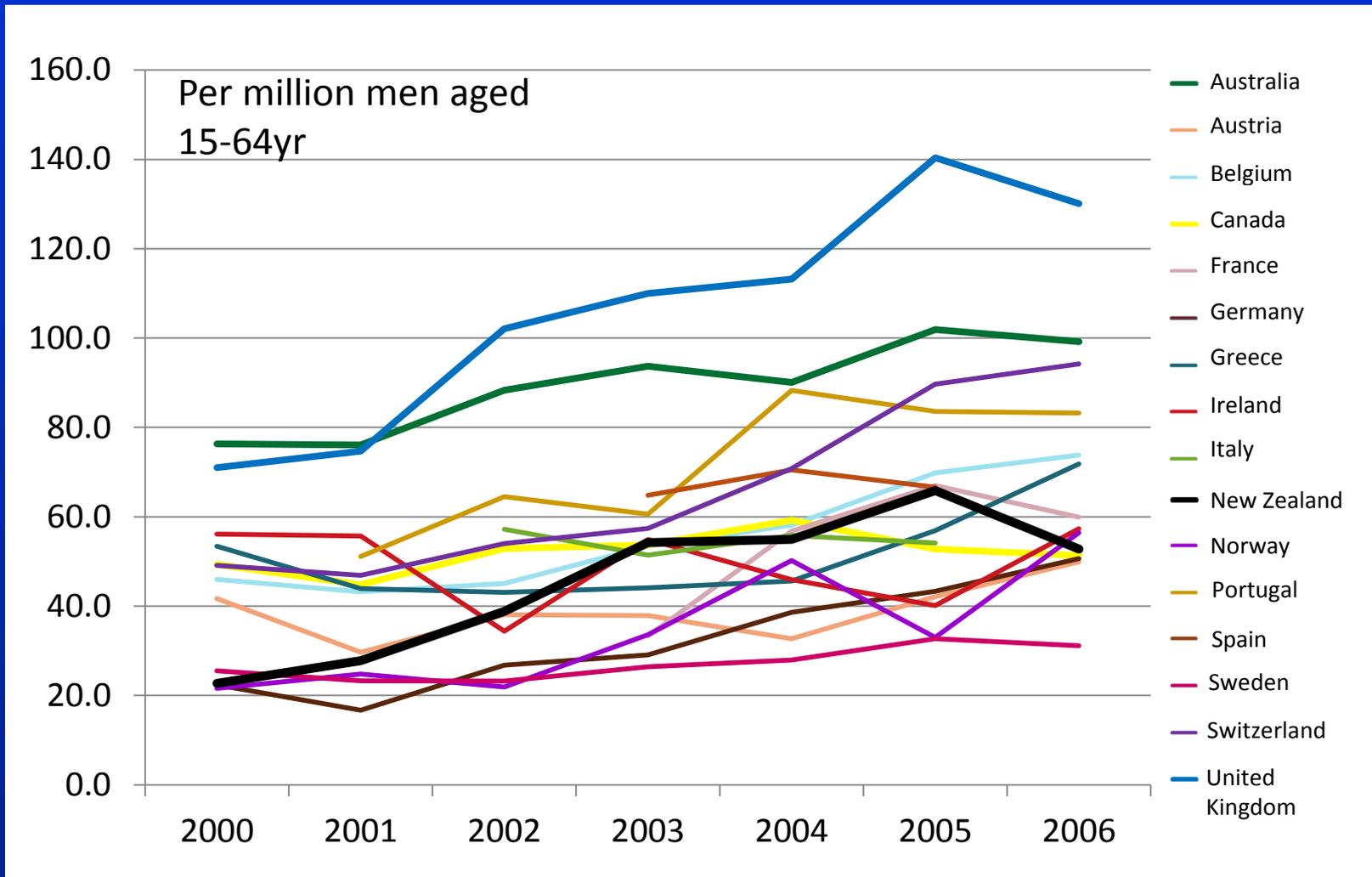


HIV prevention in gay and bisexual men: Using science to shape strategy

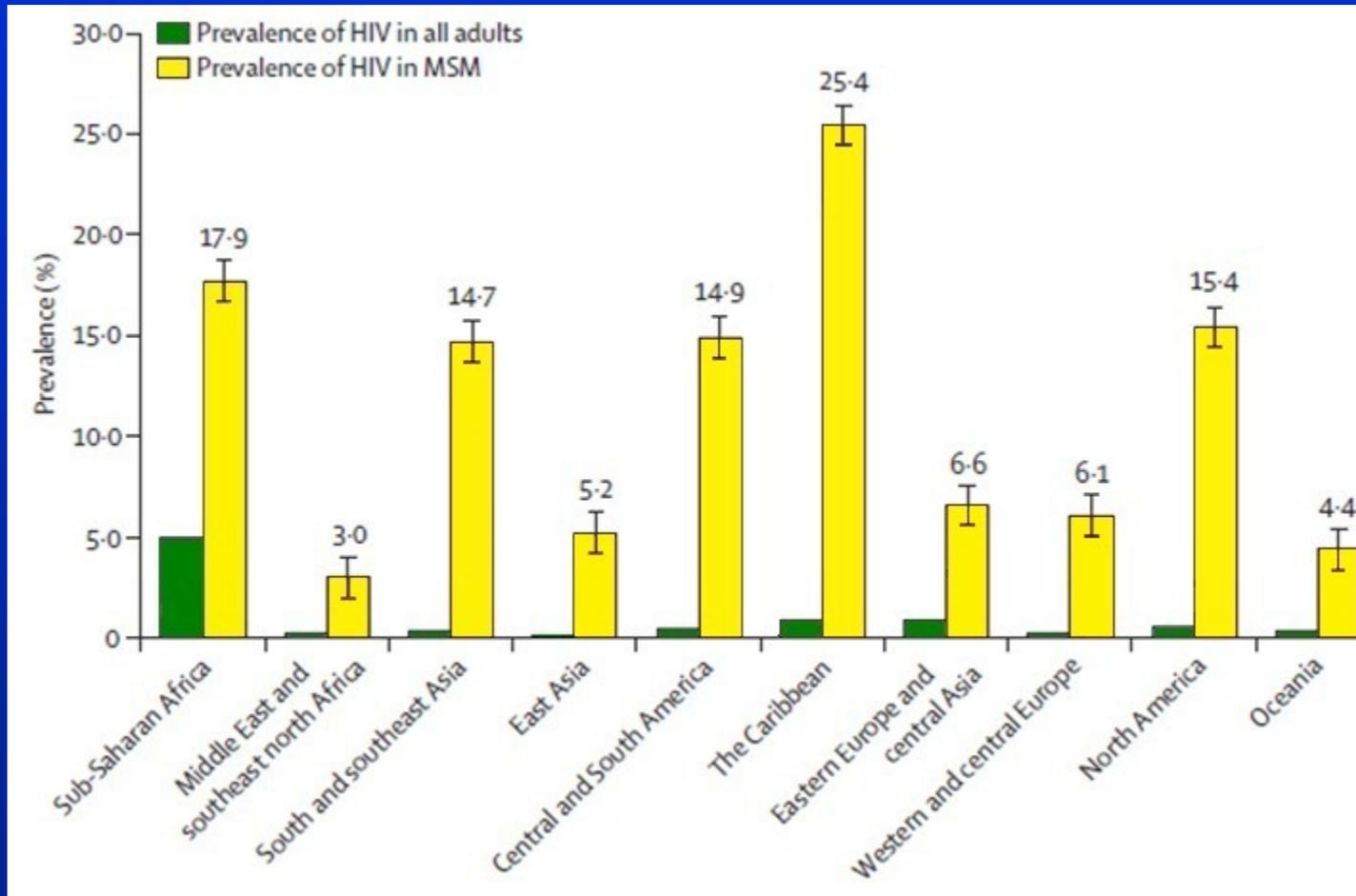
Tony Hughes
Research Director
New Zealand AIDS Foundation

Ontario HIV Treatment Network Research Conference, Toronto,
Canada, 11-13 November 2012

HIV diagnosis rate among MSM in Western European countries plus Australia, Canada and New Zealand



Global prevalence of HIV in MSM compared with adult prevalence, UNAIDS 2010.



MSM have a 140 fold higher risk for newly diagnosed HIV and syphilis compared with heterosexual men in New York City.

Men Who Have Sex With Men Have a 140-Fold Higher Risk for Newly Diagnosed HIV and Syphilis Compared With Heterosexual Men in New York City

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Objectives: To describe the population of men who have sex with men (MSM) in New York City, compare their demographics, risk behaviors, and new HIV and primary and secondary (P&S) syphilis rates with those of men who have sex with women (MSW), and examine trends in infection rates among MSM.

Design: Population denominators and demographic and behavioral data were obtained from population-based surveys during 2005–2008. Numbers of new HIV and P&S syphilis diagnoses were extracted from city-wide disease surveillance registries.

Methods: We calculated overall, age-specific and race/ethnicity-specific case rates and rate ratios for MSM and MSW and analyzed trends in MSM rates by age and race/ethnicity.

Results: The average prevalence of male same-sex behavior during 2005–2008 (5.0%; 95% CI: 4.5 to 5.6) differed by both age and race/ethnicity (2.3% among non-Hispanic black men; 7.4% among non-Hispanic white men). Compared with MSW, MSM differed significantly on all demographics and reported a higher prevalence of condom use at last sex (62.9% vs. 38.3%) and of past-year HIV testing (53.0% vs. 27.2%) but also more past-year sex partners. MSM HIV and P&S syphilis rates were 2526.9/100,000 and 707.0/100,000, each of which was over 140 times MSW rates. Rates were highest among young and black MSM. Over 4 years, HIV rates more than doubled and P&S syphilis rates increased 6-fold among 18-year-old to 29-year-old MSM.

Conclusions: The substantial population of MSM in New York City is at high risk for acquisition of sexually transmitted infections given high rates of newly diagnosed infections and ongoing risk behaviors. Intensified and innovative efforts to implement and evaluate prevention programs are required.

