 124-3,092 views per individual episode. By April 2011, the QAF Facebook page had 2,929 predominantly males fans. Evaluation participants supported the balance of education and entertainment. They endorsed the narrative ‘soap opera’ format as an effective way to deliver sexual health messages in an engaging, informative and accessible manner that encouraged online peer discussion of sexual health and the promoted community engagement.

**Conclusion:** QAF is a successful example of exploiting the reach, interactivity and engagement potential of SNS; this process evaluation provides a model to inform the delivery and evaluation of health promotion interventions via SNS.
Introduction

The internet is increasingly recognised as a platform for health communication and education due to its enormous and growing potential reach and ability to share information unrestricted by geographical location and time.\(^1\)\(^-\)\(^3\) The advent of social media and Web 2.0 applications like social networking sites (SNS), blogs, wikis, podcasts, RSS feeds and online support groups have revolutionised internet use and dramatically changed the nature of online engagement and the cumulative time individuals spend communicating, interacting, and accessing information. Eager to capitalise on this potential, many organisations have developed online health interventions for a variety of health issues and clinical outcomes,\(^1\)\(^4\)\(^-\)\(^6\) including for HIV prevention to gay men,\(^7\)\(^-\)\(^8\) with some reporting positive outcomes.\(^10\)\(^-\)\(^12\) Yet to date, there have been very few published examples of evaluation of interventions delivered on SNS; a recent review of sexual health promotion on SNS found the vast majority of activities are unreported in the scientific literature and showed limited success in practice.\(^13\)

SNS are of particular interest for health promotion due to their enormous potential audience, reach, and interactive features. SNS allow individuals to create online profiles and connect with other users within the system.\(^14\) SNS act as an ‘open communication’ channel to foster social interactions, create online communities,\(^15\) and allow the sharing of user-generated content.\(^14\) Previous studies have shown benefits of such interactive health communication capabilities for enhancing learning.\(^16\) The adaptive and interactive features of Web 2.0 applications like SNS that allow increased user-generated content have the potential to promote active and engaged learning,\(^17\) whereby users ‘construct their own knowledge through social interaction and exploration’.\(^18\) By encouraging communication between users or creating ‘community dialogue’, SNS have the potential to encourage active learning through engagement and increases the potential to internalise and process messages.\(^19\)\(^-\)\(^21\) Additionally, using the social networking features, interventions may be able to disseminate health messages quicker through a population.\(^22\)

In 2010, we launched ‘Queer as F**K’ (QAF), an innovative and novel sexual health promotion intervention using SNS to target gay men in Victoria, Australia. We have previously published implementation recommendations based on our experience in the first phase of this project targeting young people\(^23\); this paper reports the results of the process evaluation of QAF over the initial pilot phase (series one) and through the subsequent two series. The aim of this evaluation is to assess reach, interactivity and engagement generated by QAF to inform future health interventions and evaluations using SNS.
The Queer as F**K Project

QAF originated as one arm of ‘The FaceSpace Project’, which trialled the delivery of sexual health promotion via SNS to two key at-risk groups; young people aged 16-29 years and gay men in Victoria, Australia.23 QAF was designed as a drama series featuring four fictional gay characters, with health messages delivered through short ‘webisodes’ posted on Facebook (Figure 1a), and YouTube (Figure 1b), and in accompanying online narrative.

Figure 1. Screen shots of Facebook (a) and YouTube QAF pages (b).

Between posting episodes, project staff posted questions on Facebook designed to prompt online discussion about the sexual health issues embedded in the narrative of the QAF webisodes to encourage interaction with and between QAF Facebook fans. QAF was promoted through a mix of online and offline advertising, including advertisements and editorial coverage in local gay media (Figure 2), Facebook advertisements, updates through the QAF page to fans and community engagement at public events.

Figure 2. Press ads in gay community magazine used for promotion of QAF project.

The project was a collaboration between public health researchers (Centre for Population Health, Burnet Institute), experts in user interaction with information technologies (Information

Fans refer to people who ‘like’ a Facebook page.
Chapter Six

Systems, University of Melbourne), a creative productions company (X:Machine) and a community organisation with marketing and production expertise (Victorian AIDS Council/Gay Men’s Health Centre (VAC/GMHC)).

The primary aims of QAF were to:
1. Explore the extent to which SNS can reach and engage gay and bisexual men and improve their knowledge and attitudes to sexual health; and
2. Provide recommendations of appropriate frameworks for evaluating health promotion interventions delivered via SNS.

Following the relative success of the first series of QAF (the pilot), funding to continue the series was secured. Over the first three series, sexual health promotion topics covered by QAF included sero-discordant relationships, unprotected sex, post-exposure prophylaxis (PEP), strategic positioning, sexual health testing, coming out to family, casual hook-ups, HIV disclosure, sero-conversion, alcohol and recreational drugs, and surrogacy.

Evaluation Methods

The novel functions of SNS for health promotion present a challenge for monitoring and evaluating impact. Additional dimensions to evaluate SNS-based health promotion not typically considered in traditional media approaches, such as, user interactions, functions to support interaction, and content quality and credibility have been suggested.18

To monitor and evaluate QAF we adapted and combined evaluation methods from the health promotion (e.g. focus groups), information systems (e.g. usage statistics) and creative spheres (e.g. creative/development workshops) to create a dynamic and appropriate evaluation framework18.

An iterative approach allowed QAF evaluation findings to feed back into the project implementation and evaluation, with knowledge gained from previous phases used to improve intervention delivery.

This paper describes process evaluation outcomes from series one to three (Table 1). Evaluation periods were constructed around the three series’ implementation dates (series one = 1st April 2010 – 31st August 2010, series two =1st September 2010 – 30th December 2010, series three = 1st January 2011 – 30th April 2011).
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Data Collection Methods and Analysis

Website Insight statistics
Insight statistics were downloaded from Facebook and YouTube on a weekly basis and monitored throughout the project. Facebook data included fan demographics (gender, age group, country where fan is based), usage data (unique page views, active users, photo views) and total interactions (wall posts, comments, ‘likes’ per day). A user is considered ‘active’ by Facebook when they view or engage with the QAF page or any content on the page. YouTube data included cumulative number of video views, demographics, and traffic sources, which describe where users accessed the YouTube channel from. Descriptive analysis of insight statistics assessed reach, delivery and engagement for the three evaluation periods.

Diary Scrapbook Activity (Series one only)
A small sample of QAF fans who completed an online evaluation survey were invited to participate in a diary-scrapbook activity to help evaluate the pilot series. Participants attended a face-to-face introductory briefing, received their diary-scrapbook and signed a participant and information consent form. The diary-scrapbook activity aimed to gain information about participant engagement with QAF and involved participants regularly recording their activity on the QAF sites in a diary-scrapbook for six weeks (June 8th - July 20th 2010). After six weeks participants returned their diary-scrapbook via post and participated in a follow-up interview. Interviews were conducted face-to-face, took between 30 and 50 minutes and were audio recorded. Participants were reimbursed AUD$100 in cash for participation in the diary-scrapbook activity. The diary-scrapbook follow-up interviews were thematically analysed to assess participant engagement with QAF.

Focus groups
To support the data collected through website usage statistics, we conducted a series of focus groups to provide more in-depth information on engagement and explore the perceived utility of QAF and SNS more generally for sexual health promotion. Four evaluation focus groups were conducted over the period of Series 1-3; two at the end of the pilot phase (November 2010), and one each at the end of series 2 (January 2011) and series 3 (May 2011). Participants were recruited from an online evaluation survey. Focus group schedules included themes regarding general uses of SNS, reflections on QAF (aims, content, website layout, characters), strategies to drive interaction and future improvements. Focus group participants were reimbursed AUD$50 in cash for time and travelling costs. All focus group data were recorded and transcribed. Transcripts were analysed thematically.
Table 1. Development and Evaluation framework for Queer as F**k Project

<table>
<thead>
<tr>
<th>Development Stages Description</th>
<th>Evaluation Stage</th>
<th>Data Collection Method</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Planning and preparation</strong>&lt;br&gt;• Forming and discussion among project team and advisory committee&lt;br&gt;• Obtaining ethics approval&lt;br&gt;• Devising project design, implementation, and evaluation plans&lt;br&gt;• Incorporating learnings from youth arm</td>
<td>Formative Phase&lt;br&gt;<strong>Evaluation Questions:</strong>&lt;br&gt;➢ Are we developing this in the right way?&lt;br&gt;➢ Are we delivering this in the right way?</td>
<td>➢ Feedback from youth arm&lt;br&gt;➢ Creative/Development Workshops&lt;br&gt;➢ Interactive Computer laboratory testing (series one only)&lt;br&gt;➢ Project Team Meetings</td>
</tr>
<tr>
<td><strong>2. Character and narrative development workshops</strong>&lt;br&gt;• Conducting workshops &amp; focus groups with target audience, project staff and key stakeholders&lt;br&gt;• Developing scripts, including characters, narrative and health messages</td>
<td></td>
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<tr>
<td><strong>3. Creative and online production</strong>&lt;br&gt;• Rehearsing with actors&lt;br&gt;• Filming and editing of the webisodes&lt;br&gt;• Building online sites</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>4. Series launch and promotion</strong>&lt;br&gt;Promotions included:&lt;br&gt;• Press ads in gay magazines (Figure 2)&lt;br&gt;• Editorial coverage in gay media&lt;br&gt;• Targeted online advertising (Facebook advertisements)&lt;br&gt;• Facebook updates to QAF fans&lt;br&gt;• Promotion at gay public events</td>
<td>Process Phase&lt;br&gt;<strong>Evaluation Questions:</strong>&lt;br&gt;➢ Whom did we reach?&lt;br&gt;➢ To what extent did we reach our target audience?&lt;br&gt;➢ What promotional methods were most effective for reaching out target audience?</td>
<td>➢ Website insight statistics (Facebook, YouTube)&lt;br&gt;➢ Diary Scrapbook Activity (series 1 only)&lt;br&gt;➢ Focus groups</td>
</tr>
<tr>
<td><strong>5. Intervention implementation ‘live period’</strong>&lt;br&gt;• 10-12 short webisodes per series uploaded onto the Facebook and YouTube sites (Figure 1)&lt;br&gt;• Project staff used prompt questions to encourage project fans to interact with the project pages.&lt;br&gt;• Project staff utilised functionality of SNS (comments, polls, and links) to further encourage fans interaction.</td>
<td>Process Phase&lt;br&gt;<strong>Evaluation Questions:</strong>&lt;br&gt;➢ To what extent did we engage our target audience?&lt;br&gt;➢ What impact (if any) did we have on improving the gay men’s knowledge and awareness of sexual health?</td>
<td>➢ Website Insight statistics (Facebook, YouTube)&lt;br&gt;➢ Diary Scrapbook Activity (series one only)&lt;br&gt;➢ Focus groups</td>
</tr>
</tbody>
</table>
Results

Series One (Pilot) – Trialling the Approach

Reach

Facebook Insight Statistics
At the end of the pilot phase, QAF had reached 1,320 fans. The majority of fans were male (80%) and based in Australia (87%) (Table 2). Around two thirds of male fans were aged 25-44 years (Table 2). There was a rapid increase in number of fans in April-May 2010, coinciding with initial series promotion (Figure 3). The greatest increase in fans numbers (from 782 to 1,153) coincided with Facebook advertisements (11th – 21st May 2010) (Figure 3).

YouTube Insight Statistics
At the end of the series one, the QAF YouTube Channel had received 7,297 video views. The majority of viewers (with a profile, usually only a small subset) were male (92%), located in Australia (72%), and aged 44-54 years (43%) (Table 2). The most popular video was episode one, “I’ve Never...Felched”, which covered coming out and past sexual experiences, with 1,672 video views. The next most viewed was episode two “Lady Gaga on a Disco Stick”, which covered drug use and risky sex, with 1,077 views.

Engagement and Interaction

Facebook Insight Statistics
At the end of series one the QAF page had received 6,105 unique page views, 2,642 individual video views and 526 page interactions, including 281 likes, 205 comments and 40 wall posts (Table 2). There were peaks in active users and unique pages views during the early stages of implementation, particularly during the initial promotion period (April-May 2010) then a plateau throughout the rest of the series (Figure 4). The peaks in page interactions coincided with webisode posting (Figure 5).

YouTube Insight Statistics
The QAF YouTube channel had received 7,297 video views by the end of series one, resulting in 79 subscriptions to the channel and 36 likes (Table 2).

Table 2: Key metrics from the Queer as F**k Facebook and YouTube page usage statistics.
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<table>
<thead>
<tr>
<th>Variables</th>
<th>Series 1</th>
<th>Series 2</th>
<th>Series 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Facebook Statistics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reach</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total fans at series conclusion</td>
<td>1320</td>
<td>1835</td>
<td>2929</td>
</tr>
<tr>
<td>% Male</td>
<td>80.3</td>
<td>81.5</td>
<td>84.7</td>
</tr>
<tr>
<td>Age groups (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13-17 years</td>
<td>2.2</td>
<td>2.4</td>
<td>2.2</td>
</tr>
<tr>
<td>18-24 years</td>
<td>19.1</td>
<td>18.8</td>
<td>26.4</td>
</tr>
<tr>
<td>25-34 years</td>
<td>33.0</td>
<td>34.6</td>
<td>32.3</td>
</tr>
<tr>
<td>35-44 years</td>
<td>29.8</td>
<td>27.6</td>
<td>24.0</td>
</tr>
<tr>
<td>45-54 years</td>
<td>11.9</td>
<td>12.8</td>
<td>11.3</td>
</tr>
<tr>
<td>≥55 years</td>
<td>3.9</td>
<td>3.9</td>
<td>3.6</td>
</tr>
<tr>
<td>Top Countries where fans are based (%)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>87.4</td>
<td>85.3</td>
<td>88.4</td>
</tr>
<tr>
<td>United States</td>
<td>3.5</td>
<td>4.3</td>
<td>3.8</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>3.2</td>
<td>4.3</td>
<td>3.2</td>
</tr>
<tr>
<td>Other</td>
<td>5.9</td>
<td>6.1</td>
<td>4.6</td>
</tr>
<tr>
<td><strong>Engagement and Interaction</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Page Interactions</td>
<td>526</td>
<td>942</td>
<td>927</td>
</tr>
<tr>
<td>Likes</td>
<td>281</td>
<td>546</td>
<td>495</td>
</tr>
<tr>
<td>Comments</td>
<td>205</td>
<td>380</td>
<td>413</td>
</tr>
<tr>
<td>Wall Posts</td>
<td>40</td>
<td>16</td>
<td>19</td>
</tr>
<tr>
<td>Unique Page views</td>
<td>6105</td>
<td>4898</td>
<td>5771</td>
</tr>
<tr>
<td>Video Views</td>
<td>2642</td>
<td>9608</td>
<td>9903</td>
</tr>
<tr>
<td><strong>YouTube Statistics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reach</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total series views</td>
<td>7297</td>
<td>9594</td>
<td>14466</td>
</tr>
<tr>
<td>Number of views of most popular episode</td>
<td>1672</td>
<td>831</td>
<td>1816</td>
</tr>
<tr>
<td>Proportion male (%)*</td>
<td>92.1</td>
<td>91.2</td>
<td>91.1</td>
</tr>
<tr>
<td>Age group of Male Fans(%)*¥</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13-17 years</td>
<td>0.0</td>
<td>0.0</td>
<td>0.8</td>
</tr>
<tr>
<td>18-24 years</td>
<td>6.1</td>
<td>7.3</td>
<td>4.3</td>
</tr>
<tr>
<td>25-34 years</td>
<td>8.6</td>
<td>12.6</td>
<td>7.9</td>
</tr>
<tr>
<td>35-44 years</td>
<td>21.1</td>
<td>22.3</td>
<td>25.3</td>
</tr>
<tr>
<td>45-54 years</td>
<td>43.0</td>
<td>29.4</td>
<td>37.5</td>
</tr>
<tr>
<td>≥55 years</td>
<td>13.3</td>
<td>19.5</td>
<td>15.3</td>
</tr>
<tr>
<td>Top Countries where fans are based (%)*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>71.6</td>
<td>73.2</td>
<td>67.2</td>
</tr>
<tr>
<td>United States</td>
<td>13.7</td>
<td>8.3</td>
<td>9.8</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>2.4</td>
<td>3.0</td>
<td>4.2</td>
</tr>
<tr>
<td>Saudi Arabia Ω</td>
<td>-</td>
<td>2.2</td>
<td>4.4</td>
</tr>
<tr>
<td><strong>Engagement and Interaction</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Subscribers</td>
<td>79</td>
<td>61</td>
<td>44</td>
</tr>
<tr>
<td>Likes</td>
<td>36</td>
<td>70</td>
<td>75</td>
</tr>
<tr>
<td>Favourites</td>
<td>17</td>
<td>15</td>
<td>23</td>
</tr>
<tr>
<td>Comments</td>
<td>11</td>
<td>9</td>
<td>17</td>
</tr>
<tr>
<td>Sharing</td>
<td>0</td>
<td>0</td>
<td>5</td>
</tr>
</tbody>
</table>

*Source: Facebook and YouTube insights statistics
*These variables are based on the number of users with a YouTube profile, which only account for a small proportion of the total sample.
*¥ Percentages of male fans only; so do not add up to 100%
Ω In series3 Saudi Arabia took over the UK as the third country with most video views.
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Diary Scrapbook Activity and Focus Groups

Of the ten men who were invited to participate in the diary-scrabook activity, nine completed the activity. Participants were aged between 27 and 45 years. There were 14 participants that attended focus groups, aged between 24 and 44 years. Results for the diary-scrapbook activity interviews and focus groups are presented together, as emerging themes were largely shared by both groups.

Participants reported the main reason for visiting and interacting with the QAF page was to watch webisodes. They described the webisodes as interesting and engaging and liked the interactive web-based ‘soap-opera’ style and the opportunity to discuss sexual health content on Facebook.

“I found the videos really interesting and the videos were well produced... that was the thing that drove me to go back [to the page] a few times.” (Diary participant)

“I think it’s a really useful tool for the community that allows them to interact, and talk about subjects that I don’t think really exists so there’s a real need for it.” (Diary participant)

However, participants revealed that after the initial enthusiasm for the project they tended to lose interest. There were two main reasons cited for not returning to the QAF Facebook page. First, the QAF Facebook page was not very visible among the large amount of traffic occurring on their Facebook newsfeeds. Second, there was not enough engaging content on the QAF page to keep them coming back.

“There’s so much stuff [on Facebook] that is released all the time... even if you design something really good, it’s released into this huge noise of material that’s released every day, every hour.” (Diary participant)

“The long wait between episodes and the length...it’s easy to forget about the project. And there was almost no reason to go back... I probably watched two or three times and that was it...” (Focus Group participant)

Participants also reported that the public nature of Facebook meant they were careful about what they commented on. Some participants questioned the suitability/appropriateness of Facebook as a forum for discussing sexual health.

“Maybe it was a bit odd, talking about [sexual health issues] on Facebook...it’s not really the right forum, like you’re not in the mind space to be talking about this kind of stuff” (Diary participant)

Some participants acknowledged that their usual habits or interactions on Facebook dictated the extent of their engagement with the QAF page, not necessarily the content of the project.
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“I tend not to comment a lot on Facebook anyway. The only times I tend to comment on people’s various updates and things is if I know them particularly well.” (Diary participant)

Series Two and Three – Increasing reach and engagement

Building on the success of the pilot series, and aiming to capitalise on the existing fan base, QAF continued into further series. Several changes were made to the subsequent series based on evaluation findings from series one:

<table>
<thead>
<tr>
<th>Challenges from Series One</th>
<th>Changes for subsequent series</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plateau of new fans reached by mid-season;</td>
<td>Introduction of new characters to increase/sustain engagement.</td>
</tr>
<tr>
<td>Irregular timing of episode releases;</td>
<td>Twelve episodes, posted every Wednesday at midday; compared to fortnightly in pilot</td>
</tr>
<tr>
<td>Decrease in return of fans to pages;</td>
<td>Intensified use of Facebook advertisements to target self-identified gay men;</td>
</tr>
<tr>
<td>Discussion on Facebook about the webisodes or sexual health issues was minimal, communication still largely one-way.</td>
<td>Using dramatic themes in episodes to elicit organic user-led discussion about sexual health</td>
</tr>
</tbody>
</table>

Reach

Facebook Insight Statistics

There was a steady increase in fans throughout series two and a sharp increase mid-way through series three (Figure 3). By the end of series two QAF had 2,835 fans and by the end of series three this had reached 2,929 fans. Fans continued to be predominantly male. However, the proportion of younger fans increased in series three (Table 2). While fans remained predominantly based in Australia, there were fans from over 50 countries.

YouTube Insight Statistics

At the conclusion of series three, the QAF YouTube channel had received 31,357 video views. Compared to series one, QAF increased its video views in both series 2; 9,594 views (31% increase) by the end of series two and 14,466 views (98% increase) by the end of series three. YouTube viewers remained predominantly male, resided in Australia and older aged 35-54 years.
(65%) compared to Facebook fans (Table 2). The QAF YouTube channel received almost a third of their views from other countries; including the United States, United Kingdom and Saudi Arabia (Table 2).

The most popular videos were those of series one, with the most popular being episode 5, “Sex text… call Aaron for a good time”, which deals with multiple sex partners and received 3,092 individual video views.

**Figure 3. Total Fans over time on QAF Facebook page**

![Total Fans over time on QAF Facebook page](image)

**Engagement and Interaction**

**Facebook Insight Statistics**

Compared to series one, video views and page interactions, including wall posts, comments and ‘likes’, increased during series two and three (Figure 4 and Figure 5). There were similar increases in the proportion of active fans compared with series one (Figure 6). By the second half of series three (Mar-April 2011), between 50-70% of fans were active users, interacting with the page at least monthly (Figure 6).

**Figure 4. Total number of unique page interactions (includes wall posts, comments, and ‘likes’) over time, on QAF page from series 1-3.**
Figure 5. Total number of video views over season 1-3 on a weekly basis from series 1-3.

Figure 6: Total number of weekly and monthly active fans, on QAF Facebook page.
YouTube Insight Statistics

By the end of series 3, the YouTube channel had received over 30,000 video views across all the three series, ranging from 124-3,092 views per individual episode.

Focus groups

Results from the focus groups held at the conclusion of series two and three are presented together, as they covered similar themes. Comments were not necessarily restricted to those particular series.

Overall, participants reported that the videos were appealing because they were well produced, well balanced between entertainment and education, and the characters and scenarios depicted were relatable and realistic.

“I came in at episode 4, a friend shared it with me on Facebook, and then I got hooked! I thought it was really well done ... My first impression was that it was an interesting but positive portrayal of gay culture. It had real people in it, people I would know.” (series three FG participant)

Some participants also described how the discussions that occurred on the page with other fans and with the QAF project made them feel involved and ‘gave them a voice’.

“I like that I can also share it with my friends, both gay and straight. It opens up communication with people who aren’t necessarily part of the target audience. It’s a good discussion point with friends, everyone has different opinions so it’s great to have a discussion about it.” (series three FG participant)

Others were still not comfortable with interacting with the page and preferred to just to view the videos or discussions.
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“Some episodes that I’ve really enjoyed and engaged with and I read the discussions. But I’m not at a point where I’ll write on the discussions, I don’t feel comfortable putting my view across with my name and photo there.” (series two FG participant)

Participants reported that the regular format of posting videos once a week on the same day, and the introduction of new characters, including popular celebrities, helped keep them interested and engaged with the project. However, the public nature of Facebook remained a concern and was a potential barrier for some people to engage/interact with the project.