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The authors have no funding or conflicts of interest to disclose.
The findings and conclusions in this article are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention.
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Key Words: HIV/AIDS rates, health disparities, men who have sex with men, syphilis rates

(J Acquir Immune Defic Syndr 2011;58:408–416)

INTRODUCTION

The successful targeting of resources for the prevention and treatment of sexually transmitted diseases (STD), including HIV, benefits from knowledge of the population size and demographic and behavioral characteristics of those at highest risk for infections. Although national and local data have shown that men who have sex with men (MSM) comprise the majority of new HIV and new syphilis cases in the United States, understanding the full burden of disease among the MSM population has been challenging given that, until recently, direct estimates of MSM numbers in the general population were unavailable.

Several recent population-based studies using MSM denominator estimates from behavioral surveillance have quantified point prevalence of HIV^{1,2} or primary and secondary (P&S) syphilis and HIV rates among MSM.³ Our analysis adds to this body of work by examining trends in newly diagnosed HIV and P&S syphilis among sexually active MSM in New York City (NYC), an epicenter of the US HIV epidemic. In NYC, the proportion of reported male HIV diagnoses that were among MSM increased by 19% in just 5 years.⁴ MSM have also been disproportionately affected by P&S syphilis since the outbreak began in 1999. In 2008, 87% of male P&S syphilis cases in NYC reported sex with other men.⁵ To effectively plan, implement, and evaluate programs aimed at preventing transmission of HIV and other STDs, we describe the population of MSM in NYC, compare demographic and behavioral characteristics of MSM and men who have sex with women (MSW), estimate rates of disease in both groups, and examine disparities among MSM by race/ethnicity and age using 3 population-based data sources.

METHODS

Data Sources

NYC Community Health Survey

Since 2002, the NYC Department of Health and Mental Hygiene (DOHMH) has conducted an annual, cross-sectional, population-based survey [the Community Health Survey

- “The average prevalence of male same-sex behaviour for years 2005-2008 (5.0%; 95% CI: 4.5 to 5.6) was highest among men aged 40-49 years (8.0%) and lowest among men aged 18-29 years (3.9%).”
- “During 2005-2008, there were 9571 new HIV cases among MSM and 1249 among MSW, resulting in an MSM HIV case rate that was **140.4 times** as high (95% CI: 132.1 to 148.7) as the rate among MSW (2526.9/100,000 vs 18.0/100,000).”
- “The total number of [primary and secondary] syphilis cases over four years was 2678 among MSM and 334 among MSW, resulting in an MSM syphilis case rate that was **147.3 times** as high (95% CI: 130.5 to 163.2) as the rate among MSW (707.0/100,000 vs 4.8/100,000).”

Global epidemiology of HIV infection in men who have sex with men

Series

HIV in men who have sex with men 1

Global epidemiology of HIV infection in men who have sex with men

Chris Beyrer, Stefan D Brand, Frits van Griensven, Steven M Goodreau, Suwet Charjaleertsak, Andrea L Wirtz, Ron Brookmeyer

Epidemics of HIV in men who have sex with men (MSM) continue to expand in most countries. We sought to understand the epidemiological drivers of the global epidemic in MSM and why it continues unabated. We did a comprehensive review of available data for HIV prevalence, incidence, risk factors, and the molecular epidemiology of HIV in MSM from 2007 to 2011, and modelled the dynamics of HIV transmission with an agent-based simulation. Our findings show that the high probability of transmission per act through receptive anal intercourse has a central role in explaining the disproportionate disease burden in MSM. HIV can be transmitted through large MSM networks at great speed. Molecular epidemiological data show substantial clustering of HIV infections in MSM networks, and higher rates of dual-variant and multiple-variant HIV infection in MSM than in heterosexual people in the same populations. Prevention strategies that lower biological transmission and acquisition risks, such as approaches based on antiretrovirals, offer promise for controlling the expanding epidemic in MSM, but their potential effectiveness is limited by structural factors that contribute to low health-seeking behaviours in populations of MSM in many parts of the world.

Introduction
In 2012, men who have sex with men (MSM) are at substantial risk for HIV infection in virtually every context studied (panel 1).^{1,2} This risk has been present since the syndrome now known as AIDS was first described in previously healthy homosexual men in Los Angeles (CA, USA) in 1981.^{3,4} Despite decades of research and community, medical, and public health efforts, high HIV prevalence and incidence burdens have been reported in MSM throughout the world.⁵ In many high-income settings—including Australia, France, the UK, and the USA—overall HIV epidemic trends are in decline except in MSM, where they have been expanding in the era of highly active antiretroviral therapy (HAART) in what have been described as re-emergent epidemics in MSM.^{6,7} In the USA, HIV infections in MSM are estimated to be increasing at roughly 8% per year since 2001.⁸ And in much of Africa, Asia, and Latin America, the highest rates of HIV infection in any risk group are in these men.⁹

However, our understanding of worldwide epidemiology is far from complete. By the end of 2011, 93 of 196 countries had not reported on HIV prevalence in MSM in the previous 5 years.¹⁰ In several regions, notably the Middle East, north Africa, and sub-Saharan Africa, data for HIV infections in MSM are only emerging.^{11,12} Data gaps and challenges to HIV research, surveillance, and epidemiological characterisation in MSM are largely the result of the hidden and stigmatised nature of MSM populations in much of the world, and of ongoing criminalisation of homosexuality and other forms of same-sex behaviour.¹³ These structural realities have limited our understanding, and might also have crucial roles in the vulnerability of MSM to HIV.^{14,15} We review the global epidemiology and disease burden of HIV infection in MSM; individual-level, couple, and network-level risks for HIV acquisition and transmission; biological aspects of anorectal HIV transmission; and molecular epidemiology advances, with the aim of understanding why MSM continue to bear such disproportionate burdens of HIV. We also developed and report on stochastic agent-based simulation models of HIV transmission to further clarify the drivers of HIV spread in MSM.¹⁶ Finally, we discuss the public health importance of our emerging understanding of the epidemiology of HIV in MSM.

Disease burden of HIV in MSM
We did a comprehensive search for HIV burden and risks in MSM from Jan 1, 2007, to June 30, 2011 (search criteria in the appendix). We retrieved 2105 unique citations, and we identified and reviewed 68 additional surveillance studies in the public domain. We included country progress reports submitted to the UN General Assembly Special Session on HIV/AIDS (UNGASS). We obtained data from 82 peer-reviewed publications on disease burden of HIV in MSM, from 12 of the 68 surveillance reports, and from 38 of 186 country progress reports submitted to UNGASS in 2010.

Figure 1 shows aggregate HIV prevalence estimates in MSM by region derived from the comprehensive search (references in the appendix). Pooled HIV prevalence ranged from a low of 3.0% (95% CI 2.4–3.6) in the Middle East and north Africa region to a high of 25.4% (21.4–29.5) in the Caribbean. The CIs for these pooled estimates must be interpreted with caution, since they only account for sampling variation and not the inherent biases of non-representative samples, and so undoubtedly underestimate actual variances. Nevertheless, HIV prevalences were relatively consistent across North, South, and Central America, south and southeast Asia, and sub-Saharan Africa (all within the 14–18%

Lancet 2012; 380: 367-77
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This is the first in a Series of six papers about HIV in men who have sex with men
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See Online for appendix

www.thelancet.com Vol 380 July 28, 2012 367

- “The MSM epidemic is on a different trajectory from the rest of global AIDS.”
- “HIV epidemics in men who have sex with men are expanding in countries of all incomes in 2012, and these epidemics are characterised by high HIV burdens, substantial clustering of infections within networks, and high forces of infection.”
- “The disproportionate HIV disease burden in MSM is explained largely by the high per-act and per-partner probability of HIV transmission in receptive anal sex.”

Beyrer, C. *Lancet* podcast <http://www.thelancet.com/series/hiv-in-men-who-have-sex-with-men>.

Beyrer, C. et al. *Lancet* 2012; 380: 367-77.

High HIV transmission risk through anal intercourse

HIV transmission risk through anal intercourse: systematic review, meta-analysis and implications for HIV prevention

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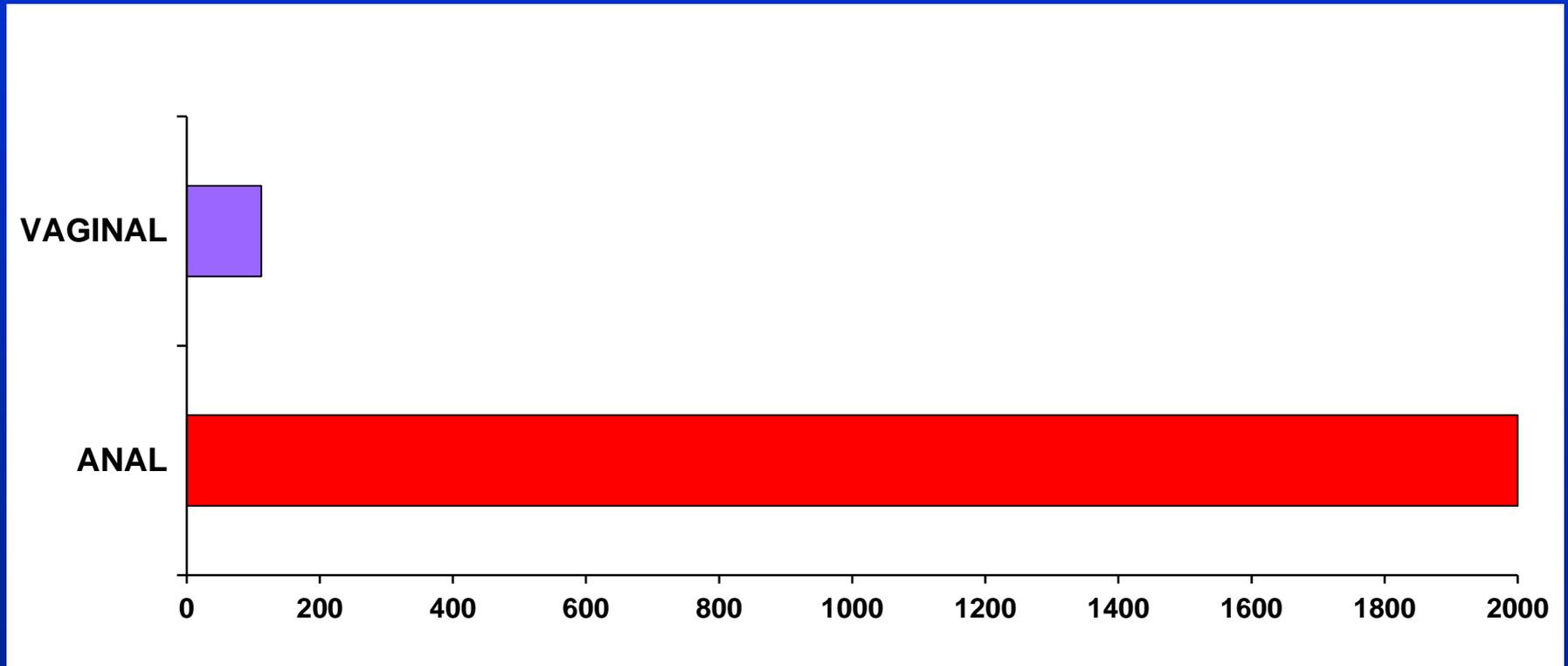
Background The human immunodeficiency virus (HIV) infectiousness of anal intercourse (AI) has not been systematically reviewed, despite its role driving HIV epidemics among men who have sex with men (MSM) and its potential contribution to heterosexual spread. We assessed the per-act and per-partner HIV transmission risk from AI exposure for heterosexuals and MSM and its implications for HIV prevention.