“I think it’s missing a website, there needs to be a website for those who don’t use Facebook or YouTube or who want it to be more private. A website would be easy to access and could be anonymous, that could further engage people.” (series three FG participant)

Discussion

The ‘Queer as F**k’ project is among the first attempts to develop, implement and evaluate an online sexual health promotion intervention on SNS. This evaluation establishes ‘Queer as F**k’ as one of the most successful attempts internationally to exploit the health promotion potential of social media. As a pilot study that developed into a sustained health promotion project, this evaluation demonstrates how an iterative and reflexive approach to health promotion interventions can be applied successfully to new media. While many organisations are using SNS for health promotion, the majority are not effectively exploiting SNS functions to engage their target audiences. With the sustained number of fans, and increasing engagement over time, QAF provides a useful model for developing further health promotion interventions on SNS.

Reach

Within a relatively short period, the QAF project managed to reach almost 3,000 fans and received over 30,000 videos views. While these numbers may not appear large considering the popularity of SNS and the ability for ‘viral’ spread, when considered against other sexual health promotion activities being delivered on Facebook (median of 327 fans, range 15-111,391), and other SNS, it is considerable.

Across the three series, QAF reach continued to increase. The most successful promotion tool for reaching potential fans was Facebook advertisements, which enabled targeting of fans by age, geographical location, and sexual orientation (i.e. ‘Interested in’ males or females). Midway through series three, Facebook enhanced the targeting capabilities for their advertisements, enabling the targeting of friends of current fans. This resulted in a substantial boost in fan numbers with no additional effort required by the project team. Furthermore,
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although promotion efforts were focused locally, viewers from over 50 countries were reached, including in a considerable number of Facebook fans and YouTube viewers from the US, UK and Saudi Arabia. This result highlights the huge potential reach of SNS.

Engagement and Interaction

A key aim of QAF was to explore the use of SNS as a space for engaging gay men in interactive sexual health promotion. This evaluation showed ongoing and increasing participant engagement with QAF across series one to three, as measured through a variety of methods. Fans engaged primarily with the short webisodes in which health promotional messages were embedded, highlighting the utility of video content in engaging fans but also in delivering health messages. Key reasons for fans returning to the site and continuing to engage with the project, included the format (video drama series), the content (realistic, relatable), the quality (high production values) and the entertainment-education or ‘Edutainment’ approach. These results demonstrate the benefits of interactive health communication to engage users on health topics, particularly on sensitive issues such as sexual health. Similar findings have been described elsewhere. Furthermore, ‘Edutainment’ has emerged as a popular approach for increasing ‘functional’ learning through content that both entertains and educates.

These attributes place further emphasis on the ‘quality and credibility’ of content produced in these spaces, as SNS rely on users’ ability to assess the usefulness, utility and trustworthiness of content before they choose to engage. Given the volume of content produced on SNS, intervention designers must carefully consider the quality and credibility of content if they are to be successful in reaching and engaging their audience in a sustained manner. This evaluation provided some evidence of the importance of these attributes, as participants described the high production quality of the webisodes as a key factor in maintaining their engagement. Participants also described how the QAF Facebook page provided both impetus and space for online discussions, and encouraged interactions between fans and with project staff. Project staff (data not reported here) also commented that by the end of series three, less promoting and probing was required by project staff as there were sufficient ongoing user-led discussions.

This evaluation exposed a number of potential barriers to fan engagement. Concerns about privacy and the public nature of Facebook inhibited some people from engaging with the project. Privacy has been identified previously as a key barrier to engaging groups in an online environment, particularly on a SNS where there is a lack of anonymity and limited capacity to provide confidentiality for participants. One important consideration here is the different
opportunity that SNS can provide for different ‘types of users’ (i.e. The Creator, The Critic, The Spectator)\textsuperscript{32,33,34} to engage in a way that is comfortable to them. More in-depth evaluation designs, including more detailed content analyses of discussions that occurred on the QAF page, may offer insights to understand the characteristics and online behaviours of different types of users. Disaggregating analyses of outcome data may also help determine whether the depth of user engagement affects the overall impact of the intervention. For example, are fans that interact at a high frequency more likely to modify behaviour or have greater awareness of the relevant health issues than other fans?

The success of SNSs and other online applications to foster online communities, often through shared beliefs and values, has resulted in enthusiastic socialising and network building.\textsuperscript{34} Exploiting the functionalities of SNS in health promotion interventions to increase engagement and excite social activity around topics such as sexual health is a potentially important factor to enhance the impact of such interventions on behavioural and attitudinal change.\textsuperscript{35}

### Evaluation Learnings

A number of key evaluation learnings emerged from this project. The combination of different evaluation methodologies (usage statistics, diary-scrapping activity, focus groups) provided a rich mix of quantitative and qualitative data enabling assessment of reach, interaction and engagement. The SNS platform enabled close monitoring of user interaction with QAF via website insight statistics, which included common website usage metrics (i.e. number of fans, likes, comments, wall posts and shares, including changes over time). As suggested by Bennet et al. (2009)\textsuperscript{3} it is vital that researchers working in this area develop a key set of metrics for the monitoring of social media and SNS. A recent report by Gordon\textsuperscript{36} suggests a simple framework for planning and reporting social media metrics, ‘SEE, SAY, FEEL, DO’, which categories website usage metrics into meaningful groups to help monitor and evaluate combination campaigns. The focus of many publically funded health promotion interventions on impact necessitates the development of measurement strategies for impact evaluations of SNS health promotion interventions. However, appropriate emphasis on process evaluation will be important to determine the elements of SNS interventions that drive impact. A detailed process evaluation was crucial to the success of QAF and provided some understanding of the key elements of the intervention and the SNS platform that drove engagement with the intervention.

### Limitations

There are several limitations to this evaluation. More generally, usage data is not always complete nor provided as raw data, thus limiting further data manipulation, analysis, or
comparisons across SNS platforms or across other interventions. There were only small numbers of participants in the diary-scrapbook activity and the focus groups, and those that chose to participate may be fans more engaged with QAF. Finally, given the limited resources available to implement and evaluate QAF, a detailed qualitative content analysis of the QAF Facebook page for series one to three was not feasible. However, such an evaluation is planned for subsequent series now that additional evaluation funding has been secured.

**Conclusion/Recommendations**

‘Queer as F**k’ is one of the first attempts to develop, implement and evaluate an online intervention delivering sexual health promotion on SNS. QAF reached a substantial number of fans over a sustained period of time, as well as continuing to increase user engagement and interaction. An iterative approach to project development, implementation and evaluation allowed ongoing improvements to project delivery and expanded reach and engagement to gay men in these important social networking spaces.

**Acknowledgements**

We acknowledge the assistance of Phuong Nguyen for her work in data collection and analysis. Alisa Pedrana receives funding from the Australia Government through a National Health and Medical Research Council (NH&MRC) Public Health Postgraduate Scholarship and the Sidney Myer Health Scholarship. Margaret Hellard receives funding from the NH&MRC as a senior research fellow. The authors gratefully acknowledge Victorian Department of Health for providing funds to support this study and the contribution to this work of the Victorian Operational Infrastructure Support Program.
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Chapter 7: New Directions: Community-based HIV testing services

Introduction

Despite successful and innovative marketing approaches designed to enhance HIV and other STI testing among MSM, as presented in Chapters Four and Five, structural barriers to testing in Australia remain. In particular, the current system of conventional HIV serology testing requires men to return for test results days after providing specimens. For high-risk men, with each HIV test associated with two visits to the clinic, the implication of following current HIV and other STI testing guidelines could mean up to eight clinic visits per year for testing alone.

Rapid HIV testing could enable men to increase their frequency of HIV testing by halving the number of visits and delivery of testing in community settings offers additional advantages. In Australia HIV testing is only available through clinical settings and HIV rapid testing, up until 2011, was not supported by the National HIV Testing Policy.

To inform changes to HIV testing policy and practice in Australia, and demonstrate the benefits of alternative testing models, a systematic review of community-based models of testing for MSM, with a focus on rapid testing, was undertaken. This chapter describes some of the HIV testing outcomes and processes involved in community-based HIV testing models. This systematic review formed part of a more comprehensive review of the outcomes and consumer/provider acceptability of community based testing services that was used as a key document to inform the recent review of Australian HIV Testing Policy by the Australian Society for Sexual Health Medicine (can be accessed at http://www.ashm.org.au/images/pdfs/national%20strategies/hiv/acon_literature_review_final_version.pdf). In 2011/2012 a new National HIV Testing Policy was released; the policy now
paves the way for rapid HIV testing for screening purposes and the provision of testing in community settings.

The study presented in this chapter represents the following submitted paper.

Declaration for Chapter Seven

Monash University

Declaration by candidate

In the case of Chapter Seven, the nature and extent of my contribution to the work was the following:

<table>
<thead>
<tr>
<th>Nature of contribution</th>
<th>Extent of contribution (%)</th>
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<tbody>
<tr>
<td>Study design, data collection and analysis, results interpretation, manuscript preparation and review</td>
<td>70%</td>
</tr>
</tbody>
</table>

The following co-authors contributed to the work. Co-authors who are students at Monash University must also indicate the extent of their contribution in percentage terms:

<table>
<thead>
<tr>
<th>Name</th>
<th>Nature of contribution</th>
<th>Extent of contribution (%) for student co-authors only</th>
</tr>
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<tbody>
<tr>
<td>Mark Stoove</td>
<td>Study design, results interpretation, manuscript preparation and review</td>
<td>N/A</td>
</tr>
<tr>
<td>Anna Bowring</td>
<td>Data collection and analysis, manuscript review</td>
<td>10%</td>
</tr>
<tr>
<td>Margaret Hellard</td>
<td>Manuscript review</td>
<td>N/A</td>
</tr>
<tr>
<td>Rebecca Guy</td>
<td>Study design, results interpretation, manuscript preparation and review</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Candidate’s Signature

Date 29/05/2012
Declaration by co-authors

The undersigned hereby certify that:

(31) the above declaration correctly reflects the nature and extent of the candidate’s contribution to this work, and the nature of the contribution of each of the co-authors.
(32) they meet the criteria for authorship in that they have participated in the conception, execution, or interpretation, of at least that part of the publication in their field of expertise;
(33) they take public responsibility for their part of the publication, except for the responsible author who accepts overall responsibility for the publication;
(34) there are no other authors of the publication according to these criteria;
(35) potential conflicts of interest have been disclosed to (a) granting bodies, (b) the editor or publisher of journals or other publications, and (c) the head of the responsible academic unit; and
(36) the original data are stored at the following location(s) and will be held for at least five years from the date indicated below:

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<th>Centre for Population Health, Burnet Institute</th>
</tr>
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Community-based HIV testing in men who have sex with men (MSM): A systematic review of published outcome data.

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Abstract

Community-based HIV testing programs aim to increase testing opportunities. We used Medline, EMBASE and Cochrane databases to systematically review testing outcomes from published evaluations of community-based HIV testing programs delivered to men who have sex with men (MSM). We identified 33 papers describing 44 community-based HIV testing services; 17 were fixed-site only, five fixed-site with outreach, and 22 outreach only. The majority of services were in the US (28) and 34 offered rapid HIV antibody testing. Where outcomes were reported for MSM, the median proportion never previously tested for HIV was 34.1% (range: 7.8%-44.0%); median HIV positivity was 3.9% (range: 0.3%-60.0%); and the median return rate for confirmatory testing was 84.2% (range: 22.7%-100%), higher in fixed-site services (100%) and lower in outreach (71.5%). Community-based HIV testing services provide a HIV testing model that attracts high-risk MSM, many who have never tested before.
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Background

In many developed countries, including the UK (85%), the US (61%), and Australia (65%), men who have sex with men (MSM) account for a large proportion of newly diagnosed HIV infections and many countries have experienced recent increases in rates of newly acquired HIV infections among MSM. Frequent HIV testing allows for early diagnosis and the timely provision of clinical care and antiretroviral therapy (ART), thus reducing mortality and morbidity for infected individuals and improving life expectancy. Regular testing also makes MSM aware of their correct HIV status, helping to reduce HIV infectivity through timely antiretroviral treatment, presenting clinicians an opportunity to provide HIV prevention information to patients, and providing the individual the opportunity to modify their sexual risk behaviours appropriately to prevent further transmission.

Despite reasonably high self-reported annual testing rates among MSM in many countries, varying proportions of MSM remain untested and many high-risk men are not testing at the recommended frequency. Less than ideal HIV testing frequencies means there may be a considerable time period between HIV infection and diagnosis, resulting in a pool of MSM with an undiagnosed HIV infection. Cross-sectional studies of community-recruited MSM have reported between 15%-76% of HIV positive MSM unaware of their status.

Commonly reported barriers to HIV testing among MSM include low risk perception, fear of a positive test result, not being able to receive a result on the day, not knowing where to get tested, and concerns about stigma/discrimination. Alternative models of HIV testing are being increasingly utilised to overcome these barriers and reach men who do not regularly access clinical services, including offering testing outside conventional clinic based settings. Technical advances in rapid HIV testing have made provision of these alternative models more feasible. In the US and Europe, community models of HIV testing for MSM, often using HIV rapid tests, have been utilised widely for over ten years.

Over the past decade a body of observational research has accrued describing the outcomes of community-based HIV testing in MSM; yet to date no systematic review of such data exists. We review the findings from community-based HIV testing services to provide an overview of these services and their HIV testing outcomes.
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Methods

This systematic review was conducted according to the PRISMA statement\textsuperscript{36}.

Search strategy

Electronic bibliographic databases, Medline, EMBASE and Cochrane Library were searched from 1980 to the end of October 2010. We also conducted searches of the following journals: AIDS; Journal of Acquired Immune Deficiency Syndromes: JAIDS; Morbidity & Mortality Weekly Report; Public Health Reports; International Journal of STD & AIDS; and Sexual Health. Google Scholar was used to search for government reports or evaluations potentially not detected through other search strategies. We also checked reference lists of selected studies for potentially relevant studies.

Search terms were developed based on previously published literature.\textsuperscript{37-45} The following key terms (and variations) were used in the searches as Medical Subject Headings (MeSH) and/or as Keywords; 1) HIV or HIV infections or, AND 2) MSM or homosexual men, AND 3) Community testing or rapid testing (for full search terms see additional Appendix 1a-c).

Only English language papers were included. For each paper, we cross-checked authors’ names, study location and key findings to ensure the same data were not duplicated. Two independent reviewers screened studies for inclusion. Disagreements were resolved by discussion and consensus. If an article reported data separately for different populations or study settings, they were considered as separate, independent studies.

We defined a community-based HIV testing service as any community-based organisation (CBO) delivering HIV testing directly to clients. We excluded testing offered as part of a health insurance program, within prison systems or as part of an army service.

Inclusion criteria

Studies were included if they described any of three HIV testing outcomes - number of clients tested, HIV positivity, and HIV testing history - from community-based HIV testing services accessed by MSM. Reasons for excluding papers are detailed in Figure 1. Only published articles were included; no contact with study authors was made.
Figure 1: Search strategy and outcomes

HIV Community Testing Search Strategy

1258 records identified through Medline

2018 records identified through Embase

1542 records identified through Cochrane

117 records identified with additional search strategies

1503 Duplicate records

2034 excluded on the basis of Title or abstract review

1398 records identified with inclusion criteria

1366 records excluded based on full paper review
178 Review Articles/ Editorials/ Commentary
221 HIV surveillance system data or HIV transmission models
318 Research studies targeting non-MSM populations
95 Research/surveillance studies targeting MSM
182 Clinic Testing or testing outside MSM population
94 Costs effectiveness / acceptability studies
275 RCT comparing testing strategies in different medical settings or other evaluations of interventions
3 Abstracts only/ not enough HIV testing information

Final included n=32
Data extraction

All records meeting the inclusion criteria were reviewed and the following information abstracted; setting, target group, service type, number of services and length of time in operation, staffing, HIV testing protocols, HIV and STI tests used, laboratory set up, counselling procedures, communicating positive test results, referral to other services, and HIV testing outcomes (total tests, testing history, HIV positivity, proportion of clients receiving HIV test results and confirmatory results, performance characteristics of HIV rapid tests - sensitivity, specificity and positive predictive value (PPV)).

Analysis

We report HIV testing outcomes and testing protocols and processes. Where possible, HIV testing outcomes were stratified by client (all clients vs. MSM) and service type (fixed-site vs. outreach). Services that reported outcomes separately for fixed-site and outreach contributed data to both. Where data was available, we calculated the median and inter-quartile range of HIV testing outcomes. For publications providing sufficient information, we calculated the PPV of rapid tests compared to EIA and Western blot, with 95% confidence intervals using Stata 10.0 (StataCorp LP; College Station, Texas, USA).

Results

Study selection process

Of the 4,935 articles identified, 4,903 were excluded and the remaining 32 papers included in the review (Figure 1). These papers were published between 2000 and 2010 (median=2008) and described testing outcomes from 44 community-based HIV testing services. Two papers each from the US and the Netherlands described the same service over different reporting periods with different outcomes; one paper provided HIV testing outcomes for four services, four papers described outcomes for three services, and one paper described outcomes for two services.

Study characteristics

Table 1 summarises the characteristics of the 44 community-based HIV testing services. Services were mostly in the US (27) and Europe (12), with three services from Australia and single services from New Zealand, Hong Kong and Canada. All services were located in and serviced urban areas, with one service in the US delivering testing in urban and rural areas (for a more detailed description of included services see Appendix Table 4).
Target group
In 16 of the 44 services, testing was provided for MSM only, while the other 27 services targeted a broader population that included MSM and one service did not report any specific “target” population but reported findings for MSM (Table 1). Most services were available to people of all ages, with four services limited to those aged 18 years and over.

Service types
Half the services (22) delivered outreach only services, 17 fixed-site only services (CBO/community clinic), and five combined fixed-site and outreach services (Table 1). Fixed-site services offering outreach included outreach at venues (bathhouses, bars/clubs), mobile facilities, needle-exchange programs, homeless shelters, drug treatment facilities, youth centres, and at public events (such as gay pride days). Outreach only services included venue-based testing at clubs, bars, bathhouses (8), mobile facilities (5), and services offering outreach at multiples sites (e.g. mobile testing van at various locations) (9).
Table 1: Characteristics of the community HIV testing services (n=44)

<table>
<thead>
<tr>
<th>Category (n=44)</th>
<th>Subcategory</th>
<th>All services n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location (n=44)</td>
<td>Australia</td>
<td>3 (6.8)</td>
</tr>
<tr>
<td></td>
<td>Hong Kong</td>
<td>1 (2.3)</td>
</tr>
<tr>
<td></td>
<td>Spain</td>
<td>1 (2.3)</td>
</tr>
<tr>
<td></td>
<td>Switzerland</td>
<td>1 (2.3)</td>
</tr>
<tr>
<td></td>
<td>The Netherlands</td>
<td>3 (6.8)</td>
</tr>
<tr>
<td></td>
<td>New Zealand</td>
<td>1 (2.3)</td>
</tr>
<tr>
<td></td>
<td>United Kingdom</td>
<td>6 (13.6)</td>
</tr>
<tr>
<td></td>
<td>USA</td>
<td>28 (63.6)</td>
</tr>
<tr>
<td>Target group (n=44)**</td>
<td>Men who have sex with men (only)</td>
<td>16 (36.4)</td>
</tr>
<tr>
<td></td>
<td>Multiple populations including: MSM</td>
<td>14 (31.8)</td>
</tr>
<tr>
<td></td>
<td>Ethnic minority</td>
<td>11 (25.0)</td>
</tr>
<tr>
<td></td>
<td>Young people</td>
<td>6 (13.6)</td>
</tr>
<tr>
<td></td>
<td>Transgender</td>
<td>4 (9.1)</td>
</tr>
<tr>
<td></td>
<td>IDUs</td>
<td>4 (9.1)</td>
</tr>
<tr>
<td></td>
<td>Multiple other groups</td>
<td>10 (22.7)</td>
</tr>
<tr>
<td></td>
<td>Not reported</td>
<td>1 (2.3)</td>
</tr>
<tr>
<td>Service type (n=44)</td>
<td>Fixed-site CBO</td>
<td>8 (18.2)</td>
</tr>
<tr>
<td></td>
<td>Community clinic*</td>
<td>9 (20.5)</td>
</tr>
<tr>
<td></td>
<td>Outreach Mobile testing facility (MTF)</td>
<td>5 (11.4)</td>
</tr>
<tr>
<td></td>
<td>Venue-based outreach (bar, club, sauna)</td>
<td>8 (18.2)</td>
</tr>
<tr>
<td></td>
<td>Multiple sites (venues, MTF, homeless shelter)</td>
<td>9 (20.5)</td>
</tr>
<tr>
<td></td>
<td>Fixed-site CBO and outreach services (combination of venues)</td>
<td>5 (11.3)</td>
</tr>
<tr>
<td>Number of sites (n=44)</td>
<td>1-2</td>
<td>29 (65.9)</td>
</tr>
<tr>
<td></td>
<td>5-10</td>
<td>2 (4.6)</td>
</tr>
<tr>
<td></td>
<td>Multiple sites – number not reported</td>
<td>12 (27.3)</td>
</tr>
<tr>
<td></td>
<td>Not Specified</td>
<td>1 (2.3)</td>
</tr>
<tr>
<td>Rapid HIV testing offered (n=44)</td>
<td>Yes</td>
<td>30 (68.2)</td>
</tr>
<tr>
<td></td>
<td>Yes in parallel with conventional EIA testing</td>
<td>4 (9.1)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>10 (22.7)</td>
</tr>
<tr>
<td>Type of rapid HIV test (n=28)**</td>
<td>Abbott Determine HIV-1/2 rapid test¥</td>
<td>12 (42.9)</td>
</tr>
<tr>
<td></td>
<td>Abbott-Murex Single Use Diagnostic System for HIV-1 [SUDS]¥</td>
<td>3 (10.7)</td>
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<tr>
<td></td>
<td>Inverness Clearview HIV 1/2 STAT-PAK¥</td>
<td>1 (3.6)</td>
</tr>
<tr>
<td></td>
<td>OraSure OraQuick Advance Rapid HIV-1/2 Antibody¥</td>
<td>12 (42.9)</td>
</tr>
<tr>
<td></td>
<td>OraSure OraQuick Rapid HIV-1 Antibody¥</td>
<td>10 (35.7)</td>
</tr>
<tr>
<td></td>
<td>Uni-gold Recombigen HIV¥</td>
<td>4 (14.3)</td>
</tr>
<tr>
<td></td>
<td>Nil - (covered by service/study)</td>
<td>17 (38.6)</td>
</tr>
<tr>
<td></td>
<td>Nil + incentive received for participating.</td>
<td>11 (25.0)</td>
</tr>
<tr>
<td></td>
<td>$10-$20 payment for test</td>
<td>4 (11.4)</td>
</tr>
<tr>
<td>Cost to patient (n=32)</td>
<td>Operating hours (n=16)</td>
<td>2-5 hours/week</td>
</tr>
<tr>
<td></td>
<td>5-10 hours/week</td>
<td>1 (6.3)</td>
</tr>
<tr>
<td></td>
<td>&gt;10 hours/week</td>
<td>5 (31.3)</td>
</tr>
<tr>
<td></td>
<td>Sessions (days)/week (n=19)</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2-3</td>
<td>2 (10.5)</td>
</tr>
<tr>
<td></td>
<td>4-6</td>
<td>3 (15.8)</td>
</tr>
<tr>
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<td>No staff/shift (n=19)</td>
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</tr>
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<td></td>
<td>2-3</td>
<td>13 (68.4)</td>
</tr>
<tr>
<td>Staff types (n=26)**</td>
<td>Administrative staff</td>
<td>4 (15.4)</td>
</tr>
<tr>
<td></td>
<td>HIV counselling &amp; testing staff/counsellors</td>
<td>16 (61.5)</td>
</tr>
<tr>
<td></td>
<td>Nurses/health care workers/clinic co-ordinator</td>
<td>8 (30.8)</td>
</tr>
<tr>
<td></td>
<td>Phlebotomists</td>
<td>2 (7.7)</td>
</tr>
<tr>
<td></td>
<td>Physicians/medical officers</td>
<td>4 (15.4)</td>
</tr>
<tr>
<td></td>
<td>Psychotherapists</td>
<td>2 (7.7)</td>
</tr>
<tr>
<td></td>
<td>Sexual health educators/peer-workers/outreach workers</td>
<td>9 (34.6)</td>
</tr>
<tr>
<td></td>
<td>Social workers/case managers</td>
<td>2 (7.7)</td>
</tr>
<tr>
<td></td>
<td>Volunteers</td>
<td>4 (15.4)</td>
</tr>
</tbody>
</table>

* Community clinics refer to services that offer direct medical services to clients; for example STI/HIV testing and treatment, vaccinations, dental services and may have a licensed pharmacies or laboratory on-site. ** Target group, type of rapid test and staffing types are not mutually exclusive, so percentages do not add up to 100%. # Some studies reported offering more than one type of rapid test, therefore numbers do not add up to n=28
HIV testing processes

HIV testing protocols

HIV testing protocols of the 44 services were as follows:

- 34 services offered HIV antibody screening using a rapid HIV test at point-of-care, of which seven services also offered clients the option of conventional testing;
- 10 services collected specimens on site (two oral fluid, three oral fluid/whole blood/urine, five venous blood) but sent specimens to an external laboratory for EIA screening and Western blot.