Methods Systematic review and meta-analysis of the literature on HIV-1 infectiousness through AI was conducted. PubMed was searched to September 2008. A binomial model explored the individual risk of HIV infection with and without highly active antiretroviral therapy (HAART).

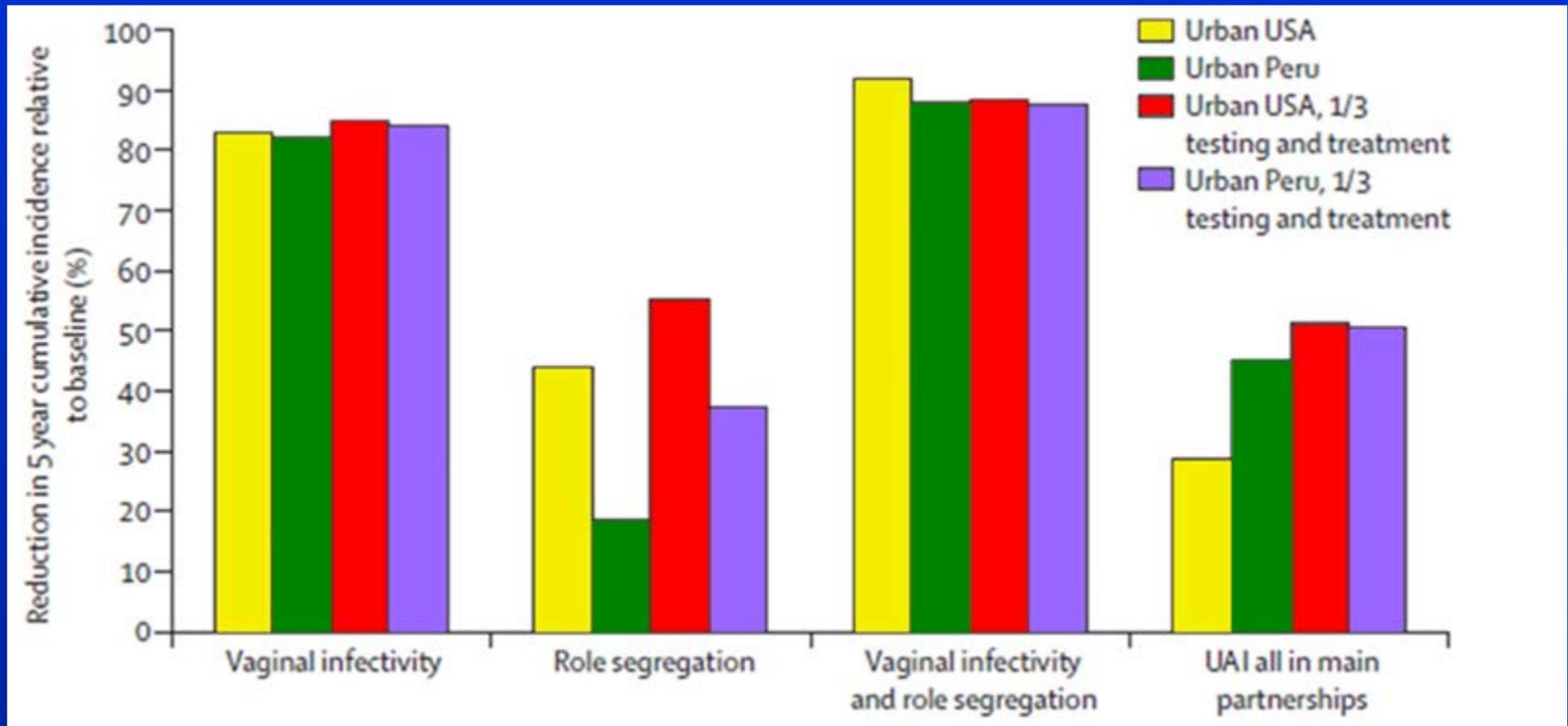
Results A total of 62 643 titles were searched; four publications reporting per-act and 12 reporting per-partner transmission estimates were included. Overall, random effects model summary estimates were 1.4% [95% confidence interval (CI) 0.2–2.5] and 40.4% (95% CI 6.0–74.9) for per-act and per-partner unprotected receptive AI (URAI), respectively. There was no significant difference between per-act risks of URAI for heterosexuals and MSM. Per-partner unprotected insertive AI (UIAI) and combined URAI–UIAI risk were 21.7% (95% CI 0.2–43.3) and 39.9% (95% CI 22.5–57.4), respectively, with no available per-act estimates. Per-partner combined URAI–UIAI summary estimates, which adjusted for additional exposures other than AI with a 'main' partner [7.9% (95% CI 1.2–14.5)], were lower than crude (unadjusted) estimates [48.1% (95% CI 35.3–60.8)]. Our modelling demonstrated that it would require unreasonably low numbers of AI HIV exposures per partnership to reconcile the summary per-act and per-partner estimates, suggesting considerable variability in AI infectiousness between and within partnerships over time. AI may substantially increase HIV transmission risk even if the infected partner is receiving HAART; however,

- HIV transmission risk through unprotected receptive anal sex is **18 times higher** than during unprotected receptive vaginal sex in developed countries in this major review.
- The absolute per act transmission risk for unprotected receptive anal intercourse (URAI) is 1.4% (95% CI 0.2 → 2.5).
- The same per act transmission risk for URAI (1.43%; 95% CI 0.48 → 2.85) was recently reported from the Australian HIM cohort study.
- The absolute per act transmission risk for unprotected receptive vaginal intercourse in developed countries is 0.08% (95% CI 0.06 → 0.11) in the review.
- Note that the per partner transmission risk for unprotected receptive anal intercourse is 40.4% (95% CI 6.0 → 74.9).

HIV transmission risk for receptive anal and vaginal intercourse without condoms in developed countries

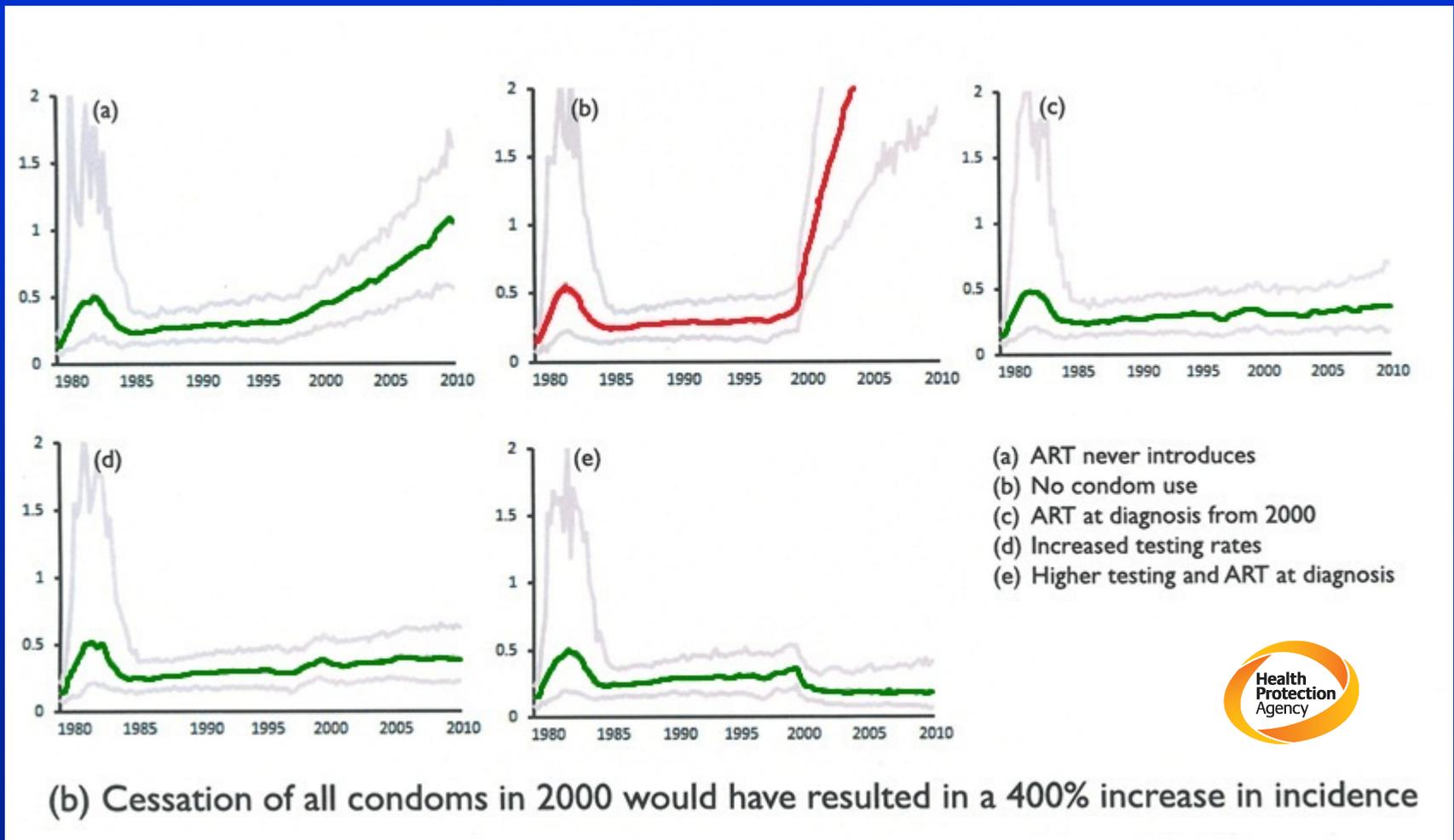


An individual-based computer simulation model for HIV infection in urban MSM in USA and Peru.