Of the services offering both rapid and conventional testing, a few services reported developing guidelines and testing algorithms to deal with clients presenting for testing based on specific risk events likely to fall within test window periods; these clients were encouraged to have conventional testing to reduce the window period.

All 44 services provided clients with pre- and post-test counselling.

Rapid HIV tests used

Most services (34) offered rapid HIV antibody testing at the point-of-care; OraQuick Advance Rapid HIV-1/2 Antibody and Abbott Determine HIV-1/2 rapid with finger-prick blood specimen were most common. All rapid tests were 3rd generation allowing detection of HIV antibodies only. Three services utilised an algorithm with two rapid tests (one using the Determine HIV 1/2; two using Determine HIV 1/2 + OraQuick Rapid HIV-1/2) and one service three rapid tests in succession (OraQuick Rapid HIV-1/2, Uni-gold Recombigen HIV and Clearview HIV 1/2 STAT-PAK). The majority (29 of 34) of rapid testing services offered confirmatory testing only to clients with reactive or indeterminate rapid test results, two services reported confirmatory testing with a conventional EIA for all rapid tests specimens and two services did not specify.

Provision of results

Where rapid testing was provided at point-of-care, 30 of 34 received results in the same session (four services did not specify). Where conventional testing was offered, clients were required to wait between 1-2 weeks, with one service offering a reduced waiting period of three days for confirmatory results.

Thirty-five services reported how clients could receive their confirmatory results; among the fixed-site CBOs (including five with outreach services) 14 of 18 services required clients to
return to the same CBO where they were tested; the other four services provide alternative options (e.g. at partnering CBO or sexual health clinic). Among the outreach only services; nine of 14 services referred clients to a partnering CBO or clinic; and eight services provided clients with an option of either returning to the outreach site or alternative sites to receive confirmatory test results.

## HIV testing outcomes

### Number of clients tested

The median number of client tested per service was 516 (range: 21–24044); for those 16 sites that catered for MSM only, the median number of men tested was 421 (range: 21–7291). For services operating for one year or less, 1-2 years and more than three years, the number of clients tested ranged from 21-2000, 129-3171, and 52-24,044, respectively (Table 2).

### HIV positivity

The median number of positive HIV test results was 14 (range: 0-331). Median HIV positivity (calculated from confirmed tests) among all clients was 2.7% (range: 0%-54%); among 22 services that reported specific outcomes for MSM, median HIV positivity was 3.6% (range: 0.4%-35.6%); and for 16 sites that catered for MSM only, median HIV positivity was 2.3% (range: 0.4%-9.5%).

HIV positivity varied by service type; highest among all clients at fixed-sites (median=2.8%, range: 0.9%-53.8%), compared to all clients tested at outreach only services (median=1.5%, range: 0.0%-20.0%). Among MSM clients, HIV positivity was highest among MSM tested at outreach only sites (median=4.0%, range: 0.4%-18.2%), compared to MSM tested at fixed-sites (median=3.4%, range: 0.6%-35.6%).

### HIV testing history

Among the 23 services describing the proportion of clients never previously tested for HIV prior to attending services, the median was 34.0% (range: 0.8%–51.3%) in the all clients (17 services) (Figure 2a) and 24.1% (range: 7.8%–44.0%) among MSM clients (six services) (Figure 2b).
Figure 2a: Percentage of all clients reporting having never been tested for HIV prior to attending the service (n=17)

<table>
<thead>
<tr>
<th>Service type, author surname, year</th>
<th>% reported never being tested before for HIV</th>
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<tbody>
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<td>O/T</td>
<td>51.3%</td>
</tr>
<tr>
<td>O/T</td>
<td>38.4%</td>
</tr>
<tr>
<td>O/T</td>
<td>50.9%</td>
</tr>
<tr>
<td>O/T</td>
<td>0.8%</td>
</tr>
<tr>
<td>O/T</td>
<td>19.8%</td>
</tr>
<tr>
<td>O/T</td>
<td>20.3%</td>
</tr>
<tr>
<td>CBO</td>
<td>29.3%</td>
</tr>
<tr>
<td>CBO</td>
<td>45.0%</td>
</tr>
<tr>
<td>CBO</td>
<td>4.6%</td>
</tr>
<tr>
<td>CBO</td>
<td>9.5%</td>
</tr>
<tr>
<td>CBO</td>
<td>14.3%</td>
</tr>
<tr>
<td>CBO</td>
<td>34.0%</td>
</tr>
<tr>
<td>CBO</td>
<td>33.3%</td>
</tr>
<tr>
<td>CBO</td>
<td>43.0%</td>
</tr>
<tr>
<td>CBO</td>
<td>45.3%</td>
</tr>
<tr>
<td>CBO</td>
<td>36.9%</td>
</tr>
</tbody>
</table>

CBO=community-based organisation, O/T=outreach testing

Figure 2b: Percentage of MSM reporting having never been tested for HIV prior to attending the service (n=7)

<table>
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<th>Service type, author surname, year</th>
<th>% reported never being tested before for HIV</th>
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<td>O/T</td>
<td>7.8%</td>
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<td>O/T</td>
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<td>CBO</td>
<td>19.4%</td>
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<td>34.7%</td>
</tr>
<tr>
<td>CBO</td>
<td>44.0%</td>
</tr>
<tr>
<td>CBO</td>
<td>24.1%</td>
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</table>

CBO=community-based organisation, O/T=outreach testing
Performance characteristics of the rapid HIV test

Of the 34 services offering rapid testing, 19 provided sufficient information to calculate the PPV; 11 services reported PPVs of 100% (median=100%, range 67%-100%) (Table 3). Most (17) reported PPV > 90%, with two studies reporting PPV of 66.7% based on small client numbers, seven and nine respectively. The median number of false positives was 2 (range 1-17) (Table 3).

Only two of the 34 studies provided sufficient information to calculate sensitivity and specificity of the rapid tests. Both studies\textsuperscript{56,65} used the Single Use Diagnostic System (SUDS) for HIV-1 (Abbott Murex Diagnostics), with sensitivity of 85.7% and 97.3% and specificity of 99.6% and 99.6%.

Proportion of clients receiving HIV test results

Among the 14 services catering for a broader population, ten services offered rapid HIV testing and four standard testing. Of the ten offering rapid testing, four were outreach only and the median return rate for confirmatory testing was 90.8% (range: 83.6%-100.0%). Six services were fixed-sites and the median return rate for confirmatory testing was 76.5% (range: 0%-100.0%). Seven of the ten services offering rapid testing reported the percentage of HIV positive patients that accepted post-diagnosis referral, with a median of 83.6% (range: 15.0%-90.0%) (Table 2). Four services offered standard testing; two were outreach only and reported return rates for conventional test results of 40.4% and 44.0% and two were fixed-site CBOs and reported return rates of 85.0% and 90.3% (Table 2).

Among 16 services catering only for MSM, five services\textsuperscript{34,50,55,61,67,68} reported the proportion of clients that received a positive rapid test who returned for confirmatory results, with a median of 84.2% (range: 22.7%-100%). Four were outreach only services and reported a median of 84.2% (range: 22.7%-95%) and one fixed-site service reported 100% of clients had returned for confirmatory results. One service (outreach)\textsuperscript{61} offered only standard testing, reporting return rates for conventional test result of 33% (Table 2).
Chapter Seven
Table 2. HIV testing outcomes (n=44)

<table>
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<tr>
<th>Author last name, study year/s</th>
<th>Service type</th>
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<th>Never Tested (A) N (%)</th>
<th>RHT pos N (%)</th>
<th>CHT Pos (B) N (%)</th>
<th>Received CHT Result (c) N (%)</th>
<th>Accepted referral N (%)</th>
<th>n</th>
<th>Never tested A N (%)</th>
<th>RH pos N (%)</th>
<th>CHT pos N (%)</th>
<th>Received CHT result N (%)</th>
<th>Accepted referral N (%)</th>
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<td>210</td>
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## Chapter Seven

### Testing among All clients

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<th>Author last name, study year/s</th>
<th>Service type Time frame (yrs)</th>
<th>n</th>
<th>Never Tested (A) N (%)</th>
<th>RHT pos N (%)</th>
<th>CHT Pos (B) N (%)</th>
<th>Received CHT Result (c) N (%)</th>
<th>Accepted referral N (%)</th>
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<td>600 45.0</td>
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<td>129</td>
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<td>78 19.4</td>
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<td>855</td>
<td>20 2.3</td>
<td>19 2.2</td>
<td>19/20 95.0</td>
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### Testing among MSM clients

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<th>Author last name, study year/s</th>
<th>Service type Time frame (yrs)</th>
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<th>Never tested N (%)</th>
<th>RH pos N (%)</th>
<th>CHT pos N (%)</th>
<th>Received CHT result N (%)</th>
<th>Accepted referral N (%)</th>
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<tr>
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¹ Data not available
² CBO Data not available
³ O/T Data not available
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<th>Author last name, study year/s</th>
<th>Service type</th>
<th>Time frame (yrs)</th>
<th>n</th>
<th>Never Tested (A) N (%)</th>
<th>RHT pos N (%)</th>
<th>CHT Pos (B) N (%)</th>
<th>Accepted referral N (%)</th>
<th>n</th>
<th>Never tested N (%)</th>
<th>RH pos N (%)</th>
<th>CHT pos N (%)</th>
<th>Received CHT result N (%)</th>
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<td>9</td>
</tr>
<tr>
<td>Weatherburn, P 2006&lt;sup&gt;4&lt;/sup&gt;</td>
<td>CBO</td>
<td>1</td>
<td>133</td>
<td></td>
<td>43.0</td>
<td>4</td>
<td>3.0</td>
<td>3</td>
<td>2.3</td>
<td>53</td>
<td>2</td>
<td>3.8</td>
<td></td>
</tr>
<tr>
<td>Weatherburn, P 2006&lt;sup&gt;5&lt;/sup&gt;</td>
<td>CBO</td>
<td>&lt;1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>316</td>
<td>n/s</td>
<td>24.1</td>
<td>10 (1 PPI)</td>
<td>3.2</td>
<td>9</td>
</tr>
<tr>
<td>Weatherburn, P 2006&lt;sup&gt;6&lt;/sup&gt;</td>
<td>CBO</td>
<td>&lt;1</td>
<td>235</td>
<td></td>
<td>49.1</td>
<td>7 (2 PPI)</td>
<td>2.9</td>
<td>2</td>
<td>0.9</td>
<td>0/2</td>
<td>0</td>
<td>17</td>
<td>0</td>
</tr>
<tr>
<td>Weatherburn, P 2006&lt;sup&gt;7&lt;/sup&gt;</td>
<td>CBO</td>
<td>&lt;1</td>
<td>246</td>
<td></td>
<td>45.3</td>
<td>8 (1 PPI)</td>
<td>3.25</td>
<td>6</td>
<td>2.4</td>
<td>6/6</td>
<td>100</td>
<td>93</td>
<td>3</td>
</tr>
<tr>
<td>Weatherburn, P 2006&lt;sup&gt;8&lt;/sup&gt;</td>
<td>CBO</td>
<td>1</td>
<td>283</td>
<td></td>
<td>36.9</td>
<td>9</td>
<td>3.2</td>
<td>8</td>
<td>2.8</td>
<td>5/8</td>
<td>62.5</td>
<td>153</td>
<td>8</td>
</tr>
<tr>
<td>Woods, W 2000</td>
<td>O/T</td>
<td>12</td>
<td>162</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>No RHT</td>
<td>N/S</td>
<td>4.0</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<sup>y</sup> those included in analysis
<sup>¥</sup> = unconfirmed rapid test, due to patient not providing a sample for confirmatory testing, excluded from test performance analysis (specificity, sensitivity, positive predictive value)
<sup>**</sup> De La Fuente, L 2009 had 2 initial indeterminate rapid test results that were late confirmed negative, for confirmatory testing, included as negative from test performance analysis (positive predictive value)
<sup>€</sup> Schulden, J et al. 2008 Service provision targets transgender people, inclusive of Transsexual, Transgender/transgenderist, Bi-gender/gender-bender, Gender-queer, Cross-dresser/transvestite, Drag queen, Female impersonator.
<sup>†</sup> Hilton et al. (2002). Used non-rapid urine testing, and reported initial urine test results and follow up confirmatory results (Western blot). Initial urine test results reported in RHT column.
<sup>#</sup> Percentage is calculated from total sample population, as total number of MSM not reported.
CBO=Community based organisation, VCT = Voluntary Counselling & Testing Centre, O/R=Outreach, RHT=rapid HIV test, CHT=confirmatory HIV test, pos=positive, neg= negative FP=false positive, Id=indeterminate U/C=unconfirmed rapid test, PPV=Positive predictive value, PPI= Prior Positive Ineligible for testing; PPE= Prior Positive Eligible for testing, newly diag= newly diagnosed, I/D to calculate = insufficient data to calculate test performance.

A. Testing history prior to being tested at CBO/service.
B. Of all clients confirmed positive by CHT
C. Of all clients who received CHT result
### Table 3. Performance of rapid HIV tests (n=19)

<table>
<thead>
<tr>
<th>Author last name, study year/s</th>
<th>Service type</th>
<th>Initial RHT</th>
<th>Unconfirmed / Prior + / Missing</th>
<th>I/D</th>
<th>Valid RHT (A)</th>
<th>CHT</th>
<th>False posn</th>
<th>False negn</th>
<th>RHT performance characteristics</th>
<th>Confidence Intervals</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIDS Concern, 2008</td>
<td>CBO</td>
<td>16</td>
<td>0</td>
<td>0</td>
<td>16</td>
<td>16</td>
<td>0</td>
<td>0</td>
<td>Sensitivity (B) (CI) Specificity (C) (CI) PPV (D)</td>
<td>79.4 – 100*</td>
</tr>
<tr>
<td>Bowles, K. E 2008</td>
<td>CBO</td>
<td>331</td>
<td>40 u/c + 5 missing</td>
<td>2</td>
<td>284</td>
<td>267</td>
<td>17</td>
<td>-</td>
<td>I/D I/D 267/284 = 94.0</td>
<td>90.6 – 96.5</td>
</tr>
<tr>
<td>Bucher, J. B 2007</td>
<td>CBO</td>
<td>189</td>
<td>9 u/c</td>
<td>180</td>
<td>178</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>I/D I/D 178/180 = 98.9</td>
<td>96.0 – 99.9</td>
</tr>
<tr>
<td>Daskalakis, D 2009</td>
<td>O/T</td>
<td>20</td>
<td>0</td>
<td>19</td>
<td>1</td>
<td>1</td>
<td>1*</td>
<td>-</td>
<td>I/D I/D 19/20 = 95</td>
<td>75.1 – 99.9</td>
</tr>
<tr>
<td>De La Fuente, L 2009</td>
<td>O/T</td>
<td>70</td>
<td>12 u/c</td>
<td>58</td>
<td>56</td>
<td>2</td>
<td>-</td>
<td>-</td>
<td>I/D I/D 56/58 = 96.6</td>
<td>88.1 – 99.6</td>
</tr>
<tr>
<td>Huebner, D.M 2010</td>
<td>O/T</td>
<td>13</td>
<td>0</td>
<td>13</td>
<td>13</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>I/D I/D 13/13 = 100</td>
<td>75.3 – 100*</td>
</tr>
<tr>
<td>Keenan, P. A 2001</td>
<td>O/T</td>
<td>9</td>
<td>6</td>
<td>3</td>
<td>1</td>
<td>85.7</td>
<td>(42.1 – 99.6)</td>
<td>99.6</td>
<td>(98.8 – 99.9)</td>
<td>6/9 = 66.7</td>
</tr>
<tr>
<td>Schwappach, D. L 2008</td>
<td>CBO</td>
<td>14</td>
<td>0</td>
<td>14</td>
<td>14</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>I/D I/D 14/14 = 100</td>
<td>76.8 – 100*</td>
</tr>
<tr>
<td>Shrestha, R 2008 1</td>
<td>PHC</td>
<td>15</td>
<td>0</td>
<td>15</td>
<td>15</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>I/D I/D 15/15 = 100</td>
<td>78.2 – 100*</td>
</tr>
<tr>
<td>Shrestha, R 2008 2</td>
<td>CBO</td>
<td>5</td>
<td>0</td>
<td>5</td>
<td>5</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>I/D I/D 5/5 = 100</td>
<td>47.8 – 100*</td>
</tr>
<tr>
<td>Shrestha, R 2008 3</td>
<td>O/T</td>
<td>20</td>
<td>0</td>
<td>19</td>
<td>19</td>
<td>1</td>
<td>-</td>
<td>-</td>
<td>I/D I/D 19/20 = 95</td>
<td>75.1 – 99.9</td>
</tr>
<tr>
<td>Smith, L 2006</td>
<td>O/T</td>
<td>77</td>
<td>2 missing</td>
<td>5</td>
<td>77</td>
<td>73</td>
<td>6</td>
<td>2</td>
<td>97.3 Ω (90.5 – 99.7) 99.6 Ω (99.1 – 99.8)</td>
<td>71/77 = 92.2</td>
</tr>
<tr>
<td>van Loon, S 2008 3</td>
<td>CBO</td>
<td>141</td>
<td>2</td>
<td>141</td>
<td>141</td>
<td>2</td>
<td>2***</td>
<td>I/D I/D 141/143 = 98.6</td>
<td>95.0 – 99.8</td>
<td></td>
</tr>
<tr>
<td>Weatherburn, P 2006 1</td>
<td>CBO</td>
<td>17</td>
<td>1 u/c</td>
<td>16</td>
<td>16</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>I/D I/D 16/16 = 100</td>
<td>79.4 – 100*</td>
</tr>
<tr>
<td>Weatherburn, P 2006 2</td>
<td>CBO</td>
<td>4</td>
<td>1 u/c</td>
<td>3</td>
<td>3</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>I/D I/D 3/3 = 100</td>
<td>29.2 – 100*</td>
</tr>
</tbody>
</table>
## Chapter Seven

<table>
<thead>
<tr>
<th>Author last name, study year/s</th>
<th>Service type</th>
<th>Initial RHT</th>
<th>Unconfirmed / Prior + / Missing</th>
<th>I/D</th>
<th>Valid RHT (A)</th>
<th>CHT</th>
<th>False pos</th>
<th>False neg</th>
<th>Sensitivity (B) (CI)</th>
<th>Specificity (C) (CI)</th>
<th>PPV(^d) (D)</th>
<th>Confidence Intervals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weatherburn, P 2006 (^3)</td>
<td>CBO</td>
<td>10</td>
<td>1 u/c</td>
<td>9</td>
<td>9</td>
<td>I/D</td>
<td>I/D</td>
<td>I/D</td>
<td>9/9 = 100</td>
<td></td>
<td></td>
<td>66.4 – 100*</td>
</tr>
<tr>
<td>Weatherburn, P 2006 (^4)</td>
<td>CBO</td>
<td>7</td>
<td>2 PP + 2 u/c</td>
<td>3</td>
<td>2</td>
<td>I/D</td>
<td>I/D</td>
<td>2/3 = 66.7</td>
<td></td>
<td></td>
<td></td>
<td>9.4 – 99.2*</td>
</tr>
<tr>
<td>Weatherburn, P 2006 (^5)</td>
<td>CBO</td>
<td>8</td>
<td>1 PP + 1 u/c</td>
<td>6</td>
<td>6</td>
<td>I/D</td>
<td>I/D</td>
<td>6/6 = 100</td>
<td></td>
<td></td>
<td></td>
<td>54.1 – 100*</td>
</tr>
<tr>
<td>Weatherburn, P 2006 (^6)</td>
<td>CBO</td>
<td>9</td>
<td>1 u/c</td>
<td>8</td>
<td>8</td>
<td>I/D</td>
<td>I/D</td>
<td>8/8 = 100</td>
<td></td>
<td></td>
<td></td>
<td>63.1 – 100*</td>
</tr>
</tbody>
</table>

\(^*\) those included in analysis

\(^\#\) = Indeterminate results on rapid test, included in test performance analysis (specificity, sensitivity, positive predictive value)

\(^\times\) = unconfirmed rapid test, due to patient not providing a sample for confirmatory testing, excluded from test performance analysis (specificity, sensitivity, positive predictive value)

** Daskalakis, D 2009; reported 19 confirmed rapid tests, and 1 false positive. However 1 participant who had a negative rapid test result received a diagnosis of acute HIV infection by use of pooled HIV viral load testing this participant, providing 1 false negative; however this participant was excluded from calculations of test performance analysis (specificity, sensitivity, positive predictive value).

** De La Fuente, L 2009 reported 3 initial indeterminate results on rapid test, of which one specimen was later confirmed as positive and two were confirmed as negative, these specimens were excluded from calculations of test performance analysis (specificity, sensitivity, positive predictive value)

*** van Loon, 2008 used a double rapid test algorithm using Determine + OraQuick tests, for two tests, OraQuick produce two false negatives, that were then confirmed as positive using the determine rapid test. These two specimens were excluded from calculations of test performance analysis (specificity, sensitivity, positive predictive value)

\(\Omega\) Schulden, J et al. 2008 Service provision targets transgender people, inclusive of Transsexual, Transgender/transgenderist, Bi-gender/gender-bender, Gender-queer, Cross-dresser/transvestite, Drag queen, Female impersonator.

\(\Omega\) Smith, L 2006 Data from total sample including CBO & Clinic (n=1457, RHT=77 CHT=73) used to calculate test performance analysis (specificity, sensitivity, positive predictive value)

CBO=Community based organisation, VCT=Voluntary Counselling & Testing Centre, O/R=Outreach, RHT=rapid HIV test, CHT=confirmatory HIV test, pos=positive, neg= negative FP=false positive, Id=indeterminate U/C=unconfirmed rapid test, PPV=Positive predictive value, PP= Prior Positive, newly diag= newly diagnosed, I/D to calculate = insufficient data to calculate test performance.

A. The number of Valid Rapid Test results was calculated by using the total number of initial RHT – the number of missing tests/unconfirmed tests/prior positives.

B. Sensitivity: number of true positive results (TP) divided by the sum of true positive and false negative (FN) results, i.e., sensitivity = TP/(TP + FN).