“The greatest reductions were associated with the scenarios that entailed reducing transmission probabilities to those of vaginal intercourse; in all settings, this quickly reduced incidence by greater than 80%, and in some by as much as 98%. This emphasises that biological factors specific to anal sex have a fundamental effect in driving HIV epidemics in MSM worldwide”

Increased HIV incidence in MSM despite high levels of ART-induced viral suppression: Analysis of the UK epidemic, Phillips et al, 2012.



Adapted from: Delpech, V. "Health system concerns related to TasP and most at risk populations." Health Protection Agency, UK. Presented at: IAPAC. "Controlling the HIV pandemic with antiretrovirals: Treatment as prevention and pre-exposure prophylaxis." Royal Garden Hotel, London, 11-12 June, 2012.

Other modelling studies on HIV in MSM populations that stress the importance of risk reduction

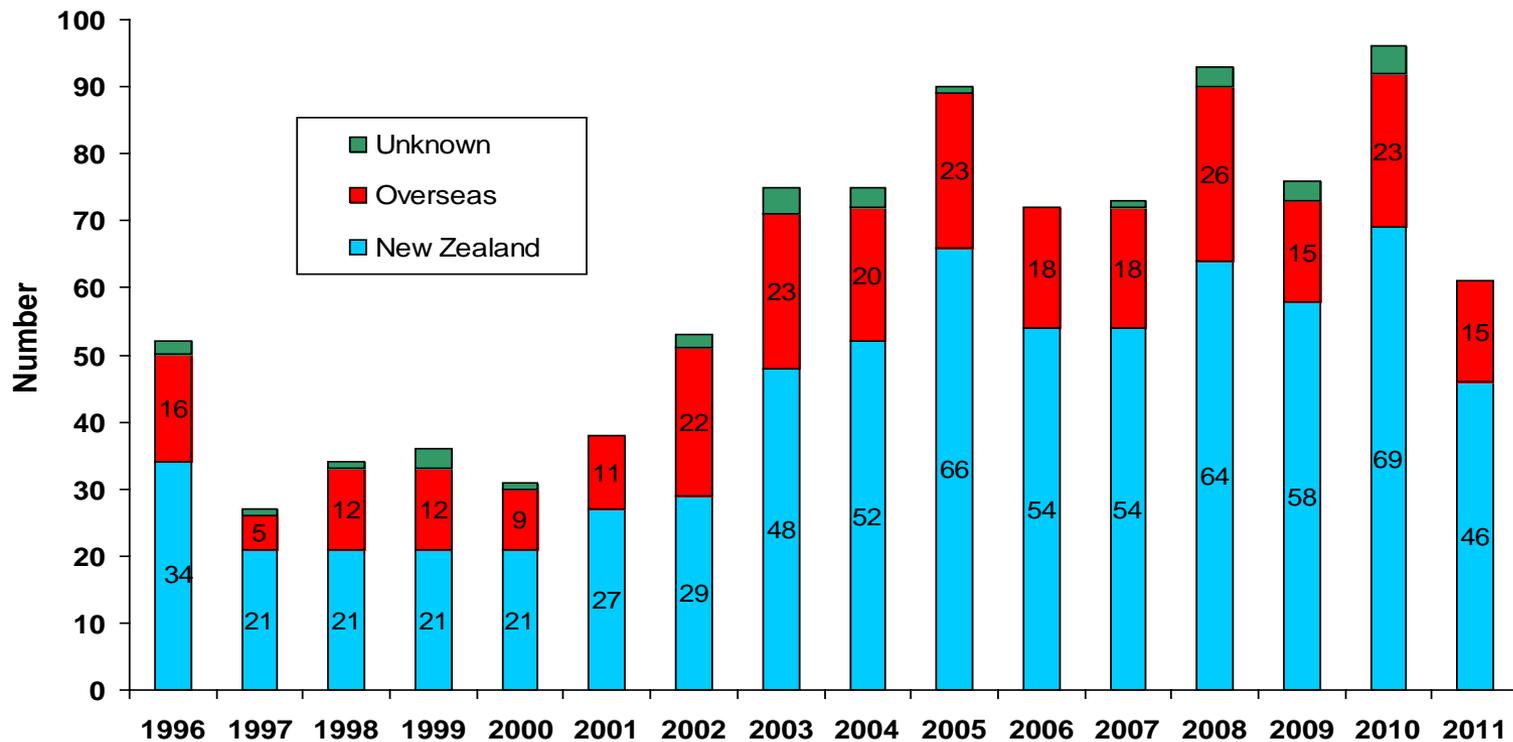
Paper	Key comments and conclusions on sexual behaviour
Velasco-Hernandez et al. 2002	HIV spread is extremely sensitive to changes in risky sex. It is imperative that the usage of ART should be tightly coupled with effective risk-reduction strategies and that levels of risky sex are substantially reduced.
Boily et al. 2004	Because ART modifies the natural history of HIV infection it will change the transmission dynamics of the epidemic, and has the potential to increase the aggregate level of risky sexual behaviour in the population over time.
McCormick et al. 2007	These results indicate that ART must be accompanied by effective HIV risk reduction interventions. Prevention programmes that decrease HIV transmission are crucial to epidemic control.
Hallet et al. 2010	The key message to patients should remain that always using condoms when receiving treatment is the best way to protect partners from the risk of HIV transmission.
Bezemer et al. 2010	This model showed that if nothing changes, twice as many MSM in the Netherlands will be in need of healthcare for HIV infection in the coming decade than at present. The most effective way to prevent this is to decrease risk behaviour.
Long et al. 2010	Even substantial expansion of HIV screening and treatment programmes is not sufficient to reduce the HIV epidemic markedly in the United States without substantial reductions in risk behavior.