C. Specificity: number of true negative results (TN) divided by the sum of true negative and false positive (FP) results, i.e., specificity = TN/(TN + FP).

D. PPV1 =Number of true positives/all positives
Discussion

We have identified publications that reported HIV testing outcomes at 44 community HIV testing services located mainly in US or Europe that provided services to MSM. To our knowledge this is the first published systematic review of HIV testing outcomes from community based testing services. The review demonstrated the services can attract large numbers of clients within the first few years of operation, including high risk MSM as evidenced by HIV positivity and high proportions of MSM never previously tested. Although this review demonstrates that community-based HIV testing services are widely utilised throughout the world, all services were operating in developed countries and the majority operated in the US and in urban areas, limiting the applicability of findings to other settings.

Three quarters of services included in the review offered rapid testing, and the popularity of these services is likely to be influenced by the provision such testing. Acceptability surveys at many of the services showed the availability of rapid testing as the main driver of attendance\textsuperscript{29} \textsuperscript{57,61,75,76}. Rapid tests can provide both individual and public health benefits. The receipt of more timely HIV results through rapid testing has the potential to reduce onward HIV transmission because clients are immediately aware of their HIV status.\textsuperscript{49,51} Structural barriers to frequent testing among high-risk MSM who are recommended to test more frequently in many countries\textsuperscript{77-79} are also diminished.

Services offering HIV rapid testing should ensure processes to facilitate high return rates for receiving confirmatory test results. Receipt of confirmatory results among services offering rapid testing was reasonably high, both among MSM and non-MSM clients; however return rates were lowest in outreach services.\textsuperscript{55,60,72,73} Returning for confirmatory test results provides opportunities for post-test counselling, facilitates referrals to appropriate care and, if needed, informs the patient of false positive HIV rapid test results. Although the PPV of the tests described in this review were generally high, some were less than 100%.

In many of services reviewed, one agency provided testing services and another agency provided care and treatment for referred positives. These models highlight the importance responsive and durable linkages to medical care, both in relation to primary (e.g. GPs) and specialist care (e.g. tertiary infectious disease specialist). This is particularly important for outreach services, which often referred positive clients to sexual health clinics for confirmatory testing and follow care and support.

This review highlights the importance of services implementing systems to monitor the operational performance, including appropriate action when test performance is unacceptably
low. Although over half the services included found the PPV of the HIV rapid results was 100%, a number reported false positives. Services described how the false positive results may have resulted from operator error as staff adjusted to testing in potentially chaotic field settings. A number of services used algorithms with two or three rapid tests to minimise the likelihood of false positive results. Some services also reported less than ideal test sensitivity, while acknowledging that low sensitivity may not be meaningful due to small numbers of HIV-positive clients. It could be argued that the benefits of high frequency testing using rapid HIV tests with sensitivity of 100% may outweigh low frequency conventional testing with 100% sensitivity.

Low sensitivity could be due missed infections as a result of individuals seroconverting at the time of test. Although not demonstrated in this review, rapid HIV tests have shown slightly lower sensitivity in men seroconverting because of slightly longer window periods for rapid compared to conventional tests. To overcome this, some services developed specific guidelines and testing algorithms to deal with clients presenting for testing and reporting risk events likely to fall within test window periods.

Finally, service costs and funding sources, although not covered in this review are a key consideration for community based testing services. Previous reports describing costs of HIV testing in CBOs varied costs on the basis of type of HIV testing offered (rapid vs. conventional), the staffing profile of the services (physician, nurse/allied health worker or peer led), and infrastructure costs associated with particular testing models (outreach vs. community clinic). Services involving physicians in rapid testing activities and those requiring initial fixed costs such as mobile vans for outreach compared to a community clinic were associated with higher costs.

Although this review involved a search strategy, there are also potential limitations. Only English language sources were searched, which may have biased results towards studies from English speaking countries. Also the studies did not formally evaluate rapid test performance and the PPV was often based on small numbers limiting validity and prohibiting further analyses across settings.

This reviews shows community based HIV testing (with or without rapid testing) provides a model that enhances the reach and accessibility of HIV testing for MSM at high risk of HIV infection and is therefore likely to represent an important part of local HIV prevention strategies. Given the geographic bias of studies included in this review, it is important for those considering implementing community-based models with HIV rapid testing to undertake comprehensive formative and pilot work before implementation and/or expansion. The benefits
seen in one location may not be translated to another due to differences in populations and health systems.

**Acknowledgements**

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- Phillip Keen from AFAO;
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- The New Zealand AIDS Organisations, in particularly Eamonn Smythe;
- The Fenway Community Health Centre;
- Terrence Higgins Trust, UK;
- AIDS Concern, Hong Kong;
- Checkpoint Clinic, Amsterdam; and
- The many other organisations that provided data for this review.

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APPENDICES

Appendix 1.A

Search Terms for Section 4: Community-based HIV testing services for MSM: a systematic review

A. Medline – OvidSP

Step 1: Searched for following Community/Rapid Testing for HIV among MSM

<table>
<thead>
<tr>
<th>Disease</th>
<th>MSM</th>
<th>Rapid testing &amp; Community-based testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIV</td>
<td>sex with men</td>
<td>rapid adj2 test*</td>
</tr>
<tr>
<td>HIV Infections</td>
<td>homosexual adj men or man or male*</td>
<td>HIV adj2 test*</td>
</tr>
<tr>
<td>human adj immun* adj deficiency</td>
<td>gay adj (men or man or male*)</td>
<td>HIV adj2 screen*</td>
</tr>
<tr>
<td>human adj immunodeficiency</td>
<td>homosexuality</td>
<td>HIV adj2 detect*</td>
</tr>
<tr>
<td>HIV*</td>
<td>homosexuality, male</td>
<td>Serologic Tests</td>
</tr>
<tr>
<td>acquired adj immun* adj deficiency</td>
<td></td>
<td>Community Health Services</td>
</tr>
</tbody>
</table>

n = 168602 results

Step 2: Search terms combination

Combined 1 AND 2 AND 3: 1317 results

Step 3: Restricted the search to 1980 current, English

Combined 1 AND 2 AND 3: 1258 results
Appendix 1.B

B. EMBASE OvidSP

Steps taken to conduct the search

Step 1: Searched for following

Community/Rapid Testing for HIV among MSM

<table>
<thead>
<tr>
<th>Disease</th>
<th>MSM</th>
<th>Rapid testing &amp; Community-based testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Human immunodeficiency virus</td>
<td>sex with men.mp. homosexual adj (men or man or male*)</td>
<td>rapid adj2 test* HIV adj2 test* HIV adj2 screen* HIV adj2 detect* Serologic Tests Community Care Health Center Preventative Health Services Health services research Community adj1 (test* or model* or setting*) bath?house* sauna* (Sexual adj health adj clinic* Outreach*</td>
</tr>
<tr>
<td>Human immunodeficiency virus infection</td>
<td>gay adj (men or man or male*)</td>
<td></td>
</tr>
<tr>
<td>human adj immun* adj deficiency</td>
<td>homosexuality or male homosexual</td>
<td></td>
</tr>
<tr>
<td>human adj immunodeficiency acquired adj immun* adj deficiency acquired adj immunodeficiency</td>
<td></td>
<td></td>
</tr>
<tr>
<td>HIV*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

n = 322948 results n = 23202 results n = 297246 results

Step 2: Search terms combination
Combined 1 AND 2 AND 3:: 2165 results

Step 3: Restricted the search to 1980 current, English
Combined 1 AND 2 AND 3:: 2018 results
Appendix 1.C

C. Cochrane Library

Steps taken to conduct the search

**Step 1:** Searched for following

Community/Rapid Testing for HIV among MSM

<table>
<thead>
<tr>
<th>Disease</th>
<th>MSM</th>
<th>Rapid testing &amp; Community-based testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIV</td>
<td>sex with men</td>
<td>rapid adj2 test*</td>
</tr>
<tr>
<td>HIV Infections</td>
<td>homosexual adj man or man or male*</td>
<td>HIV adj2 test*</td>
</tr>
<tr>
<td>human adj immun*</td>
<td>gay adj (men or man or male*)</td>
<td>HIV adj2 screen*</td>
</tr>
<tr>
<td>adj deficiency</td>
<td>homosexuality</td>
<td>HIV adj2 detect*</td>
</tr>
<tr>
<td>human adj</td>
<td>homosexuality, male</td>
<td>Serologic Tests</td>
</tr>
<tr>
<td>immunodeficiency</td>
<td></td>
<td>Community Health Services</td>
</tr>
<tr>
<td>HIV*</td>
<td></td>
<td>Community Health Centers</td>
</tr>
<tr>
<td>acquired adj</td>
<td></td>
<td>Mobile Health Units</td>
</tr>
<tr>
<td>immun* adj</td>
<td></td>
<td>Health services research</td>
</tr>
<tr>
<td>deficiency)</td>
<td></td>
<td>Community adj1 (test* or model* or setting*)</td>
</tr>
</tbody>
</table>

n=9227 results  n= 306277 results  n= 14372 results

**Step 2:** Search terms combination

Combined 1 AND 2 AND 3: **1543 results**

**Step 3:** Restricted the search to 1980current

Combined 1 AND 2 AND 3:: **1542 results**
### Appendix 2

**Table 4. Characteristics of community HIV testing services (n=44)**

<table>
<thead>
<tr>
<th>Author/Year</th>
<th>Setting</th>
<th>Repeat Paper</th>
<th>Site / Type of Service</th>
<th>Target Group; Main ethnic Group</th>
<th>Gender/Sexual Identity Breakdown</th>
<th>Age</th>
<th>Funding Source</th>
<th>Length of Study Period (*still in operation)</th>
<th>Delivery Model (Cost to client / Incentives)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIDS Concern, 2008</td>
<td>HONG KONG number of sites=2 location: Hong Kong</td>
<td>No</td>
<td>CBO Combination: 1 community centre, 1 outreach in various gay saunas.</td>
<td>MSM</td>
<td>Male: 100</td>
<td>&lt;20: 8.1 2130: 45.8 3140: 31.6 4150: 12.7 &gt;51: 1.6</td>
<td>Government</td>
<td>2007*</td>
<td>Free-covered by service/study</td>
</tr>
<tr>
<td>Bell, D.N 2003</td>
<td>USA number of sites=1 location: Cook County Hospital/Chicago HIV Risk Reduction Partnership for Youth (CHRPRP)</td>
<td>Yes</td>
<td>Outreach Testing Multiple sites: link CHRRPY’s counselling and testing services to various community agencies using outreach workers</td>
<td>Youth (13-24yrs old); Black, Non-Hispanic</td>
<td>Male: 67 Female: 33</td>
<td>1319: 92 2024: 8</td>
<td>Government</td>
<td>1998 –2000</td>
<td>Assumed free</td>
</tr>
<tr>
<td>Bell, D.N 2003</td>
<td>USA number of site=1 location: University of Medicine and Dentistry of New Jersey/DAYAM Adolescent HIV Project (DAYAM).</td>
<td>Yes</td>
<td>Outreach Testing Mobile testing facility, linked with peer educators.</td>
<td>Multiple: youth, including gay and T/gender youth; Black, Non-Hispanic</td>
<td>Male: 55 Female: 45</td>
<td>1219: 64 2024: 36</td>
<td>Government</td>
<td>1998 –2000</td>
<td>Assumed free</td>
</tr>
<tr>
<td>Bell, D.N 2003</td>
<td>USA number of site=2 location: The Centre for Children and Families/NYC Youth MDI Housing Project (SafeSpace)</td>
<td>Yes</td>
<td>CBO Combination: Mobile testing facility and SafeSpace’s Day Centre (CBO)</td>
<td>Youth homeless youth, including gay men; Black, Non-Hispanic</td>
<td>Male: 57 Female: 36 T/gender: 7</td>
<td>1319: 18 2024: 82</td>
<td>Government</td>
<td>1998 –2000</td>
<td>Assumed free</td>
</tr>
<tr>
<td>Author/Year</td>
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<td>Length of Study Period (*still in operation)</td>
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<tr>
<td>Bell, D.N 2003&lt;sup&gt;11&lt;/sup&gt;</td>
<td>USA number of site=1 location: University of Miami School of Medicine / Teen Outreach Project (TOPUM),</td>
<td>Yes</td>
<td>Outreach Testing Mobile testing facility</td>
<td>Youth poor, racial &amp; ethnic minority youth; Hispanic</td>
<td>Male: 39 Female: 61</td>
<td>1319: 100</td>
<td>Government</td>
<td>3 years program.</td>
<td>Free-covered by service/study Incentives: mass transit transportation, meal coupons, movie passes, free interventions and condoms.</td>
</tr>
<tr>
<td>Beverly, G. 2008&lt;sup&gt;11&lt;/sup&gt;</td>
<td>USA number of site=1 location: Boston, Massachusetts</td>
<td>No</td>
<td>CBO Community clinic</td>
<td>Multiple: MSM ; Anglo-Saxon</td>
<td>N/S</td>
<td>N/S</td>
<td>Government</td>
<td>Pilot 4 years*</td>
<td>Free-covered by service/study</td>
</tr>
<tr>
<td>Bowles, K. E 2008&lt;sup&gt;11&lt;/sup&gt;</td>
<td>USA number of sites= multiple N/S location: Boston, Chicago, Detroit, Kansas City, Missouri, Los Angeles, San Francisco, Washington DC</td>
<td>No</td>
<td>CBO Combination: Outreach + Community settings. Outreach (NSP, community clinics, CBOs, special events, social service organisations, homeless shelters, drug treatment facilities, community settings);Mobile testing facility; venue outreach.</td>
<td>Multiple: racial/ethnic minority &amp; others at high risk. 6 IDU, 17 MSM, 9 homeless; Mixed Ethnicity</td>
<td>Male: 63 Female: 37</td>
<td>1324: 27 2534: 29 3544: 24 &gt;=45: 20</td>
<td>Government</td>
<td>2004 - 2006</td>
<td>Free-covered by service/study Incentives: Nonmonetary incentives such as snacks, or donated hats or gloves and a $20 grocery gift card.</td>
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<tr>
<td>Daskalakis, D 2009&lt;sup&gt;11&lt;/sup&gt;</td>
<td>USA number of site=2 location: New York</td>
<td>No</td>
<td>Outreach Testing Venue based (bar, club, bathhouse)</td>
<td>MSM; Anglo-Saxon</td>
<td>Male: 100</td>
<td>1829: 17.8 3039: 35.1 4049: 26.4 &gt;=50: 20.7</td>
<td>Government</td>
<td>2005</td>
<td>Assumed free</td>
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<tr>
<td>Erausquin, J. T 2009&lt;sup&gt;40&lt;/sup&gt;</td>
<td>USA number of site=1 location: Los Angeles County (LA, West Hollywood)</td>
<td>No</td>
<td>Outreach Testing Venue based (bar, club, bathhouse)</td>
<td>Young Latino MSM; Hispanic</td>
<td>N/S</td>
<td>25 years and under Median age ~21.8 years</td>
<td>Research Study</td>
<td>Aug - Oct 2004</td>
<td>Free-covered by service/study</td>
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<tr>
<td>Gibson, S 2008&lt;sup&gt;41&lt;/sup&gt;</td>
<td>USA number of site=1 location: San Francisco</td>
<td>No</td>
<td>CBO CBO/ community centre: Sexual Health services, Community Programs &amp; Wellness Services</td>
<td>MSM; Anglo-Saxon</td>
<td>Male: 100</td>
<td>&lt;20: 1 2029: 24 3039: 36 4049: 27 5059: 9 60+: 2</td>
<td>Multiple sources</td>
<td>2003 - 2008*</td>
<td>Free-covered by service/study</td>
</tr>
<tr>
<td>Hilton, C.2002&lt;sup&gt;42&lt;/sup&gt;</td>
<td>USA Number of site=multiple N/S (4 ongoing sites) Location: Baltimore</td>
<td>No</td>
<td>Outreach Testing Multiple sites: 16 discrete events and 4 ongoing testing sites, including: churches, food kitchens, a shelter for men and a health fair. 4 additional ongoing sites including an organization for the deaf, a mobile testing facility, a church and outpatient research clinic in local hospital.</td>
<td>Multiple, &gt;90 African American</td>
<td>Male: 58.6 Female: 41</td>
<td>Mean age 38.6 years (range, 13–78 years).</td>
<td>Research Study</td>
<td>Feb 1998 - August 2001</td>
<td>Free-covered by service/study Incentives: Food or small monetary incentives offered at some sites.</td>
</tr>
<tr>
<td>Huebner, D.M 2010&lt;sup&gt;43&lt;/sup&gt;</td>
<td>USA number of site=1 location: San Francisco</td>
<td>No</td>
<td>Outreach Testing Venue based (bar, club, bathhouse)</td>
<td>MSM; Anglo-Saxon</td>
<td>N/S</td>
<td>Mean age 41.7</td>
<td>Research Study</td>
<td>March 2004 - Feb 2005</td>
<td>Free-covered by service/study</td>
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<tr>
<td>Author/Year</td>
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<tr>
<td>Langdon, T 2010</td>
<td>AUSTRALIA</td>
<td>No</td>
<td>CBO CBO/ community centre: M Clinic and M Clinic</td>
<td>MSM; N/S</td>
<td>MSM: 78  MSM&amp;W: 22</td>
<td>N/S</td>
<td>Government</td>
<td>2007 - 2010*</td>
<td>Free- covered by service/study</td>
</tr>
<tr>
<td>Langdon, T 2010</td>
<td>AUSTRALIA</td>
<td>No</td>
<td>Outreach Testing Venue based: Bathhouse 'Steamworks'</td>
<td>MSM; N/S</td>
<td>Male: 100</td>
<td>N/S</td>
<td>Government</td>
<td>2007 - 2010*</td>
<td>Cost to patient ($10)</td>
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<tr>
<td>Mayer, K. H. 2007</td>
<td>USA</td>
<td>No</td>
<td>CBO CBO/ community centre</td>
<td>Multiple: MSM, Hetero sex, IDU, and occupational exposure; Anglo-Saxon</td>
<td>Male: 75</td>
<td>2049: 84</td>
<td>Government</td>
<td>From July 2003 - June 2004.*</td>
<td>Free- covered by service/study</td>
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<tr>
<td>Mayer, KH 2006</td>
<td>USA</td>
<td>No</td>
<td>Outreach Testing Venue based (bar, club, bathhouse)</td>
<td>MSM; &quot;men of colour&quot;</td>
<td>Male: 100</td>
<td>Range: 1870</td>
<td>N/S</td>
<td>June 2004 - February 2006</td>
<td>Assumed free</td>
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<tbody>
<tr>
<td>Reynolds, G. L 2008&lt;sup&gt;14&lt;/sup&gt;</td>
<td>USA number of site= Multiple N/S location: Long Beach, California</td>
<td>No</td>
<td>Outreach Testing Multiple sites: Mobile testing van, drug treatment programs, methadone maintenance programs, NSP, a community-based agency serving the gay and lesbian community, and the Centre for Behavioural Research and Services' office based testing facility</td>
<td>Multiple: MSM, women at sexual risk, IDU, MSM&amp;M, T/gender; Mixed Ethnicity</td>
<td>Male: 81 Female: 19</td>
<td>N/S</td>
<td>Government</td>
<td>January 2005 - November 2007.</td>
<td>Free- covered by service/study Incentives: $5 nonmonetary gift card as an incentive for testing.</td>
</tr>
<tr>
<td>Rose, VJ 2006&lt;sup&gt;16&lt;/sup&gt;</td>
<td>USA number of site= 1 location: 3 neighbourhoods in San Francisco</td>
<td>No</td>
<td>Outreach Testing Mobile testing facility</td>
<td>MSM Especially Methamphetamine-users Anglo-Saxon;</td>
<td>N/S</td>
<td>Of MSM Participants: 1825: 29 2635: 22 36+: 49</td>
<td>Government</td>
<td>July - October 2004</td>
<td>Free- covered by service/study Incentives: $20 food voucher for the baseline assessment.</td>
</tr>
<tr>
<td>Schulden, J 2008&lt;sup&gt;17&lt;/sup&gt;</td>
<td>USA number of site= Multiple N/S location: Miami Beach, New York, San Francisco</td>
<td>Yes</td>
<td>Outreach Testing Multiple sites: social events in T/gender community members' homes/SoBAP offices/local bars &amp; restaurants; Internet-based outreach through chat rooms and social network sites.</td>
<td>T/gender; Hispanic</td>
<td>Transsexual: 61.4 T/gender: 4.7 Drag queen: 5.3</td>
<td>1319: 4.7 2029: 38.0 3039: 28.7 4049: 2.9 &gt;50: 10.5</td>
<td>Government</td>
<td>January 2005 - December 2006</td>
<td>Free- covered by service/study</td>
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<tr>
<td>Schulden, J 2008&lt;sup&gt;18&lt;/sup&gt;</td>
<td>USA number of site= Multiple N/S location: Miami Beach, New York, San Francisco.</td>
<td>Yes</td>
<td>Outreach Testing Multiple sites: Mobile testing facility and social networking. TG participants were asked to recruit their fellow TG acquaintances for participation, and people recruited via the social network approach were also asked to recruit their TG acquaintances.</td>
<td>T/gender; Black, Non-Hispanic</td>
<td>Transsexual: 22.4 T/gender: 59.8</td>
<td>1319: 30.5 2029: 42.1 3039: 13.9 4049: 8.5 &gt;50: 1.2</td>
<td>Government</td>
<td>January 2005 - December 2006</td>
<td>Free- covered by service/study</td>
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<tr>
<td>Schulden, J 2008&lt;sup&gt;19&lt;/sup&gt;</td>
<td>USA number of site= Multiple N/S location: Miami Beach, New York, San Francisco</td>
<td>Yes</td>
<td>CBO Combination: CBO, venue-based outreach</td>
<td>T/gender; N/S</td>
<td>Transsexual: 30 T/gender: 55</td>
<td>1319: 0.8 2029: 21.7 3039: 37.2 4049: 20.2 &gt;50: 16.3</td>
<td>Government</td>
<td>January 2005 - December 2006</td>
<td>Free- covered by service/study</td>
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<tr>
<td>Schwappach, D. L 2008&lt;sup&gt;20&lt;/sup&gt;</td>
<td>SWITZERLAND number of site=1 location: Zurich</td>
<td>No</td>
<td>CBO Community clinic</td>
<td>MSM; Anglo-Saxon</td>
<td>Homosexual: 60.0 Hetero: 26.4 Bisexual: 13.4</td>
<td>Multiple sources</td>
<td>June - December 2006</td>
<td>Free- covered by service/study</td>
<td></td>
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<tr>
<td>Author/Year</td>
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<tr>
<td>Shrestha, R 2008¹⁰</td>
<td>USA number of site=1 location: Kansas City, Missouri; Detroit, Michigan.</td>
<td>Yes</td>
<td>CBO Community clinic</td>
<td>Multiple target groups; N/S</td>
<td>N/S</td>
<td>N/S</td>
<td>Government</td>
<td>April 2004 - March 2006 Rapid HIV testing offered from May 2005 - March 2006.</td>
<td>Free-covered by service/study</td>
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<tr>
<td>Shrestha, R 2008¹⁰</td>
<td>USA number of site= Multiple N/S location: Kansas City, Missouri; Detroit, Michigan.</td>
<td>Yes</td>
<td>Outreach Testing Mobile testing facility: health fairs, public parks, homeless shelters, substance-abuse treatment centres, soup kitchens, motels, bars and nightclubs, and areas frequented by commercial sex workers.</td>
<td>Multiple target groups; N/S</td>
<td>N/S</td>
<td>N/S</td>
<td>Government</td>
<td>April 2004 - March 2006</td>
<td>Free-covered by service/study Incentives: Nonmonetary incentives (transportation tokens or grocery vouchers) for testing in outreach</td>
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<tr>
<td>Shrestha, R 2008¹⁰</td>
<td>USA number of site= Multiple N/S location: Kansas City, Missouri; Detroit, Michigan.</td>
<td>Yes</td>
<td>Outreach Testing Multiple sites: venue based (bathhouses, bars) and outreach (Street corners, NSP, substance-abuse and mental health treatment centres, homeless shelters, soup kitchens)</td>
<td>Multiple target groups; N/S</td>
<td>N/S</td>
<td>N/S</td>
<td>Government</td>
<td>April 2004 - March 2006</td>
<td>Free-covered by service/study Incentives: Nonmonetary incentives (transportation tokens or grocery vouchers) for testing in outreach</td>
</tr>
<tr>
<td>Smith, L 2006⁷⁰</td>
<td>USA number of site=1 location: Los Angeles</td>
<td>No</td>
<td>CBO CBO/ community centre: Los Angeles Gay and Lesbian Centre (LAGLC)</td>
<td>Multiple: MSM; Mixed Ethnicity</td>
<td>Male: 85.2 Female: 13.5 MTF T/gender: 1.3</td>
<td>1819: 1.8 2029: 38.2 3039: 42.3 4049: 12.8 5080: 4.8</td>
<td>Government</td>
<td>June 1999 - August 2001</td>
<td>Free-covered by service/study</td>
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<tr>
<td>Smythe, E 2007⁷¹</td>
<td>NEW ZEALAND number of site= 1 location: Auckland</td>
<td>No</td>
<td>CBO CBO/ community centre</td>
<td>MSM;</td>
<td>Gay : 49.6 Bisexual: 20.9 Hetero: 27.3</td>
<td>compared 2005 -2006 Period *</td>
<td>Government</td>
<td></td>
<td>Free-covered by service/study</td>
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<tr>
<td>Spielberg, F 2003⁷²</td>
<td>USA number of site= N/S location: Seattle</td>
<td>No</td>
<td>Outreach Testing Venue based (bar, club, bathhouse)</td>
<td>MSM; Anglo-Saxon</td>
<td>N/S</td>
<td>&lt; 20: 0.5 2029: 26 3039: 28 &gt; 40: 44</td>
<td>Government</td>
<td>N/S</td>
<td>Free-covered by service/study</td>
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<tr>
<td>Stein, R 2010&lt;sup&gt;3&lt;/sup&gt;</td>
<td>USA number of site= multiple N/S location: Houston, Miami, New York City, Newark, and San Juan.</td>
<td>No</td>
<td>Outreach Testing Multiple sites: street outreach, outreach in bars/clubs, participation in gay pride and testing events, and mobile testing facility.</td>
<td>MSM; Hispanic</td>
<td>N/S</td>
<td>1317: 7.4 1824: 64.4 2529: 28.2</td>
<td>Government</td>
<td>August 2005 - July 2006</td>
<td>Free- covered by service/study incentives: N/S</td>
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<tr>
<td>Sturrock, C 2007&lt;sup&gt;3&lt;/sup&gt;</td>
<td>AUSTRALIA number of site=5 location: Canberra</td>
<td>No</td>
<td>Outreach Testing Multiple sites: sex-on-premises venue, a community AIDS organisation, a university campus, brothels and a youth centre.</td>
<td>Multiple : MSM, sex workers, youth and university students; N/S</td>
<td>Males: 65.5 Females: 34.5</td>
<td>Median age (range) Students: 21 (18–30) MSM: 42 (16–72) Sex workers: 29 (18–55) Youth venue: 20 (15–33) Other: 39 (22–63)</td>
<td>Government</td>
<td>June 2002 - June 2005</td>
<td>Free- covered by service/study</td>
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<td>van Loon, S 2008&lt;sup&gt;3&lt;/sup&gt;</td>
<td>NETHERLANDS number of site=1 location: Mister B in the Warmoesstraat, Amsterdam</td>
<td>No</td>
<td>Outreach Testing Venue based (bar, club, bathhouse)</td>
<td>MSM; N/S</td>
<td>Homosexual: 48 Hetero: 42 Bisexual: 10</td>
<td>&lt;20: 2 2029: 29 3039: 41 4049: 22 &gt;50: 7</td>
<td>Research Study</td>
<td>October 7th - December 31st 2007*</td>
<td>Cos to patient (€ 20)</td>
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<td>van Loon, S 2008&lt;sup&gt;1&lt;/sup&gt;</td>
<td>NETHERLANDS number of site=1 location: Amsterdam</td>
<td>No</td>
<td>CBO CBO/ community centre</td>
<td>N/A: MSM, other</td>
<td>Male: 82 MSM: 53 Hetero male:29 Female: 18</td>
<td>N/S</td>
<td>Multiple sources</td>
<td>No</td>
<td>Cost to patient (€ 20)</td>
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<tr>
<td>Weatherburn, P 2006&lt;sup&gt;6&lt;/sup&gt;</td>
<td>UNITED KINGDOM number of site=1 location: THT West, Bristol</td>
<td>Yes</td>
<td>CBO community clinic</td>
<td>Multiple : MSM &amp; Africans Anglo-Saxon</td>
<td>MSM: 50.6 Hetero male: 33 lesbian/bisexual: 1 Hetero female: 15.4</td>
<td>1519: 3.2 2029: 42.7 3039: 40.0 4044: 7.3 45+: 6.6</td>
<td>Multiple sources</td>
<td>Pilot 24/10/2004; Evaluation 8/05/2005 - 30/10/2005*</td>
<td>Assumed free</td>
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<tr>
<td>Weatherburn, P 2006&lt;sup&gt;76&lt;/sup&gt;</td>
<td>UNITED KINGDOM number of site=1 location: Brighton; THT South.</td>
<td>Yes</td>
<td>CBO community clinic</td>
<td>MSM; Mixed Ethnicity</td>
<td>Male: 100</td>
<td>1519: 5.1 2029: 33.7 3039: 36.8 4044: 14.6 &gt;= 45: 9.9</td>
<td>Government / Research Study</td>
<td>Pilot 03/10/2004 Evaluation 14/11/2004 - 18/12/2005*</td>
<td>Assumed free</td>
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<tr>
<td>Weatherburn, P 2006&lt;sup&gt;75&lt;/sup&gt;</td>
<td>UNITED KINGDOM number of site=1 location: THT Yorkshire, Leeds;</td>
<td>Yes</td>
<td>CBO community clinic</td>
<td>Multiple : MSM Africans &amp; Gay men; Anglo-Saxon</td>
<td>MSM: 50.6 Hetero male:33 lesbian/bisexual: 1 Hetero female: 15.4</td>
<td>1519: 3.2 2029: 43.7 3039: 40.0 4044: 7.3 45+: 6.6</td>
<td>Multiple sources</td>
<td>Pilot 7/12/2004 ; Evaluation 8/06/2005 - 20/12/2005*</td>
<td>Assumed free</td>
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<tr>
<td>Woods, W 2000&lt;sup&gt;77&lt;/sup&gt;</td>
<td>USA number of site=2 location: San Francisco</td>
<td>No</td>
<td>Outreach Testing Venue based (bar, club, bathhouse): Two sex clubs</td>
<td>MSM; Anglo-Saxon</td>
<td>N/S</td>
<td>Average age at Sex clubs: 40 years Average age at Clinic: 36 years</td>
<td>N/S</td>
<td>September 1997 - December 1998</td>
<td>Assumed free</td>
</tr>
</tbody>
</table>

* Testing service still in operation- verified in paper as ongoing service and verified by author or service website. CBO = Community based organisation, IDU= Injecting Drug User, MSM = Men who have sex with men, MSM&W=Men who have sex with men and women, MTF = Male-to-female, N/S = Not specified, NSP= Needle Syringe Program, SW=Sex Workers, Hetero = Heterosexual, T/gender= Transgender
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Chapter Eight: Integrated Discussion

Despite advances in treatment that have reduced HIV-related morbidity and extended the life expectancy of those affected, HIV continues to be a chronic incurable infection. Lifelong health care costs, treatment burden on individuals and the emergence of non-HIV related morbidities among HIV positive individuals mean that the recent increase in diagnoses of HIV and other STIs among MSM in Australia is a serious public health concern.33 MSM continue to report sexual practices that place them at risk for HIV, including unprotected anal intercourse, multiple sex partners, group sex and illicit drug use associated with sex.135 435 Recent evidence suggests an increase in high risk sexual practices among Australian MSM, particularly, unprotected anal intercourse.35 94 At the same time, there is some evidence that men are engaging in these practices with knowledge of the risks involved and are taking steps to reduce their risk of infection through specific risk reduction practices, such as serosorting, negotiated safety and strategic positioning.436 437 The effectiveness of these risk reduction strategies, however, is dependent on men’s testing patterns to ensure they are aware of their true HIV status. Current data suggests a significant proportion of men do not know their current HIV status.45 46

This thesis presents a combination of prevention approaches designed to increase the rates at which MSM access HIV/STI testing in Australia. The community-based HIV prevalence study,45 438 provided valuable evidence regarding the role of undiagnosed HIV infections in driving the current HIV epidemic in Australia. This study also highlighted limitations to current methods for estimating HIV prevalence and provided a framework for future HIV surveillance mechanisms to incorporate biological samples into behavioural surveillance to continually monitor HIV prevalence and incidence in Australia. The mixed method evaluation of the national STI testing campaign320 provided encouraging results, showing the campaign had positive impacts on sexual health knowledge and behaviour and generating ecological evidence of resultant increases in HIV/STI testing among MSM populations in Victoria. This evaluation also emphasised the need to continue to diversify communication channels to ensure health promotion messages reach men who may not have previously been exposed or engaged with traditional styles of HIV health promotion. The evaluation of the ‘Queer as F**K’ project provided evidence for the utility of social networking sites, and potentially other forms of new media, to reach and engage a large sample of gay men in sexual health promotion. Finally, to
address some of the structural barriers to HIV testing, the systematic review of community-based HIV testing sites provided evidence for the utility of community-based testing services to reach high risk men who don’t normally access testing. This review also provided encouraging results for the use of rapid testing in such settings, which allowed clients to be tested and receive their HIV test results in the same session (usually within 30 minutes), facilitating timely access to support and care services.

**Impact of Undiagnosed HIV infections**

While community-based studies of MSM throughout the developed world have used biological samples to estimate HIV prevalence and prevalence of undiagnosed infection, producing a wide range of estimates (15 - 76%), the extent to which undiagnosed HIV infection contributed to the continuing transmission of HIV in Australia is still largely unknown.46 73

In Australia, only two such studies have been undertaken.45 46 The study presented in Chapters Two and Three measured HIV prevalence of close to 10% and an undiagnosed prevalence of over 30% among MSM in Victoria. MSM with undiagnosed HIV reported more frequent risk behaviours and less frequent HIV testing than HIV negative men, underscoring the importance of encouraging men to reduce their sexual risk practices and increase their frequency of testing. Although this study revealed evidence of MSM utilising risk-reduction strategies, the high proportion of undiagnosed infections observed in this study meant that any HIV disclosure used to negotiate these risk reduction strategies was unlikely to reflect the true HIV status of these men. The effectiveness of risk reduction strategies, particularly around the practice of ‘serosorting’, has recently come under intense scrutiny internationally.169 Findings from an Australian study suggest that a significant proportion of MSM are making uninformed decisions regarding the serostatus of their sex partners which may lead to serodiscordant UAIC.226 230 The potential impact of such practices on the Australian HIV epidemic warrants further targeted research to help inform guidance around this issue.

This study utilised sampling methods never previously employed in Australia to estimate HIV prevalence; it combined biological specimens with behavioural data, which also allowed the estimation of the number of undiagnosed infections. The significant discrepancy between test-detected biological and self-reported HIV status reported in this study highlights some of the limitations with Australia’s current approach to estimating HIV prevalence and the weaknesses of surveillance systems that cannot provide estimates of undiagnosed infections.

The results of this study were widely disseminated to the community and government and informed a new HIV prevention campaign developed by the Victorian AIDS Council/Gay Men’s
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Health Centre (VAC/GMHC). This campaign used simple and effective slogans such as “1 in 3 men with HIV don’t know they have HIV” and “the person infecting you with HIV probably doesn’t even know he has it” to increase community awareness of undiagnosed HIV and encourage all gay men to seek HIV/STI testing. Focus group data collected as part of the qualitative evaluation of the ‘Drama Downunder’ campaign (Chapter Five) showed positive responses to the campaign, providing support for further evidence-based social marketing campaigns.

The successful completion of the study and the acceptability of the study design to community-recruited participants imply that it would be feasible to incorporate oral fluid specimen collection in future behavioural surveys or similar community-recruited studies. Consequently, this study formed the basis of an NHMRC application in 2012 (APP# 1044749) which proposes to develop a nation-wide HIV surveillance system. The ongoing monitoring of undiagnosed HIV also offers valuable information for the assessment of the effectiveness of HIV prevention campaigns, including those aimed at increasing frequency of testing.

Utility of Mass Media campaigns

Mass media campaigns have been used as a prevention tool since the early stages of the HIV epidemic and are considered an integral part of Australia’s HIV prevention approach. While previous mass media campaigns have shown limited success in increasing testing, the mixed methods evaluation of the National ‘Drama Downunder’ STI campaign (Chapters Four and Five) suggests the campaign achieved high awareness among the target audience and was successful in achieving its aims of increasing health seeking behaviour, STI testing and HIV/STI knowledge among MSM in Victoria. Triangulation using survey and ecological clinic data (Chapter Four) and qualitative data (Chapter Five) provided evidence of increased health seeking behaviour and HIV/STI testing throughout the campaign periods and identified key components of the campaign that facilitated campaign success. The online cohort of MSM used for collecting periodic survey data in this study also demonstrated the utility of such methods as a valuable and efficient behavioural evaluation tool; although the rolling recruitment and gradual increase in sample size limited the ability to analyse these data longitudinally.

The qualitative evaluation of the ‘Drama Downunder’ campaign (Chapter Five) provided important information regarding men’s response to the campaign, revealing that gay men found the campaign messages acceptable and valued their humour, light-hearted approach and informal language. The use of mainstream media channels, in particular outdoor advertisements, were perceived as crucial to campaign success by helping to normalise HIV/STI
testing and encouraging regular sexual health checks. A few potential limitations of the ‘Drama Downunder’ campaign were identified, including the limited portrayal of consequences associated with not getting tested and the limited ability of the campaign to create or prompt community dialogue among MSM. This evaluation provided regular feedback to the campaign developers, the VAC/GMHC, to help guide future campaign directions and improve their sustainability, and resulted in the Victorian Department of Health awarding recurring annual funding of $500,000 to continue the development and implementation of the campaign. With an increasing need to develop rigorous evaluations for complex interventions,\textsuperscript{362} the triangulation of surveillance, survey and qualitative data described in Chapter Four provided a framework for future evaluations.

The qualitative component of the evaluation identified the “mainstreaming” of the gay community as an issue. Combined with the observation that younger MSM are increasingly being diagnosed with HIV and other STIs,\textsuperscript{111} this findings suggests that future campaigns need to diversify media channels to ensure they reach men who may be less gay community-attached, and therefore may not have previously been exposed to or engaged with traditional styles of HIV prevention health promotion. Continuing to use “mainstream” media channels and other forms of popular communication technology may be a way to ensure broad reach into MSM populations.

**Potential of Social Networking Sites**

The internet is increasingly recognised as a platform for health communication and education due to its enormous reach.\textsuperscript{249,250} Social networking sites (SNS), part of the new Web 2.0, provide an ‘open communication’ channel between individuals that aims to foster social interactions and create online communities.\textsuperscript{441-443} Due to these sites’ popularity, and their growing functionality that encourages user interaction and engagement, SNS offer an exciting opportunity for health promotion practitioners to increase reach and population engagement beyond the scope of many traditional approaches.\textsuperscript{425,444} For these reasons, new technologies such as SNS have prompted calls from health practitioners for their use in the delivery of health-related interventions, including health promotion.\textsuperscript{264,425,445,446} Despite both the potential of and enthusiasm for using SNS for health promotion, there are very few published examples of interventions delivered on SNS.\textsuperscript{430}

The ‘Queer as F**K’ project (evaluated in Chapter Six) used SNS to present an innovative and novel sexual health promotion intervention to gay men in Victoria, Australia. This project was one of the first attempts to develop, implement and evaluate an online sexual health promotion
intervention on SNS. The evaluation demonstrated how an iterative and reflexive approach to
development and evaluation enabled ‘Queer as F**K’ to reach and engage a large number of
MSM with sexual health messages over a sustained period. Evaluation findings highlighted some
of the advantages of SNS for delivering health promotion, including the ability to target
advertisements. The project highlighted some of the complexities inherent in developing and
evaluating health promotion interventions in this setting such as accurately measuring reach
and engagement with the intervention. Despite these complexities, this project provided
evidence for the utility of SNS-delivered sexual health promotion to overcome some of the
challenges identified earlier in reaching and engaging less gay community-attached MSM who
might not be sufficiently exposed to messages delivered through traditional media.

Given the success of the initial pilot project of “Queer as F**K”, we negotiated a hand over of
the project to the VAC/GMHC, who incorporated the project into their suite of health
promotion initiatives; evidence of direct translation research. The project has since produced
five series building on the initial concept; “Queer as F**K” now has a following over almost
5,000 fans. To continue to ensure translation of lessons learnt from the ongoing project into the
academic world, the Burnet remains a key collaborator and continues to evaluate the project.
Future directions include the continued refinement of evaluation processes to both measure
the impact of the intervention and to understand the mechanisms (e.g. exposure only,
engagement, users posting comments) through which impact actually occurs. As well, the
author and other Burnet researchers are exploring other new technologies that might enhance
the delivery of sexual health promotion to MSM, such as less public online platforms that allow
men to engage anonymously.

Reducing barriers to testing

Data from self-report behavioural surveys indicates that a high proportion of gay men have at
least one HIV test per year35 314, yet the proportion of men actually undertaking annual testing
and the proportion of ‘high risk’ men having two or more tests per year, as specified in clinical
guidelines, is quite low.277 Barriers at the individual, provider and structural levels restrict
uptake of HIV testing by MSM.37 309 447 Over the past decade, researchers have generated a body
of observational research on the outcomes of community-based HIV testing in MSM and its
potential to reduce some of these barriers.448-450 451 452

The systematic review of community-based testing services (Chapter Seven) summarised
reports of HIV testing outcomes at 44 community HIV testing services (located mainly in the US
and Europe) that provided services to MSM. Results from the review suggest that HIV testing
services based on a community model attract a significant proportion of high-risk MSM and reach a high proportion of men who have never tested before. Although there exist implementation and maintenance challenges, such as ensuring individuals receive confirmatory test results and are appropriately linked to treatment and care services, this review demonstrates that community-based models are a feasible and acceptable approach to increase access to testing for MSM populations. Findings from the review support the implementation of community based testing, including the use of rapid point-of-care tests, in Australia.

The systematic review presented in this thesis formed part of a more comprehensive review of the outcomes and consumer/provider acceptability of community based testing services that was used as a key document to inform the recent review of Australian HIV testing policy by the Australian Society for Sexual Health Medicine. In 2011/2012 a new National HIV Testing Policy was released; the policy now paves the way for rapid HIV testing for screening purposes and the provision of testing in community settings.

**Thesis Strengths and Limitations**

A key strength of this thesis is the focus on combined approaches to HIV prevention. This holistic view of the HIV epidemic in Australia and potential responses outlines how an effort to implement complementary and supporting biomedical, behavioural and structural interventions can increase access to testing and produce reductions in HIV diagnoses.

Several methodological limitations were outlined and discussed in each of the studies. Some key limitations related to the recruitment strategy used throughout. The decision to use venue-based recruitment methodologies largely replicating those used in the Melbourne Gay Community Periodic Surveys was intentional, and allowed comparisons to be made between the data collected in these studies and existing behavioural surveillance data. However, the design also resulted in probable selection bias towards more gay-identified and gay community-attached men, men who have been shown to report more frequent HIV testing and greater awareness and knowledge of sexual health issues. Future studies should aim to diversify recruitment strategies by targeting a broader sample of MSM to allow assessment of HIV prevalence and risk practices among men who are less gay-identified and less gay-community attached.

Whilst important in identifying that many Australian MSM are unaware of their HIV status, the limited total number of undiagnosed infections (n=19) in the community-based prevalence study (Chapters Two and Three) was insufficient to enable detailed multivariate analysis of factors associated with this outcome. However, this study has provided the basis for a planned
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national study that will yield significantly more outcomes, enabling a more robust examination of the potential correlates of undiagnosed infections. Such a study will also deliver: i) an estimation of the population-level prevalences of HIV and undiagnosed HIV infections with a high degree of precision, ii) a refinement of mathematical models to estimate the population-level effect of undiagnosed infections, iii) a more nationally representative sample of gay men, and iv) baseline data to evaluate the effectiveness of national and jurisdictional HIV prevention initiatives.

The timing of the ‘Drama Downunder’ evaluation (Chapters Four and Five) meant that it was not possible to collect true baseline data from the MSM cohort prior to campaign implementation, which limited the ability to assess causality between the campaign and the measured outcomes. Furthermore, the limited sample size in early survey waves restricted our ability to conduct a true longitudinal analysis of campaign awareness and its impact on knowledge, health seeking behaviours and STI testing. Nevertheless, the evaluation approach was strengthened by the triangulation of data from multiple sources, including cross-sectional assessments of key indicators by campaign exposure from survey data and a time-series analysis of routinely collected testing data from high caseload clinics that spanned pre-campaign phases.

A process evaluation of Queer as F**K (Chapter Six) was included in this thesis; although not part of the scope of this PhD, a more comprehensive process and impact evaluation will be conducted including a robust qualitative analysis of page content to identify the aspects of the project that drove its success. We will also ensure that as the intervention continues to be funded we will continue to evolve our evaluations strategies by ensuring flexible frameworks. This will allow timely results to be fed back into the intervention development and implementation process and thus enhance its utility and relevance.

Although the systematic review of community-based HIV testing services located most of the published reports on community-based HIV testing services, as with all systematic reviews it was biased towards peer-reviewed publications over technical or government evaluation reports. Additionally, conference presentations that did not have a linked abstract or related paper were excluded, limiting the inclusion of more recent data on community-based testing services. The review was also focused on examining the testing outcomes of community based services to assess potential advantages that these services offer over clinical settings in reaching MSM with HIV testing; it did not aim to assess the impact of such testing on individual testing frequency. Such outcomes would require a more comprehensive review of the processes and outcomes of community based testing services. A more extensive review was undertaken as part of a consultancy for Sydney Area Health Services and the AIDS Council of New South Wales,
which included a review of barriers and facilitators of community-based testing by consumers and providers and the costs of HIV testing through these services; such reviews were beyond the scope and timeline of this PhD and consequently were not included in this thesis.

**Conclusion**

The recent increase in diagnoses of HIV and other STIs among MSM populations in Australia requires a concerted public health response. Such a response would concord with international calls for a ‘prevention revolution’, including more comprehensive and integrated evidence-based prevention approaches to HIV prevention.

This thesis provides evidence to support a combination approach to addressing one of the strategic priorities of HIV prevention in Australia: increasing access to HIV/STI testing. The community-based prevalence study underscored the importance of undiagnosed HIV when considering prevention approaches and highlighted the need to address barriers to high frequency HIV testing among MSM in Australia. The robust mixed methods evaluation of a national STI testing campaign that aimed to increase health-seeking behaviour and testing rates in gay men provided evidence for the effectiveness of mass media campaigns. Results suggested that the campaign delivery and style achieved high awareness and was associated with increased health seeking behaviour, HIV/STI testing and HIV/STI knowledge among gay men in Victoria. This thesis described the development, implementation and evaluation of one of the first ever online sexual health promotion interventions on SNS. This evaluation demonstrated the potential to reach and engage a large sample of MSM with sexual health messages using new media channels. Finally, a review of community-based HIV testing services provided evidence for the feasibility and acceptability of such models to increase access to testing for MSM; the findings suggest that pilot studies of community-based testing services are warranted in Australia.
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Appendices

**Appendix One:** A Systematic Examination of the Use of Online Social Networking Sites for Sexual Health Promotion.

**Appendix Two:** Developing Health Promotion Interventions on Social Networking Sites: Recommendations from The FaceSpace Project.

**Appendix Three:** The changing age distribution of men who have sex with men diagnosed with HIV in Victoria, Australia

**Appendix Four:** The Future of HIV Testing in Australia.

**Appendix Five:** Quick and easy: how rapid HIV tests can help reduce transmission.

**Appendix Six:** Promotional material for the ‘Suck it and See Study’
Appendix One. A Systematic Examination of the Use of Online Social Networking Sites for Sexual Health Promotion.

A systematic examination of the use of Online social networking sites for sexual health promotion

Judy Gold1,2*, Alinka E Pedrama1,2, Rachel Sacks-Davis1,2, Margaret E Helliard1,2, Shanton Chang4, Steve Howard4, Louise Keogh5, Jane S Hodding4 and Mark A Stoove1,2

Abstract

Background: In recent years social networking sites (SNSs) have grown rapidly in popularity. The popularity of these sites, along with their interactive functions, offer a novel environment in which to deliver health promotion messages. The aim of this paper is to examine the extent to which SNSs are currently being used for sexual health promotion and describe the breadth of these activities.

Methods: We conducted a systematic search of published scientific literature, electronic sources (general and scientific search engines, blogs and SNSs Facebook, MySpace) to identify existing sexual health promotion activities using SNSs. Health promotion activities were eligible for inclusion if they related to sexual health or behaviour, utilized one or more SNSs, and involved some element of health promotion. Information regarding the source and type of health promotion activity, target population and site activity were extracted.

Results: 178 sexual health promotion activities met the inclusion criteria and were included in the review; only one activity was identified through a traditional systematic search of the published scientific literature. Activities most commonly used one SNS; were conducted by not-for-profit organisations; targeted young people and involved information delivery. Facebook was the most commonly used SNS (used by 71% of all health promotion activities identified), followed by MySpace and Twitter. Seventy nine percent of activities on MySpace were considered inactive as there had been no online posts within the past month, compared to 22% of activities using Facebook and 14% of activities using Twitter. The number of end-users and posts in the last seven days varied greatly between health promotion activities.

Conclusions: SNSs are being used for sexual health promotion, although the extent to which they are utilised varies greatly and the vast majority of activities are unreported in the scientific literature. Future studies should examine the key factors for success among these activities attracting a large and active user base, and how success might be measured, in order to guide the development of future health promotion activities in this emerging setting.

Keywords: Social networking sites, health promotion, sexual health.

Background

Social networking sites (SNSs), websites that enable individuals to maintain, form and visualise their social networks [1] – have rapidly become an established part of the online environment. Facebook, Twitter, LinkedIn and MySpace are the most popular SNSs globally [2].

Numerous other SNSs exist, although many are popular only among certain sub-groups or within particular geographic regions [1]. Most SNSs also facilitate public and private messaging, photo, video and other content sharing, provide live updates, enable the formation of groups and organisation pages and include applications such as games, quizzes and polls [1,2-5]. SNSs are part of 'Web 2.0', a loose collection of web-based technologies and services where end-users interact and collaborate as
content creators, rather than one-way information flow, which characterizes the relatively static websites of “Web 1.0.”

Growth in the use of SNSs has been extremely rapid; in August 2010 Facebook reported over 500 million active users, [9] compared to 200 million users in April 2009 [10]. A multi-country study conducted in 2008 found that two thirds of those who use the internet access SNSs [11]. Although young people are the most frequent users of SNSs, use by older adults is increasing [11,12]. The time that individuals spend on SNSs is also increasing; there was a 63% increase in use between 2007 and 2008 compared to an 18% increase in time spent online overall [11]. A 2007 study from the UK reported that 50% of SNS users visit their SNS profile at least every second day [13].

The considerable increase in users of SNSs, their frequency of use, and the interactive functionality of SNSs have prompted calls for health-related interventions, including health promotion, to be delivered in these spaces [6,14-16]. SNSs provide a medium of enormous potential for health promotion both in terms of audience reach and interactive functions that could be exploited for intervention delivery.

In this paper, we examine the current use of SNSs for health promotion. We focus on sexual health promotion, our own area of expertise, and also a critical public health issue where online health promotion interventions are already well established [17-23]. Given the relatively short time in which SNSs have been in use and a lack of consensus with regards to how the outcomes of health promotion activities using SNSs should be evaluated, [8] the aim of this paper is not to assess the impact of individual health promotion activities using SNSs, but to provide an overview of existing activities using this medium. This overview identifies the SNSs that are currently being utilised, the organisations responsible for the health promotion activities, and characteristics of the health promotion activities themselves, including an indication of user activity.

Methods
To examine the use of SNSs for health promotion we developed a novel search strategy covering published scientific literature, electronic sources and SNSs. The search strategy was developed after preliminary searching of published scientific literature revealed very few sexual health promotion activities using SNSs, despite our knowledge of examples from scientific conferences [24-31].

The search strategy was informed by previous examples of searching electronic data, [32-35] consultation with a subject librarian and our understanding of SNSs. We experimented with multiple electronic data sources and search terms before developing the final search strategy. All searches were conducted in November 2010.

Search Strategy
1. Published Scientific Literature
Key medical and scientific databases (CINAHL, Embase, Ovid MEDLINE, PsycINFO Scopus, Web of Science) were systematically searched. Relevant search terms were developed based on previously published literature [24,36-39]; the full list of search terms used for each database can be found in additional file 1. Search terms for sexual health covered sexual behaviour, sex education, sexually transmitted infections (STIs), condoms and contraception. Search terms for SNSs were adapted from those used by Bardaus et al [24] and included social networking websites, online social networking as well as specific SNSs (Facebook and MySpace). These two SNSs were chosen as they are the two most well-established SNSs globally [1]. Where possible, search terms were matched to appropriate subject headings and the ‘explode’ function used. One screener reviewed the titles and abstracts of all reports retrieved.

2. Electronic Sources
As electronic sources did not permit the same level of complexity in search terms as the medical and scientific databases, simplified search terms were used, adapted from those used for searching the published scientific literature (see additional file 1): Three types of electronic sources were searched:


As the number of records retrieved by searches of electronic sources is generally unmanageably large, only the first 100 results retrieved from each electronic source for each search term [34] were reviewed for inclusion. Searches were conducted once only, on the same day for each electronic source. One screener reviewed each result retrieved for inclusion.

3. Social Networking Sites
Searches were performed in two key SNSs, Facebook http://www.facebook.com and MySpace http://www.myspace.com. These SNSs do not allow the use of ‘AND’ or ‘OR’ operators within searches, so searches used key terms only (see additional file 1).

As with the searches of electronic sources, the first 100 search results for each search term were reviewed for inclusion by one screener.
Inclusion Criteria

Search results from the published scientific literature, electronic sources and SNs were included if they met all of the following criteria:

1. **Involved the use of SNSs**: SNSs were defined as websites that functioned primarily for individuals to maintain, form and visualise their social networks (consistent with Boyd’s definition of a SNS) [1]. Websites with either primary functions, such as online dating or content sharing were not included. SNSs could be pre-existing sites, or created specifically for the health promotion activity.

2. **Related to sexual health or behaviour**: Records were included if they involved some information or discussion related to sexual health or behaviour, sexual education, HIV and other sexually transmitted infections, condoms or contraception.

3. **Involved health promotion**: Health promotion was defined as any activity relating to awareness, education, service provision or advocacy related to sexual health or behaviour.

Health promotion activities hosted on multiple websites, including SNSs, were included, as were ‘general health’ promotion activities on SNSs that included a health health focus. Activities that aimed to facilitate communication among professionals were excluded as this communication was not considered a health promotion activity. Records retrieved that were not in English were excluded.

Data Extraction and Analysis

All records meeting the inclusion criteria were reviewed by viewing the health promotion activity on the SNS used. Information was collected about the organisation responsible for the health promotion activity (name, country of origin, organisation type), the health promotion activity itself (title, year created on SNS, type of SNS) and the context of the health promotion activity (primary sexual health topic, primary target group, purpose of the health promotion activity). The number of end users (fans/follower/member) of the health promotion activity was also recorded.

As a measure of site activity, we recorded when the most recent post (excluding spam) was made for each health promotion activity. We also recorded the number of posts by the owner and end-users of the health promotion activity in the seven days prior to review of the health promotion activity. ‘Likes’ on Facebook were considered user posts. No user posts were reported from Twitter because user posts are not publicly displayed on the owners’ Twitter profiles. Health promotion activities were defined as ‘active’ if there were any posts in the month prior to review.

Where the required information could not be sourced from the SNS, reasonable attempts were made to locate the information (for example, visiting the organisation’s website). All details of the health promotion activities were entered into a Microsoft Access 2007 database. Health promotion activities using multiple SNSs were treated as one record.

Results

Search Results

Figure 1 displays the number of records retrieved and reviewed using the three search strategies. In total 2332 records were reviewed from the three search strategies: from these records, 295 (13%) health promotion activities were identified that met the inclusion criteria. An additional 27 health promotion activities appeared to meet the inclusion criteria but insufficient information was available to examine them (for example, the presence on a SNS could not be located, or the activity had not yet been conducted). The greatest number of health promotion activities were identified through direct links to SNSs (n = 125, n = 42%) and blogs (n = 55, 19%), followed by news sites (n = 40, 13%). Removal of duplicates resulted in 178 health promotion activities for inclusion (see Additional file 2, table 1).

The search of the published scientific literature identified 18 reports that met the first two inclusion criteria (used SNSs and were related to sexual health and behaviour) but did not meet the third (involved sexual health promotion). Among these 18 excluded reports, 10 examined aspects of SNSs (profiles, groups, networks, posts), 40-49 four reported using SNSs to recruit participants [50-53] and three examined the association between the use of SNSs and sexual health and behaviour [54-56]. One report described an intervention to reduce references to personal sex practices and substance use on publically available user profiles [57].

Sexual Health Promotion Activities Using Social Networking Sites

- **Social Networking Sites Utilised**: Among the 178 health promotion activities identified, 58% used one SNS and 42% used two or more SNSs (Table 1). Facebook was the most commonly used SNS, used by 71% of all health promotion activities. MySpace was used by 46% of activities and Twitter by 30%. Other commercial SNSs used were Ning (n = 3), Bebo (n = 2) and MyMyspace (n = 1). Ten health promotion activities used a custom SNS (Table 1).

- **Organisations Responsible**: Of the 178 health promotion activities identified, just under half were conducted by not-for-profit
organisations (43%), followed by government departments or agencies (16%) and the private sector (12%) and academic institutions (11%; Table 1). Fifty-six (32%) of the health promotion activities were conducted by organisations that deliver clinical services (Table 1). Most health promotion activities did not report the year they commenced on SNSs (n = 104, 58%) among those that did, 60 (81%) commenced in 2008 or later.

Health promotion activities were mainly conducted by organisations or individuals based in the United States (n = 126, 71%), followed by the United Kingdom (n = 20, 11%). Most activities were conducted by organisations or individuals from high income countries: 58% seven were from middle income countries (five from South Africa, one from each of Maldives and Mauritius) and none were low income countries. Two health promotion activities were conducted by multinational organisations while the country of origin of an additional four activities could not be identified.

Characteristics of Health Promotion Activities

Among the 178 health promotion activities, three purposes of using SNSs were identified; connecting similar individuals (6%), delivering a campaign or intervention (29%) and having an organisational or programme presence on SNSs (63%; Table 1). Most of the activities focused on sexual health in general (57%) or HIV specifically (25%). Among the 91 activities where the target audience was known, the most common target audience was young people (30% of all activities; Table 1). Three quarters of all health promotion activities (n = 139, 78%) provided information related to sexual health while 87 (49%) provided direct referrals to clinical services.

Table 1 displays the level of site activity for health promotion activities using the three most popular SNSs (Facebook, MySpace and Twitter). The majority of health promotion activities using Facebook (68%) and Twitter (86%) were considered active as there had been new posts within the month prior to review, compared to 21% of health promotion activities using MySpace. The number of end-users and posts in the past seven days varied greatly between health promotion activities. Among the active sites, MySpace had the highest median number of end-users and Twitter the highest median
Table 1 Characteristics of Included Health Promotion Activities

<table>
<thead>
<tr>
<th>Activity Characteristic</th>
<th>Number of Activities (%)</th>
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<tr>
<td><strong>Number of SNSs used by activity</strong></td>
<td></td>
</tr>
<tr>
<td>One</td>
<td>104 (68.4)</td>
</tr>
<tr>
<td>Two</td>
<td>50 (31.3)</td>
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<tr>
<td>Three</td>
<td>22 (12.6)</td>
</tr>
<tr>
<td>Four</td>
<td>2 (1.1)</td>
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<tr>
<td><strong>SNS used</strong></td>
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<tr>
<td>Facebook</td>
<td>126 (80.8)</td>
</tr>
<tr>
<td>MySpace</td>
<td>82 (66.1)</td>
</tr>
<tr>
<td>Twitter</td>
<td>54 (39.9)</td>
</tr>
<tr>
<td>Other site*</td>
<td>6 (3.8)</td>
</tr>
<tr>
<td>Custom site</td>
<td>10 (0.6)</td>
</tr>
<tr>
<td><strong>Owner</strong></td>
<td></td>
</tr>
<tr>
<td>Academic institution</td>
<td>20 (12.2)</td>
</tr>
<tr>
<td>Collaboration</td>
<td>11 (6.2)</td>
</tr>
<tr>
<td>Government</td>
<td>26 (15.7)</td>
</tr>
<tr>
<td>Individual</td>
<td>11 (6.2)</td>
</tr>
<tr>
<td>Not for profit</td>
<td>72 (43.3)</td>
</tr>
<tr>
<td>Private sector</td>
<td>22 (13.4)</td>
</tr>
<tr>
<td>Unknown</td>
<td>9 (5.1)</td>
</tr>
<tr>
<td><strong>Country of Origin</strong></td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>136 (70.9)</td>
</tr>
<tr>
<td>Other</td>
<td>52 (30.2)</td>
</tr>
<tr>
<td><strong>Main Purpose of Activity</strong></td>
<td></td>
</tr>
<tr>
<td>Connect individuals</td>
<td>10 (6.0)</td>
</tr>
<tr>
<td>Campaigns and interventions</td>
<td>51 (32.7)</td>
</tr>
<tr>
<td>Organisation/programme presence</td>
<td>112 (68.9)</td>
</tr>
<tr>
<td>Underspecified</td>
<td>5 (2.8)</td>
</tr>
<tr>
<td><strong>Sexual Health Focus</strong></td>
<td></td>
</tr>
<tr>
<td>General health (including sexual health)</td>
<td>12 (6.7)</td>
</tr>
<tr>
<td>HIV</td>
<td>44 (27.7)</td>
</tr>
<tr>
<td>Sexual health</td>
<td>101 (62.2)</td>
</tr>
<tr>
<td>STIs (sexually transmitted infections)</td>
<td>1 (0.6)</td>
</tr>
<tr>
<td>Other*</td>
<td>9 (5.1)</td>
</tr>
<tr>
<td><strong>Target Audience</strong></td>
<td></td>
</tr>
<tr>
<td>Same-sex attracted individuals</td>
<td>10 (5.0)</td>
</tr>
<tr>
<td>People living with HIV</td>
<td>12 (7.3)</td>
</tr>
<tr>
<td>Young people</td>
<td>52 (30.9)</td>
</tr>
<tr>
<td>Other*</td>
<td>16 (9.2)</td>
</tr>
<tr>
<td>Unclear/not specified</td>
<td>87 (44.8)</td>
</tr>
</tbody>
</table>

SNS: Social Networking Site.  
* Not mutually exclusive.  
* Includes men (n = 32), women (n = 23), heterosexuals (n = 3).  
* Includes a range of 20 health-related interventions (n = 24) and those focused on the health of same-sex attracted individuals (n = 10).  
* Includes adults (n = 3), people infected with STIs (n = 4), African Americans (n = 2), males (n = 2), HIV negative individuals (n = 1), indigenous (n = 1) and sex workers (n = 1).

Discussion

This study is the first published report describing how SNSs are being used for health promotion. In this case, sexual health promotion. Although there are many examples of SNSs being used for sexual health promotion, most activities are unreported in the scientific literature and the number and activity of end-users varies greatly. Knowing the scale and scope of the current level of health promotion using SNSs is a key first step in designing more effective health promotion interventions in this new medium.

For the moment, it appears the use of SNSs for sexual health promotion is not widespread: most activities are from the United States, largely target young people and primarily focus on having an organisational or programme presence on SNSs. These outcomes are perhaps not surprising given the emergence of SNSs and the high Internet penetration in the United States, the initial young user-base of SNSs [11] and the reality that many organisations may have viewed SNSs (at least initially) as simply an additional online location in which to add a presence, alongside their organisational website. However, as SNSs become more widely used, it is likely that they will also be increasingly used in more diverse ways for health promotion, including for the delivery of campaigns and interventions (now that there is an established user base) and for targeting sub-populations other than young people.

The dominance of three SNSs (Facebook, MySpace and Twitter) within the health promotion activities identified is partly a reflection on our search strategy (which specifically sought out activities on Facebook and MySpace) and also a reflection of the current market share of these SNSs. The advantage of using these established SNSs is that the target audience is already present and interacting with their social networks, unlike creating a custom SNS that must first attract end-users before it can reach individuals for health promotion. However, utilising an established SNS can restrict how the health promotion activity is presented, the content that can be provided under each SNS’s ‘acceptable use’ policy, and ownership of online content, which may affect the delivery and fidelity of health promotion activities.
### Table 2: Site Activity among Active Health Promotion Activities

<table>
<thead>
<tr>
<th></th>
<th>Active</th>
<th>Number of Users</th>
<th>Number of Posts by Owners past seven days*</th>
<th>Number of Posts by Users past seven days*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>No. Median</td>
<td>Range</td>
<td>Median</td>
</tr>
<tr>
<td>Facebook</td>
<td>84</td>
<td>56.3</td>
<td>337</td>
<td>15:111,291</td>
</tr>
<tr>
<td>MySpace</td>
<td>17</td>
<td>21.3</td>
<td>655</td>
<td>1:288,809</td>
</tr>
<tr>
<td>Twitter</td>
<td>44</td>
<td>86.3</td>
<td>505</td>
<td>2:77,087</td>
</tr>
</tbody>
</table>

NA Not available

* Posts within the 50 days prior to review

---

Defining features of Web 2.0 include generation of content by end-users and online social engagement [59]. There was great diversity in popularity and the extent of online interaction among the health promotion activities identified. The most popular health promotion activities had thousands of end-users, with regular posts by owners and end-users each week. Nonetheless, many health promotion activities were inactive, particularly those using MySpace. There seems little purpose in having a relatively ‘static’ presence on a SNS, with few posts and end-user interactions, in addition to an organisational or campaign ‘Web 1.0’ website.

From reviewing the health promotion activities identified, it appears that some organisations have simply broadened their online presence into SNSs with relatively minimal effort, using similar content to their existing websites and making little attempt to encourage social activity and engagement. However, other organisations appear to have ‘purpose built’ their presence on SNSs, providing regular updates and delivering content specifically designed for each SNS used. Often, but not always, the most popular sites are also those with the most active online communities. Online social activity does not always happen naturally [60]; future investigations should focus on the most popular and active health promotion activities on SNSs in order to better understand the content, features and approaches that successfully encourage social engagement. These elements could then be used to develop more engaging interventions, which may be more effective as interaction is known to promote deeper learning and understanding [61].

SNSs are constantly evolving. This creates challenges for health promoters, for example when the functionality of SNSs change, or when end-users migrate from one SNS to another. In this review, the high proportion of dormant health promotion activities using MySpace may be a reflection of the more general migration of users from MySpace to Facebook [62-64]. Organisations need to be flexible in responding to this evolution in order to maximise the value of health promotion activities using SNSs. For example, from 2009 Facebook allowed external websites to use Facebook logos and access content from Facebook which has been very popular [65,66]. Thus it is now possible to deliver health promotion activities using functions (and audience reach) of SNSs, without the site actually being hosted on an external commercial platform.

A comprehensive overview of existing sexual health promotion activities using SNSs required us to search electronic sources and SNSs themselves, as well as the published scientific literature. That so little was available in the published scientific literature was most likely a reflection of the rapid emergence and uptake of SNSs, coupled with the time involved in obtaining funding, implementing and evaluating activities using SNSs, and publishing the results. An additional impediment to the scientific publication of health promotion activities using SNSs may be the lack of consensus regarding appropriate evaluation frameworks for these activities [8]. However, searches of electronic sources and SNSs bring their own challenges, such as the restricted search capabilities, the inability to replicate searches (see limitations), the incompleteness of information within health promotion activities identified and the unmanageably large number of records retrieved. Given that the need to use electronic sources and SNSs brings their own challenges, such as the restricted search capabilities, the inability to replicate searches (see limitations), the incompleteness of information within health promotion activities identified and the unmanageably large number of records retrieved. Given that the need to use electronic sources and SNSs brings their own challenges, such as the restricted search capabilities, the inability to replicate searches (see limitations), the incompleteness of information within health promotion activities identified and the unmanageably large number of records retrieved. Given that the need to use electronic sources and SNSs brings their own challenges, such as the restricted search capabilities, the inability to replicate searches (see limitations), the incompleteness of information within health promotion activities identified and the unmanageably large number of records retrieved.
forced to make choices about which search terms could be used in each data source. However, we attempted to maximise coverage by searching within key SNSs as well as using multiple electronic data sources and multiple search terms. In addition, the searches conducted are not replicable because online content and search algorithms are constantly changing. The search strategy also limited the likelihood that campaigns using SNSs primarily for 'viral marketing' would be identified (although one such campaign was identified and included). Only English language sources were searched, which biased results towards health promotion activities from English speaking countries. Due to the large number of records retrieved and time limitations, each record was assessed by only one screener. However, the two screeners regularly consulted each other when it was unclear whether the record met the inclusion criteria, and in case of disagreement consulted with a third individual (author AP). For practical reasons, measures of reach was limited to number of end-users of each health promotion activity, while the measure of online social engagement was limited to user posts within a short time period. Although these metrics have clear limitations, it has been argued that online usage statistics are important because they currently offer the one standardised and comparable metric for Internet-based interventions and has been associated with positive outcomes across a range of health conditions [8].

This study focused on providing an overview of the current use of SNSs for sexual health promotion; it did not aim to assess the impact of individual health promotion activities. Process and impact evaluations of individual health promotion activities using SNSs should consider inclusion of measures such as:

- Characteristics of end-users - demographics, health knowledge, attitudes and behaviours;
- Quantity of interactions - number of interactions with end-users;
- Quality of interactions - content analysis of interactions to assess relevance and utility;
- Message spread - number of 'shares' and 'retweets' of site content (and characteristics of secondary recipients of site content, if possible);
- Impact of activity on health knowledge, attitudes and behaviours; and
- Cost-effectiveness of activities, particularly in comparison to the cost and effectiveness of delivering health promotion interventions via more traditional channels.

**Conclusion**

This investigation presents the first published overview of how SNSs are being used for sexual health promotion. It appears that the call has been heeded [6,14-16] SNSs are being used to deliver health promotion, although these activities have not been described in the published scientific literature or evaluated for their effectiveness in improving health outcomes. The key elements highlighted in this study, such as SNSs used and levels of online social engagement, provide a focal point for individuals and organisations considering using SNSs for health promotion activities. Future studies should consider detailed investigation of individual health promotion activities that have attracted large and active end-user bases in order to elucidate the key factors for success. SNSs offer an unparalleled medium for reaching and engaging with a large number of individuals; the challenge now is how to maximise the reach and impact of health promotion delivered in this new setting and how to attribute success to the varying intervention components and website functionalities.

**Additional material**

Additional file 1: Search terms used. This file contains the full list of search terms used for each information source, and some additional detail to how the searches of electronic sources were conducted.

Additional file 2: Health promotion activities identified. This file contains key information about each health promotion activity included in the review.

Additional file 3: Most active health promotion activities. This file contains a list of the health promotion activities identified with the highest number of users, highest number of posts by owner and highest number of posts by users.

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**Authors' contributions**

JG contributed to the conception of the manuscript, conducted the literature review and analysis, and was responsible for manuscript preparation and review. AP and RD contributed to the conception of the manuscript, analysis of the literature and manuscript review. NH contributed to the conception of the manuscript, assisted with literature analysis and manuscript review. SC, SH, UC and JS assisted with literature analysis and...
reviewed the manuscript. MS contributed to manuscript conception, started with literature analysis and reviewed the manuscript. All authors read and approved the final manuscript.

Competing interests
The authors declare that they have no competing interests.

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Appendix Two: Developing Health Promotion Interventions on Social Networking Sites: Recommendations from The FaceSpace Project

Viewpoint

Developing Health Promotion Interventions on Social Networking Sites: Recommendations from The FaceSpace Project

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Abstract

Online social networking sites offer a novel setting for the delivery of health promotion interventions due to their potential to reach a large population and the possibility for two-way engagement. However, few have attempted to host interventions on these sites, or to use the range of interactive functions available to enhance the delivery of health-related messages. This paper presents lessons learnt from “The FaceSpace Project”, a sexual health promotion intervention using social networking sites targeting two key at-risk groups. Based on our experience, we make recommendations for developing and implementing health promotion interventions on these sites. Elements crucial for developing interventions include establishing a multidisciplinary team, allowing adequate time for obtaining approvals, securing sufficient resources for building and maintaining an online presence, and developing an integrated process and impact evaluation framework. With two-way interaction an important and novel feature of health promotion interventions in this medium, we also present strategies trialled to generate interest and engagement in our intervention. Social networking sites are now an established part of the online environment, our experience in developing and implementing a health promotion intervention using this medium are of direct relevance and utility for all health organizations creating a presence in this new environment.

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KEYWORDS
Health promotion, Internet, social networking sites

Introduction

Over the past 20 years the Internet has dramatically changed how individuals access information and communicate. Global Internet use has grown exponentially, with an estimated 1.3 billion Internet users in 2009, up from 318 million users in 1998 [1]. The Internet is increasingly used for health purposes [2]. One survey reported 83% of American Internet users source health information online [3]. Numerous Internet-based health interventions have been developed, with several reviews concluding that such interventions generally have positive effects for a range of behaviours [4-7].

“Web 2.0” is a relatively recent development that refers to a loose collection of web-based technologies and services that
allow end users to interact and collaborate as content creators, rather than the one-way information flow on relatively static 'Web 1.0' websites [8-10]. The term 'social media' is used interchangeably with Web 2.0 to describe sites and applications that allow information sharing and interactive activities among online communities; examples include blogs, wiki, content-sharing sites, virtual worlds and social networking sites [10,11].

Social networking sites allow individuals to maintain, form and visualize their social networks, and often offer additional functions such as public and private messaging and photo, video and other content sharing [12]. Facebook, Twitter, LinkedIn and MySpace are the most popular social networking sites globally [13], with others largely popular only within certain sub-groups or geographical regions [12]. Growth in usage has been extremely rapid, with Facebook reporting 500 million active users [14], up from 200 million in April 2009 [15].

Commercial organizations have been quick to capitalize on the utility of using Web 2.0 to attract, retain and engage end users [10], while health organizations have lagged behind [10,16,17]. Very little has been published about how social networking sites might be exploited for health promotion interventions. A recent review of the use of social media for social marketing identified just four examples, none of which used the most common social networking sites listed earlier [18]. Some health organizations have begun extending their presence into social networking sites [19-22]; however, this has often been used as an additional form of marketing to promote services rather than for intervention delivery. Other work has focused on the public display of risky behaviour (e.g. alcohol use) on these sites [23,24]. However, there are few published examples of organizations actually delivering health promotion interventions through social networking sites.

The lack of published examples describing intervention delivery using social networking sites makes it very difficult for others to realistically consider if and how they might approach developing interventions in these spaces. Moreover, the lack of evidence for evaluating such interventions makes it difficult to determine if health promotion interventions using social networking sites are effective.

During 2009 and 2010, we implemented a novel health promotion intervention using social networking sites: "The FaceSpace Project". The aim of this paper is to use our experience to provide recommendations for developing health promotion interventions on social networking sites.

The FaceSpace Project

The FaceSpace Project trialled the delivery of sexual health promotion via social networking sites to two key at-risk groups: young people aged 16-29 years, and men who have sex with men (MSM). The project concept was to use fictional characters to post content (primarily videos) and to interact on various social networking sites, with sexual health promotion messages embedded within some postings and interactions. The project was a collaboration between public health researchers, experts in user interaction with information technologies, a creative productions company, and a community organization.

The young people's arm was developed and implemented first. Two young male and two young female characters and character narratives were developed in workshops with young people, actors, and project staff, and character narratives developed. Each character had a Facebook page (www.facebook.com/thefacespaceproject), and a presence on one other social networking site (Twitter, Flickr, YouTube) (www.youtube.com/thefacespaceproject) (Figure 1). (Note that the pages for the young people's arm are no longer actively maintained.) The overall project also had a Facebook page and a YouTube channel. From November 2009 until April 2010, each character posted regular updates and periodic videos on their sites, including interactions on each other's sites. Project evaluation included site usage and interaction statistics, questionnaires and focus group discussions.

The learnings from the young people's arm of the project informed the development of the MSM arm. This arm was separately branded 'Queer As F**k!' and launched online in April 2010. In this arm, four male characters (all MSM) were developed; however, the emphasis of the development phase was on the series narrative (rather than character-focused), and all the characters interacted together on one Facebook page (www.facebook.com/QAFock), supported by one YouTube channel (www.youtube.com/queeradick) (Figure 2). Unlike the youth arm where the videos were styled predominantly as personal blogs, videos in the MSM arm were episode in nature with a cohesive narrative and sexual health themes embedded in most episodes. Similar evaluation methods were used to the youth arm, with the addition of a diary-scrapping.
Figure 1. Screen shots from the site of The FaceSpace Project targeting young people.

Figure 2. Screen shots from the site of The FaceSpace Project (Queer as F**k) targeting men who have sex with men.
Key Outcomes From The FaceSpace Project

At the conclusion of the young people’s arm of the project, the 3 Facebook pages had a total of 3,900 fans. The 51 project videos had 5,300 total views on YouTube, with views of individual videos ranging from 12 to 3,088 views. Interaction on the Facebook pages varied over time, with peaks generally corresponding to posting of project videos.

At the conclusion of the arm of the project targeting gay men (‘Queer as F**K’), the Facebook page had 1,352 fans. The 10 video episodes of the project had 2,980 views, with views of individual episodes ranging from 256 to 1,814 views. As with the youth arm of the project, interaction on the Facebook page varied over time, with peaks in interactions generally corresponding to when new video episodes were posted (Figure 4).

Since the conclusion of The FaceSpace Project, the arm targeting gay men (‘Queer as F**K’) has been taken up by the project’s key community partner, the Victorian AIDS Council/GayMen’s Health Service. Subsequent seasons of Queer as F**K have formed an integral part of their social marketing campaigns.

Figure 4: Daily number of interactions (likes, wallposts and comments) in the Facebook page of the arm of The FaceSpace Project targeting gay men.

http://www.jsm.org (Email: jsm@journals.org)
Key Recommendations from The FaceSpace Project

Table 1. Recommendations from the FaceSpace Project.

<table>
<thead>
<tr>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Create and maintain a multidisciplinary team with all the skills required—just because you can drive a car and change the oil doesn’t make you a mechanic.</td>
</tr>
<tr>
<td>2. Avoid data delays getting approval (fiscal, legal, organizational)—it’s a new medium and sometimes the process hasn’t been tested</td>
</tr>
<tr>
<td>3. Resources must be resources—you will need time, money, human and brand power to develop and maintain sites (without forgetting the rest)</td>
</tr>
<tr>
<td>4. Measure impact (hard) and do it early—just because you’ve built it doesn’t mean they’ll come</td>
</tr>
<tr>
<td>5. Keep your audience engaged—don’t sell off the seventies</td>
</tr>
<tr>
<td>6. Be social—if you find the formula, you’re on a winner</td>
</tr>
<tr>
<td>7. Define success and how you will measure it.</td>
</tr>
</tbody>
</table>

We formed a multidisciplinary project team that involved public health researchers (Burnet Institute), experts in how and users interact with technology [Department of Information Systems, University of Melbourne], a creative production company experienced in online performance (XENON/life). |

Although our multidisciplinary project team was successful in isolating the differences of their own, including assessing timely and adequate communications, clear delineation of roles and responsibilities, and interdisciplinary tensions including different philosophies, understanding approaches to design and implementation (eg, user-level vs
creative-led design). This was the first time this team had worked together, and we had not anticipated the resources (time, financial) required to build and maintain this collaboration. Such resourcing is vital to ensure a healthy and vibrant collaboration to support the development of effective interventions.

**Recommendation 2. Anticipate Delays Getting Approval (Ethical, Legal, Organizational)—It’s a New Medium and Sometimes the Waters Haven’t Been Tested.**

The use of social networking sites for health promotion interventions can raise ethical, legal and organizational concerns. In addition, individuals and boards who are responsible for approving interventions may not be familiar with social networking sites or how they are used by individuals [25]. Potential concerns include privacy, consent, intervention access, duty of care, organizational reputation, data collection and management, and reduced control over message delivery compared to other settings.

In our case, while legal approval was relatively straightforward, we had some challenges negotiating intellectual property ownership between the collaborating organizations. In addition, we undertook a lengthy review process before being granted approval by our ethical review board. One positive outcome of this review included development of a clearer and more detailed protocol for responding to ‘inappropriate’ posts on our pages (see Multimedia Appendix 1). However, we were required to significantly modify the delivery of our intervention in several ways. For example, the board required prominent disclaimers on the page and regular reminders to fans that reinforced that our characters were fictional, and warnings not to post information that individuals ‘may regret later’. We believe these requirements may have negatively impacted on our credibility on social networking sites and thus reduced end users’ willingness to participate and engage with our intervention.

Social networking sites are a new and challenging environment for many organizations. This should be anticipated in project timelines, as applying and obtaining ethical, legal and organizational approval can be time-consuming and difficult. Content areas considered socially ‘sensitive’ (such as ours) or related to illicit behaviour (e.g. drug use) may attract additional scrutiny, given the public nature of social networking sites. Including a “Social Networking 101” education component for approval bodies during the development period may be a useful strategy to minimize delays in obtaining approval.

**Recommendation 3. Resource, Resource, Resource—You Will Need Time, Money, Human and Brain Power to Develop and Maintain Sites (Without Forgetting the Rest).**

One of the advantages of delivering health interventions online is they can reach a large number of people relatively cheaply, and at a reduced cost compared to other approaches [2, 26]. However, although hosting pages on social networking sites is free, the time spent creating, developing and maintaining them isn’t. The time to upload posts can be substantial when multiple sites need to be updated, and posts monitored and responded to. Sourcing and developing the content of posts also requires resources, even if sites are largely reliant on existing content, this must be sourced and reviewed for accuracy and appeal. We used an ‘educainment’ (education and entertainment) approach to maximize appeal to our target audience, which required substantial investment to develop.

As our project involved a novel approach, we were unsure at the outset of the resources required. As the project evolved, we realized we had substantially underestimated the time and effort required to develop the sites initially, and to maintain them for the duration of the project. Given the amount of information on social networking sites, and the speed at which information changes (on Facebook alone 30 billion pieces of content are shared each month [14]), we potentially needed to be posting content several times a day, rather than every few days. We found that the resources required to maintain sites detracted from attending to other key tasks, such as exploring alternative approaches to engage end users, maintaining our collaboration, and project evaluation. Upon reflection, it would have been ideal to have had the capacity to employ an individual with the time and interest to maintain the pages (e.g. an avid social media user), rather than using a combination of creative professionals and researchers, whose primary project roles were not online maintenance.

**Recommendation 4. Generate Interest (buzz) and Do It Early—Just Because You’ve Built It, Doesn’t Mean They’ll Come.**

One of the greatest challenges for health promotion interventions using social networking sites is being noticed amongst the huge amount of content online. Unlike traditional advertising, being visually appealing is not sufficient to attract attention. It helps to have an established base of end users when the site is launched; feedback from our initial IT laboratory testing with end users indicated sites need to look active to attract interest from others. We attempted to do this by ‘soft launching’ our pages via word-of-mouth through personal and professional networks. However, this approach required having an initial fan base different to the target demographics, which may limit the appeal of the intervention to the intended audience.

Promotion of the intervention is also critical, while we utilized ‘traditional’ methods of promotion such as print and broadcast media coverage and advertising, by far the most successful was using Facebook advertisements (although ours had an incentive attached) and uploading and tagging photos of end users at public events. Others have also noted the success of using online advertisements and photo tagging to attract end users [22, 27]. Resources for promotion are most effectively spent in online strategies that allow end users to immediately ‘click through’ to sites, rather than a two-step process of viewing the advertisement and finding the site online. Having a defined offline community to reach (as we did for the MSM arm of the project) also assists with targeting promotion.

**Recommendation 5. Keep Your Audience Engaged—Don’t Fall Off The Newsfeed.**

Users frequently connect with pages and groups, and download applications, never to take notice of them again. The amount of content available is overwhelming. Facebook alone has 900
million pages, groups, events and community pages [14]. This presents a difficulty for the delivery of health promotion online, especially when sustained engagement over time is required to deliver the intervention.

We were conscious at the outset that we did not want to deliver a Web 1.0 intervention using a Web 2.0 site. We aimed to truly interact and engage with our target group, not just broadcast information. The challenge was to maintain interest and engagement over a four-month intervention period with sufficient audience reach. We attempted to do this by using different delivery mechanisms such as posting regular updates (both text and videos), posing questions and encouraging comments on posts, and launching quizzes and polls, with varying success. However, it was clear from site usage data that interest and interaction on our pages declined considerably over time in both project arms (Figure 3 and Figure 4). In addition, the use of multiple delivery mechanisms may have ‘fragmented’ our key health messages; even if an individual had been exposed to one delivery mechanism, they may not have received the full message if they did not view other content on the site.

The loss of participants over time within an online intervention – the ‘Law of Attrition’ – is well known, and is often simply due to loss of participants [10,28]. In retrospect, we may have been able to increase (or simply maintain) engagement by delivering the intervention over a shorter time frame, focusing on a single core message, ensuring all posts could act as ‘stand alone’ messages and creating more opportunities for endusers to generate and manipulate content themselves. Further investigations are needed to establish the optimum method to engage users of social networking sites in health promotion interventions, and to retain them over time.

Recommmendation 6. Go Viral—If You Find the Formula, You’re a Millionaire.

Ultimately, the greatest success one can have on a social networking site is “going viral” – where enough people are sufficiently interested in a post to share it with their friends, who then share it with their friends and so on, resulting in an exponential growth of connections. This spread of information has been termed “internet meme” [30], the most common examples are when videos go viral and attract millions of views (eg, “Dancing Matt”, “Obama Girl”, “Diet Coke + Mentos” [30]). Even some videos containing health-related content have managed to achieve this; for example, “Keelee’s Sex Ed” YouTube channel has attracted over 240 million views [31]. In terms of health promotion, this aim would be to achieve viral spread primarily within the target population, as a widely dispersed intervention may be of little value if it does not reach the intended audience.

The challenge for those developing interventions on social networking sites is that no formula exists for achieving viral spread, and we certainly didn’t achieve this with our project (our most popular video had 3118 views). The critical factors believed to be important for viral spread include the structure of the campaign (if it is structured to encourage viral activity, and if it complies to ethical standards), the product being marketed by the campaign (if it is suitable for viral spread) and the message content (if the message is imaginative, contains fun and intrigue, is accessible and is engaging) [32]. Others stress the importance of having individuals with exceptionally large numbers of social connections to share the message [33]. Available empirical data supports that positive content, content inspiring emotion (particularly awe and surprise), content capturing imagination, and the connectivity of the person transmitting the information are important in ensuring viral spread [34-37]. Additionally, viral spread alone may not be enough; while it may increase viewing of one piece of content, this may not translate into sustained interest and engagement. Currently, our best suggestion is to keep testing different strategies targeted to your audience; hopefully you’ll be lucky and hit the jackpot!


There is little point developing health promotion interventions on social networking sites if it is not possible to measure if they are successful. This brings up two challenges: how to define success and how best to measure it.

As our project was a pilot we had both ‘process’ and ‘impact’ evaluation aims. These evaluation aims included assessing whether we could develop an intervention on social networking sites and attract and engage end users whilst delivering health promotion messages that would have a positive effect on sexual health knowledge and behaviour. As with any approach in its infancy, it is appropriate to focus on process as well as impact evaluation outcomes [38].

An appropriate methodology is of critical importance when evaluating interventions on social networking sites. Not only may we wish to evaluate traditional process and impact outcomes for health interventions (eg, reach, dose delivered and received, knowledge and behavioural change) [38,39], the usability and appeal of the sites is also of key importance. Evaluations of interventions using social networking sites need to appropriately define and measure end user engagement, and develop ways of measuring if and how engagement assists with achieving intervention aims; for example, is a ‘like’ of a page a valid measure of engagement, or is only a comment indicative of true user engagement. Evaluation in this setting is complicated further by the fragmenting of health messages across delivery mechanisms; it can be complex to measure which messages and delivery mechanisms end users were exposed to, and whether this exposure translated into any degree of positive behaviour change.

For our project, we integrated evaluation methods derived from both the health (questionnaires, focus groups, diaries) and information technology (user laboratory testing, expert review) spheres. This is consistent with O’Grady’s proposed ‘dynamic framework’ that suggests incorporating technology (eg, system robustness, reliability, usage statistics) and computer-mediated micronorm (eg, usability, accessibility, interactivity) elements within system evaluations [40]. To establish the evidence base for how best to use social networking sites for health promotion interventions, it is critical to move beyond simply collecting end user statistics and integrate evaluation methods from multiple disciplines.
Conclusion

Although there is much discussion and interest about using social media for health promotion interventions [10,16,17], our experience suggests this is far easier said than done, particularly if the intervention aims to truly use Web 2.0 functions to engage end users. Developing an intervention on social networking sites requires consideration of additional aspects beyond more traditional methods of health promotion. Developers need to consider the online environment and the nature of human interaction online, including Web 2.0 functionality, the characteristics of the target audience and their preferred social networking site(s), and how end users interact and engage in these spaces. Additionally, obtaining ethical, legal and organizational approval, and developing effective evaluation strategies may be challenging. These aspects require additional expertise not typically found in health-focused organizations, and the investment of considerable time and resources.

Social networking sites are now an established part of the online environment; despite being less than ten years old, they are among the most frequently accessed sites globally [13]. While the particular site that is most popular may change over time [12], these sites share common functions that have fundamentally changed how individuals communicate and interact both on- and off-line. Although these sites are primarily used to communicate with social networks, the increasing amount of time individuals spend in these settings [41] suggests that health organizations need to develop effective strategies for reaching individuals in these spaces, whether delivering interventions or using these sites to promote interventions delivered elsewhere.

The FaceSpace Project was our first attempt to develop a health promotion intervention using social networking sites. At the time of project conception there was no information in the published health literature to guide our project development, and undoubtedly we made several mistakes throughout the process. However, our staged implementation approach ensured we could incorporate learnings from the first site into the second (and now into the extension of the MSM arm), and we were able to develop an appropriate evaluation strategy.

As the popularity of social networking sites continues to increase, we hope that our experience is able to inform the development and evaluation of future health promotion interventions in these spaces. Developing health promotion interventions in this setting, and making mistakes and learning from them is certainly far better than doing nothing at all [30]. With the continuing change in communications media, health organizations must embrace these technologies or risk being left behind.

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Authors’ Contributions

All authors were involved in the design and implementation of The FaceSpace Project. JG led the conception, preparation and review of this manuscript. AP and MS were involved in manuscript conception and preparation. SH, SC, JA, OL, and CB contributed to the recommendations presented in the manuscript, and reviewed the manuscript. MH was involved in manuscript conception and preparation.

Multimedia Appendix 1

Content Monitoring Protocol.

[PDF File (Adobe PDF File), 28KB - jmir_v14i1e30_app1.pdf]

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**Abbreviations**

MSM: Men who have sex with men

© Judy Gold, Alisa E Pedrazzi, Mark A Stoove, Shanton Chang, Steve Howard, Jason Asselin, Olivia Ilic, Colin Batrouney, Margaret E Holland. Originally published in the Journal of Medical Internet Research (http://www.jmir.org), 28 02 2012. This is an open-access article distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/2.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work, first published in the Journal of Medical Internet Research, is properly cited. The complete bibliographic information, a link to the original publication on http://www.jmir.org/, as well as this copyright and license information must be included.
Appendix Three: The changing age distribution of men who have sex with men diagnosed with HIV in Victoria, Australia

The changing age distribution of men who have sex with men diagnosed with HIV in Victoria

Carol El-Hayek, Isabel Bergari, Margaret E Helled, Alisa E Pedrama, Nasa Higgins, Alan Brenchikin and Mark Stoop

ABSTRACT

Objective: To describe recent trends among men who have sex with men (MSM) in age at diagnosis of HIV in Victoria.

Design and setting: Analysis of Victorian HIV surveillance data from (i) passive surveillance (2000–2009) and (ii) the Victorian Primary Care Network for Sentinel Surveillance (VPCNSS) (2006–2009). Age-race comparisons were made using syphilis and gonorrhoea enhanced surveillance.

Main outcome measures: HIV diagnoses, HIV testing and behavioural indicators by year and age group among MSM.

Results: Following a period of sustained increase between 2000 and 2007, the median age at HIV diagnosis among MSM declined significantly, from 38.8 years in 2003 to 35.3 years in 2008 (P = 0.023), remaining at 35.9 years in 2009. Between 2007 and 2008, the median age of syphilis and gonorrhoea notifications also declined, from 40.6 to 36.0 years and from 32.3 to 29.3 years, respectively. The median age of HIV testing among MSM in the VPCNSS population remained constant between 2006 and 2009, at 35.0 years. Compared with older MSM, those aged less than 35 years were more likely to have never previously been tested for HIV (relative risk [RR], 1.36 [95% CI, 1.30–1.41]), to not know the HIV status of their regular partner (RR, 1.11 [95% CI, 1.01–1.21]), and to report inconsistent condom use with casual partners (RR, 1.07 [95% CI, 1.01–1.14]) and regular partners (RR, 1.07 [95% CI, 1.00–1.14]).

Conclusions: Younger MSM in Victoria may be at increasing risk of HIV infection. Enhanced methods of monitoring HIV and sexually transmitted infection transmission in younger MSM are needed, as well as prevention messages to target this group, who may not fully understand their HIV risk.

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For editorial comment, see page 653

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HIV/AIDS

HIV diagnoses declined in Australia during the 1990s, only to increase again through the 2000s, with men who have sex with men (MSM) continuing to be the group at greatest risk. Increased rates of HIV diagnosis have been greater in Victoria than in other states.1,2 Multiple factors are thought to be contributing to this increase, including increased rates of unprotected anal intercourse among MSM,3 an increase in other sexually transmitted infections (STIs) that facilitate HIV transmission,4,5 and increased numbers of sexually active HIV-positive MSM since the introduction of highly active antiretroviral treatment (HAART).6

Over the years, there has been an increase in the age at HIV diagnosis among MSM in Victoria,7 as would be expected given reported similarities in age within MSM sexual networks.8 Despite this trend, there has been ongoing concern about the potential risk of acquiring and transmitting HIV among younger MSM because, compared with older MSM, they have less frequent testing for HIV and STIs9 and are less likely to know their HIV status and that of their partner.10

In this article we report on recent trends from Victorian passive HIV surveillance and the Victorian Primary Care Network for Sentinel Surveillance (VPCNSS) that suggest younger MSM in Victoria are at increasing risk of HIV infection.

METHODS

Victorian passive HIV surveillance

HIV infection is a notifiable disease in Australia. However, HIV surveillance is enhanced by the collection of the following information based on patient self-report: the most likely route of exposure, most likely place the infection was acquired, clinical characteristics (symptoms, CD4 count), reason for the test; and HIV testing history (date, location and result of the previous HIV test).

Victorian Primary Care Network for Sentinel Surveillance

The VPCNSS is a network of clinical sites participating in the surveillance of HIV, syphilis, chlamydia and/or hepatitis C.11 The HIV network sites include sexual health and gay men’s health clinics with a high case load of MSM. These sites notified about 52% of all new HIV diagnoses in Victoria in 2008 (unpublished data, Burnet Institute, 2010). Demographic and risk behaviour information are collected from MSM undergoing routine testing for HIV and linked with their test result using a unique identifier.

Syphilis and gonorrhoea surveillance

Syphilis and gonorrhoea infections are notifiable diseases in Victoria. Enhanced surveillance of notified infectious syphilis (acquired ≤2 years previously) and gonorrhoea infections is voluntary and includes self-reported risk factor data such as gender of sexual partner, source and probable place of infection.

Analysis

Victorian passive HIV surveillance data (2000–2009) on cases reporting male-to-male sexual contact as the sole exposure to HIV were analysed. A “recently acquired” HIV infection was defined as an HIV diagnosis after a negative HIV test within the previous 12 months or a seroconversion illness in the previous 12 months. These data were supplemented by Victorian passive surveillance data on age trends in infectious syphilis (2004–2009) and gonorrhoea (1999–2008).

Self-reported data on MSM from the VPCNSS HIV network between April 2006 and June 2009 were analysed to determine trends in age at HIV test and differences in risk behaviours between age groups.

The Mann–Whitney U test was used to assess differences in age at HIV diagnosis between two reporting years, and linear regression was used to investigate long-term age trends. Differences in VPCNSS risk characteristics between age groups were assessed using univariate logistic regression. All analyses were conducted using Stata software, version 10 (StataCorp, College Station, Tex, USA).
RESULTS

HIV passive surveillance, 2000–2009

Between 2000 and 2009, 1625 MSM were diagnosed with HIV in Victoria. The median age of MSM at HIV diagnosis increased steadily from 34.5 years (range, 19.6–64.5 years) in 2000 to 38.8 years (range, 19.2–70.5 years) in 2007 (P < 0.0001), then declined significantly to 33.3 years in 2008 (range, 17.5–77.2 years) (P = 0.023) and remained at 33.0 years (range, 17.5–78.5 years) in 2009 (Box 1). Between 2007 and 2008, HIV notifications among MSM increased in all age groups under 35 years and decreased in all age groups between 35 and 49 years. In 2009, the number of HIV

diagnoses among MSM aged 25–29 years was 62% higher than in 2007 (Box 2).

Between 2000 and 2009, 41% of the total

HIV diagnoses among MSM were recently acquired infections. The annual median age of MSM diagnosed with recently acquired HIV ranged between 29.8 years (range, 19.1–73.0 years) in 2000 and 36.5 years (range, 18.6–62.8 years) in 2006. By 2009, the median age of MSM diagnosed with recently acquired HIV infections had declined to 33.6 years (range, 18.6–78.5 years) (P = 0.027 for difference between 2006 and 2009) (Box 1).

VPCNSS data, 2006–2009

The VPCNSS recorded 1649 HIV tests among MSM between April 2006 and June 2009. The median age of MSM testing for HIV remained constant (33.0 years), and the median age of MSM testing positive for HIV did not change significantly (37.2 years in 2006; 34.8–34.9 years in 2007–2009).

Based on recent HIV passive surveillance data showing that MSM diagnoses increased in all age groups under 35 years, we reclassified VPCNSS patients into two age groups (<35 years and ≥35 years) and compared behavioural data across the two groups. Compared with MSM aged 35 years and over, MSM aged under 35 years were more likely to have never previously been tested for HIV (odds ratio [OR], 1.39 [95% CI, 1.03–1.81]; to report not knowing the HIV status of their regular partner (OR, 1.11 [95% CI, 1.01–1.21]); and to report inconsistent condom use with casual partners (OR, 1.07 [95% CI, 1.01–1.14]) and regular partners (OR, 1.07 [95% CI, 1.00–1.14]). Among sexually active MSM, those aged 35 years and over were less likely to report having more than five sexual partners in the previous 6 months (OR, 0.91 [95% CI, 0.85–0.97]) (Box 3).

Syphilis surveillance, 2004–2009

Between 2004 and 2009, 1,313 infectious syphilitic cases were diagnosed among MSM in Victoria. The median age at diagnosis among MSM increased from 35.0 years (range, 20.9–70.0 years) in 2004 to 40.6 years (range, 18.6–43.6 years) in 2007 (P < 0.0001), then declined to 36.6 years (range, 17.9–70.0 years) in 2008 (P < 0.0001) and 37.1 years (range, 16.7–68.0 years) in 2009 (Box 1).

Gonorrhoea surveillance, 2000–2009

Between 2000 and 2009, 4,744 gonorrhoea cases were diagnosed among MSM in Victoria. The median age at diagnosis among MSM increased from 32.9 years (range,
16.6–67.2 years) in 2000 to 33.9 years (range, 15.9–66.5 years) in 2005, then declined to 26.3 years (range, 15.9–66.5 years) in 2008 (P<0.001) and 29.9 years (range, 17.6–60.7 years) in 2009 (Box 1).

**DISCUSSION**

In 2008, we observed a significant decline in the median age of MSM diagnosed with HIV in Victoria. This decline in age, which continued into 2009, is the first observed in Australia since the introduction of HAART. The decline in the median age of MSM recently acquiring HIV suggests recent increases in HIV transmission (as distinct from diagnosis) and risky sexual behaviour among younger MSM. Syphilis and gonorrhoea notification rates also increased among younger MSM. These STIs are considered markers of risky sexual behaviour, and may provide early indicators of HIV trends because they are more infectious and commonly asymptomatic, thus encouraging testing.

Although the VPCNSS testing data are biased by health-seeking behaviour, the data showed no change in the median age of MSM tested between 2006 and 2009. While this finding suggests that reductions in age at HIV diagnosis may not be an artefact of younger MSM testing for HIV, it may also be the case that younger MSM were being tested at other non-VPCNSS sites. Assumptions regarding overall testing trends in this group are difficult given that statewide HIV testing data lack information about the reasons for testing or the characteristics of those tested.

Examination of self-reported behavioural data from the VPCNSS showed little difference across age groups in the reported number of sexual partners. Younger gay men were slightly more likely to engage in risky sexual behaviour and to be unaware of their partners' serostatus, and were more likely to have never previously been tested for HIV. These findings are consistent with other behavioural and epidemiological data relating to testing history and knowledge of partner serostatus.

In addition, recent focus group data have shown that younger MSM are less likely to discuss HIV and other STIs with peers (Bonnet Institute, unpublished data). It has also been suggested that younger gay men may be more acceptable to engaging in risky sexual behaviour because they are less aware of or less concerned about the implications of HIV since the introduction of HAART.

As the observations reported here occurred in a limited time frame and represent a relatively small number of cases, we cannot rule out a clustering of infections within younger MSM sexual networks being responsible for the declining age at HIV diagnosis. On the other hand, if these data represent a turning point in HIV epidemiology, a number of implications emerge. First, the potential diversification of the epidemic within the primary at-risk group highlights the importance of ongoing research and surveillance of future trends. While routine surveillance data are important to monitor changes in epidemiology, more detailed and mixed-methods approaches would provide a better understanding of what is driving epidemiological changes and inform the development or refinement of public health interventions. Second, deciding whom and how to respond to increasing HIV diagnoses in younger MSM is difficult. The concordance of surveillance data on age at diagnosis of HIV and other STIs suggests that a response may be needed in the short term. Such a response would need to consider more diverse health promotion strategies to ensure that prevention messages reach young MSM.

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We would like to acknowledge the ongoing contributions of the surveillance officers at the Burnet Institute and the notifying medical practitioners. Special thanks to the partner notification officers for their important role in the HIV/STI notification process, and to the sentinel sites and laboratories that undertake pathology services for the VPCNSS clinics. We are grateful for the financial support received from the Victorian Department of Health.

**COMPETING INTERESTS**

The Centre for Population Health at the Burnet Institute is contracted by the Victorian Department...

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3 Selected characteristics of MSM presenting for HIV testing at VPCNSS HIV clinics, by age group, April 2006 to June 2009

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>&lt; 35 years*</th>
<th>≥ 35 years*</th>
<th>RR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total MSM tested</td>
<td>9279 (56.4)</td>
<td>7262 (43.6)</td>
<td></td>
</tr>
<tr>
<td>Tested positive for HIV</td>
<td>142 (11.9)</td>
<td>157 (2.2)</td>
<td></td>
</tr>
<tr>
<td>Survey data/face-to-face rate</td>
<td>8755 (93.7)</td>
<td>6701 (92.6)</td>
<td></td>
</tr>
<tr>
<td>Reason for test</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asymptomatic screen</td>
<td>6746 (63.8)</td>
<td>5360 (50.2)</td>
<td>1.0</td>
</tr>
<tr>
<td>STI symptoms</td>
<td>1302 (11.6)</td>
<td>932 (12.4)</td>
<td>1.09 (1.01-1.09)</td>
</tr>
<tr>
<td>Time since previous negative HIV test</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 1 year</td>
<td>3241 (41.3)</td>
<td>2449 (41.5)</td>
<td>1.0</td>
</tr>
<tr>
<td>≥ 1 year</td>
<td>2036 (44.6)</td>
<td>2221 (44.6)</td>
<td>0.97 (0.94-1.00)</td>
</tr>
<tr>
<td>Never previously tested</td>
<td>746 (9.1)</td>
<td>226 (4.4)</td>
<td>1.36 (1.30-1.41)</td>
</tr>
<tr>
<td>Number of sexual partners in previous 6 months</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>176 (6.1)</td>
<td>502 (14.4)</td>
<td>0.54 (0.48-0.62)</td>
</tr>
<tr>
<td>1-5</td>
<td>2030 (70.4)</td>
<td>2206 (62.6)</td>
<td>1.0</td>
</tr>
<tr>
<td>&gt; 5</td>
<td>670 (23.5)</td>
<td>674 (22.4)</td>
<td>0.91 (0.85-0.97)</td>
</tr>
<tr>
<td>HIV status of regular partner</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td>1072 (46.9)</td>
<td>1294 (47.7)</td>
<td>1.0</td>
</tr>
<tr>
<td>Positive</td>
<td>165 (10.9)</td>
<td>303 (15.8)</td>
<td>0.78 (0.66-0.92)</td>
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<tr>
<td>Don't know</td>
<td>318 (20.5)</td>
<td>316 (15.7)</td>
<td>1.11 (1.01-1.21)</td>
</tr>
<tr>
<td>Consed use with regular partner</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Always</td>
<td>840 (44.2)</td>
<td>1004 (47.3)</td>
<td>1.0</td>
</tr>
<tr>
<td>Inconsistent</td>
<td>1071 (55.8)</td>
<td>1116 (52.7)</td>
<td>1.07 (1.00-1.14)</td>
</tr>
<tr>
<td>Consed use with casual partner</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Always</td>
<td>1399 (63.7)</td>
<td>1769 (66.2)</td>
<td>1.0</td>
</tr>
<tr>
<td>Inconsistent</td>
<td>786 (36.3)</td>
<td>876 (33.8)</td>
<td>1.07 (1.00-1.14)</td>
</tr>
</tbody>
</table>

MMS = men who have sex with men; RR = relative risk; STI = sexually transmitted infection; VPCNSS = Victorian Primary Care Network for Sentinel Surveillance. *Data are number (%). Some data were missing in each category. Missing data were excluded from all percentage calculations. †Linkage analysis. ‡ Represents only maintained and surveyed at the gay men’s health clinic.
of Health to manage HIV passive surveillance (since 1991) and HIV, other STIs, and hepatitis C sentinel surveillance (since 2006) in Victoria. Data from these surveillance systems form the basis of our article.

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REFERENCES
Appendix Four: The Future of HIV Testing in Australia

The future of HIV testing: exploring new strategies to improve access to testing through community-based testing

By Alissa Pedrana and Mark Stoove

In Australia, men who have sex with men (MSM) account for more than 65% of newly diagnosed and 85% of newly acquired cases of HIV each year. Despite high self-reported annual testing rates (around 60%) and a reduction in viral loads among those on antiretroviral therapy (ART), Australia has witnessed substantial increases in newly diagnosed HIV infections over the past decade. This rise has been attributed to factors including moderate increases in sexual risk behaviours among gay men, and dramatic increases in other sexually transmitted infections (STIs) including syphilis, gonorrhoea and chlamydia, which are known to increase HIV transmission risk.

Regular HIV testing is one of the key HIV prevention strategies for gay and homosexually active men in Australia. Frequent testing decreases the number of people who are unaware of their HIV status and reduces cases of late diagnoses. Timely diagnosis of HIV provides opportunities for optimal commencement of treatment, which in turn suppresses viral load, thereby reducing transmission risk and enhancing long-term health outcomes for individuals. Frequent testing, and timely diagnosis, also provides opportunities for risk assessment and allows for discussion of risk reduction strategies and behavioural modification to reduce the risk of onward transmission.

HIV testing patterns among men who have sex with men in Australia

Although annual Australian HIV testing rates among MSM are generally considered to be high, recent national behavioural data and a recent national online survey of 5,457 MSM paint a different picture: only about 20% of men deemed to be in the ‘high-risk’ category tested regularly for HIV; 20% of the men surveyed reported two or more HIV tests per year; while between 6–24% said that they had never been tested. The non-adherence to the recommended HIV testing guidelines among many gay and other MSM is also concerning.

A recent study assessing compliance with recommended HIV testing frequency guidelines among MSM attending primary care clinics in Melbourne reported a testing rate as low as 33% in one year, indicating that self-reported annual testing rates among MSM could be over-estimated.

So why, despite extensive health promotion activities designed to highlight the importance of HIV testing, are so many men not testing as frequently as recommended?
Structural barriers to HIV testing

Structural, personal and policy barriers to frequent HIV testing are commonly reported. These include not knowing where to get tested, difficulties in getting an appointment, difficulties finding a gay-friendly doctor and the need to return for a test result. A number of study findings indicates that many MSM prefer HIV testing options that provide more timely results and greater convenience. These men report not having enough time to get tested, citing inconveniences such as the return visit required to receive results when being tested at GP clinics and sexual health services (where the majority of HIV testing is conducted). Current testing guidelines recommend annual testing for sexually active gay men and more frequent testing (3–6 monthly) for men at ‘high risk’. Current models of HIV testing in Australia

In Australia, HIV testing involves conventional testing of venous blood samples using enzyme-linked immunoorbent assay (ELISA) followed by confirmatory Western blot at a laboratory. Test results usually take at least a few days (but sometimes a week) because testing is often batched. Conventional HIV testing requires a return visit to the testing site to receive results and post test counselling. Thus, the process from testing to receipt of results can be 1–2 weeks and multiple appointments per test means that ‘high risk’ men may need 4–8 clinic appointments per year.

Technical advances in rapid HIV testing have resulted in test performance comparable to conventional testing. Rapid HIV tests therefore provide a potentially valuable alternative to current testing models. Advantages of rapid testing include specimen collection processes that are less invasive, results are available within 30 minutes and provided back to clients in the same visit, testing can be conducted almost anywhere including by non-clinically trained staff in community-based settings, and individuals are only required to return for another visit if their rapid test is ‘preliminary positive’ or indeterminate, which accounts for a small proportion of tests.

Review of community-based models of HIV testing

Community models of HIV testing for MSM, often using rapid HIV tests, have been used widely in the United States and throughout Europe for over 10 years, and more recently in New Zealand. The primary goal of community-based HIV testing models is to increase opportunities for people at risk of HIV to get tested. The Centers for Disease Control and Prevention (CDC) in the United States recommend that community-based organisations test all at-risk clients, while the European Centre for Disease Prevention and Control recommends offering HIV testing in medical and non-medical settings in cooperation with non-governmental organisations to facilitate access and uptake.

However, to date there has been limited uptake of community-based HIV testing models in Australia and current HIV testing policies and other regulatory restrictions in Australia preclude the use of rapid tests, except under very restricted circumstances. In response, ACN recently commissioned the Burnet Institute to undertake a systematic review of published literature in relation to community-based testing and rapid HIV testing for MSM. This review examined 32 published papers between 2000 and 2010 that described 44 community-based HIV testing services accessed by MSM (mostly located in the US (n=28) and Europe (n=11)).

HIV testing outcomes

The review demonstrated that on average a third of MSM who were tested at services had never been tested previously for HIV. In addition, services were generally successful in attracting men who were at high risk; most services identified a high number of new HIV infections, with the median HIV positivity of 3.9% among services that catered for MSM only. The highest positivity rates were reported at community-based organisations/community clinics. These data suggest that rapid testing services, particularly those based in community sites, are providing an alternative HIV testing option for populations at risk of HIV who may not routinely access other HIV testing services.

These data suggest that rapid testing services, particularly those based in community sites, are providing an alternative HIV testing option for populations at risk of HIV who may not routinely access other HIV testing services.
Rapid tests also enable testing to be conducted by non-medically trained staff, without the need for the space and privacy needed for traditional blood draw procedures; 65% of these services were therefore able to provide outreach rapid testing services.

References


Appendix Five: Quick and easy: how rapid HIV tests can help reduce transmission

The Conversation

28 June 2011, 2.17pm AEST

Quick and easy: how rapid HIV tests can help reduce transmission

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If you’ve ever had to wait two agonising weeks for a HIV test result, you’ll be pleased to hear that rapid HIV tests can now give an equally accurate result in just 30 minutes. The problem is, these tests aren’t available in Australia. Not yet, anyway.

While HIV tests are obviously an essential tool for timely diagnosis, the contact with health professionals is equally important because it facilitates discussions about prevention.

Or, if the result is positive, counselling can focus on behaviour modification to reduce the risk of onward transmission.

Services in the United States and Europe have been offering rapid point-of-care HIV testing in community settings for the past ten years. But current Australian HIV testing policies and other restrictions preclude the use of such devices except in very restricted circumstances.

The Australian Society of HIV Medicine (ASHM) is currently reviewing these guidelines and is likely to recommend the widespread availability of rapid HIV tests.

Reducing HIV transmission

Like many other developed countries, Australia has seen a substantial increase in HIV diagnoses over the past decade. Around 85% of these new infections are from sexual contact between men.

The rise has been attributed to more risky sexual behaviours among gay men and dramatic increases in other sexually transmitted infections (STIs) that are known to increase HIV transmission risk.
To reduce onward HIV and STI transmissions, we need to increase diagnostic testing. And the best "bang for our buck" will come from testing high-risk individuals more often.

Current testing guidelines recommend three to six monthly HIV testing for "high risk" gay men (those visiting sex-on-premises venues or reporting high numbers of sexual partners). This classification would apply to around half of the men completing annual national gay community behavioural surveys.

But research shows the proportion of high risk gay men in Australia adhering to such guidelines is as low as 15%.

Mathematical modelling suggests people who aren't aware of their HIV positive status are disproportionately contributing to new HIV transmissions — again, a factor that can be addressed through more frequent testing.

Two recent Australian studies — Birell et al. (2010) and Pedraza et al. (2009) — have estimated that between 20% and 30% of gay men with HIV are unaware of their HIV positive status.

With extensive health promotion campaigns encouraging regular testing, why don't gay men have more frequent HIV tests?

**Reducing the testing barriers**

Finding the time to visit a GP clinic or sexual health service and the availability of appointments is a key barrier to regular testing.

The requirement for a return visit to receive the results adds to this burden. For high risk men, this may mean four to eight clinic appointments a year.

Just how realistic is this expectation of eight appointments a year?

Technical advances in rapid HIV testing over the past decade mean rapid tests perform just as reliably as traditional tests, offering a valuable alternative to overcome these barriers.

There are many advantages to rapid testing at the point-of-care:

It's non-invasive and most commonly uses a finger-prick blood specimen;

Results are available within 30 minutes;

Testing can take place almost anywhere (night clubs, cruising beats, sex-on-site venues, festivals, among other places);

Testing can be done by non-clinical (but well-trained) staff, and

Individuals are only required to return for another visit if their rapid test is "preliminary positive", which only accounts for a small proportion of tests.

**Lessons learnt**

A recent Burnet Institute systematic review of community models for rapid HIV testing in the US, Europe and New Zealand showed the services have attracted significant proportions of high-risk gay men and men who have never been tested for HIV.

[Source: theconversation.edu.au/quick-and-easy-how-rapid-hiv-tests-can-help-reduce-transmission-1447]
The testing included pre- and post-test counselling, support and referral processes. Clients reported high rates of satisfaction with the non-clinical staff (usually peer educators and counsellors), who were empathic and fitted well in the community setting.

Who should provide rapid tests?

If and when rapid HIV testing is approved, we're likely to see some robust discussion about who should provide these tests.

Clinicians have resisted the idea of having non-clinically trained staff undertake rapid HIV tests. But this seems to be based on notions of professional boundaries and overestimates the ability of clinically-trained staff like doctors and nurses to deliver culturally appropriate health services to at-risk groups on the ground.

A clinic-based GP who requires booking days or weeks in advance and allocates ten minutes for an appointment, for instance, isn't going to have the same reach as allied health care staff.

Peer educators, on the other hand, may provide more appropriate services to test and counsel men who engage in risky sex, for example in outreach settings such as at nightclubs or sex-on-premises venues. This involvement of "affected" communities has been widely recognised as an essential part of the effectiveness and appropriateness of the HIV response.

With the rest of the world making progress in reducing barriers to testing and providing greater access to health services, Australia can't afford to be left behind.

The current ASHM review, which is expected to be submitted to the Commonwealth Department of Health and Ageing, must enable non-clinicians to undertake rapid HIV tests where they're needed.

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Appendix Six: Promotional material for the ‘Suck it and See Study’

What is it about?
Suck it and See is trying to see what percentage of gay men have HIV and to better understand the spread of HIV.

When and where is it happening?
We will be out in clinics, bars, sex clubs and saunas in June.

What do you need from me?
Just answer a short questionnaire and provide us with a saliva sample. Your answers and your test results will be 100% confidential and anonymous.

Who can participate?
All gay men can participate; HIV-positive, HIV-negative or even if you aren’t sure of your status.

Who is running the study?
The study is being conducted by the Bumet Institute in collaboration with the Victorian AIDS Council/Gay Men’s Health Centre and The University of NSW.

Who can I contact for more info?
Just go to www.bumet.edu.au/suckit or call Henry on 0422 563 410.