Universal primary prevention response to HIV and other sexually transmitted infections in MSM





Annual HIV diagnoses in gay and bisexual men* by antibody testing in New Zealand, 1996-2011

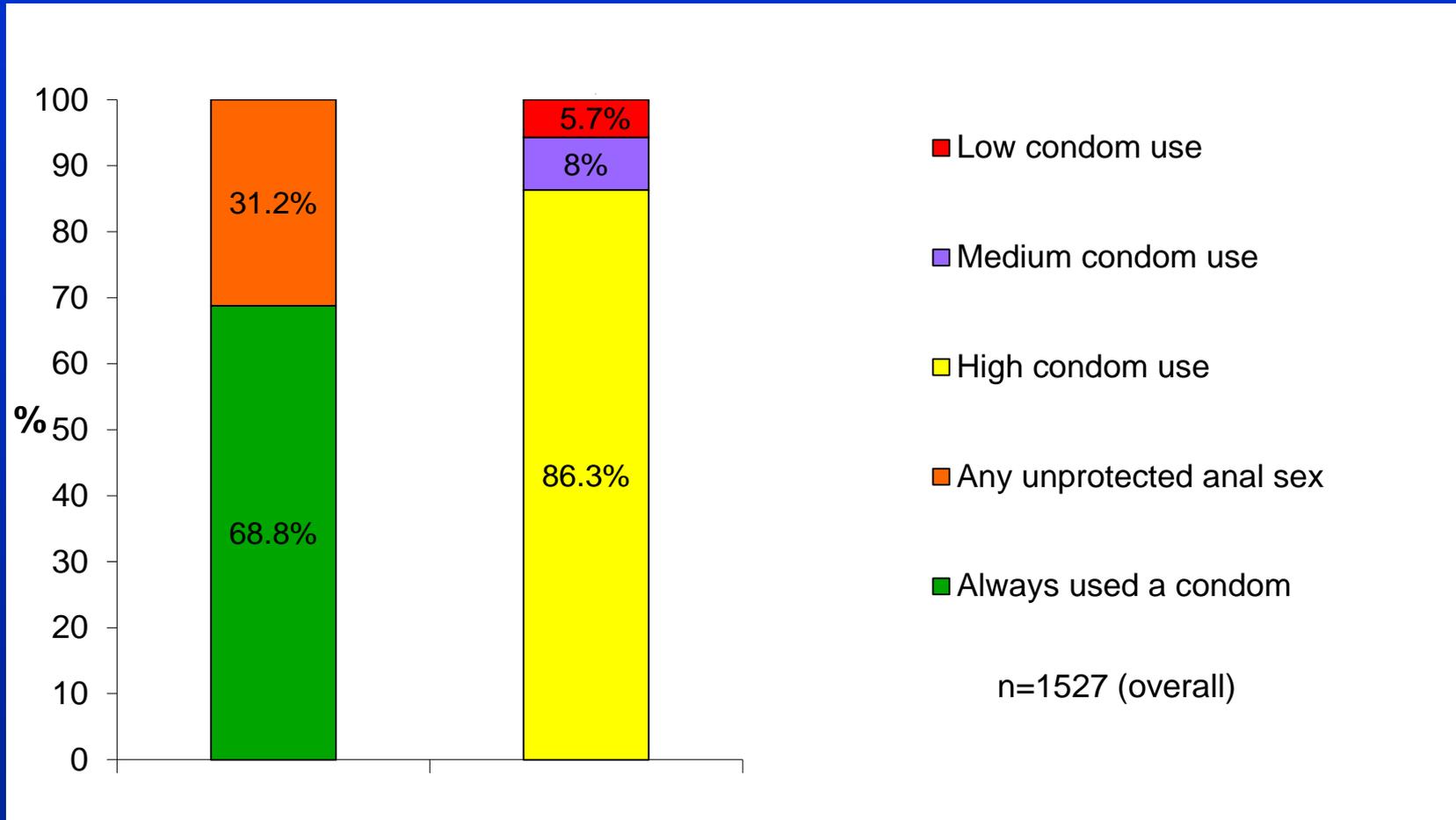


*Includes both homosexual/bisexual and homosexual/bisexual/IDU

Data provided by AIDS Epidemiology Group, Department of Preventive and Social Medicine, University of Otago

Graph produced by Research, Analysis and Information Unit, New Zealand AIDS Foundation 2012.

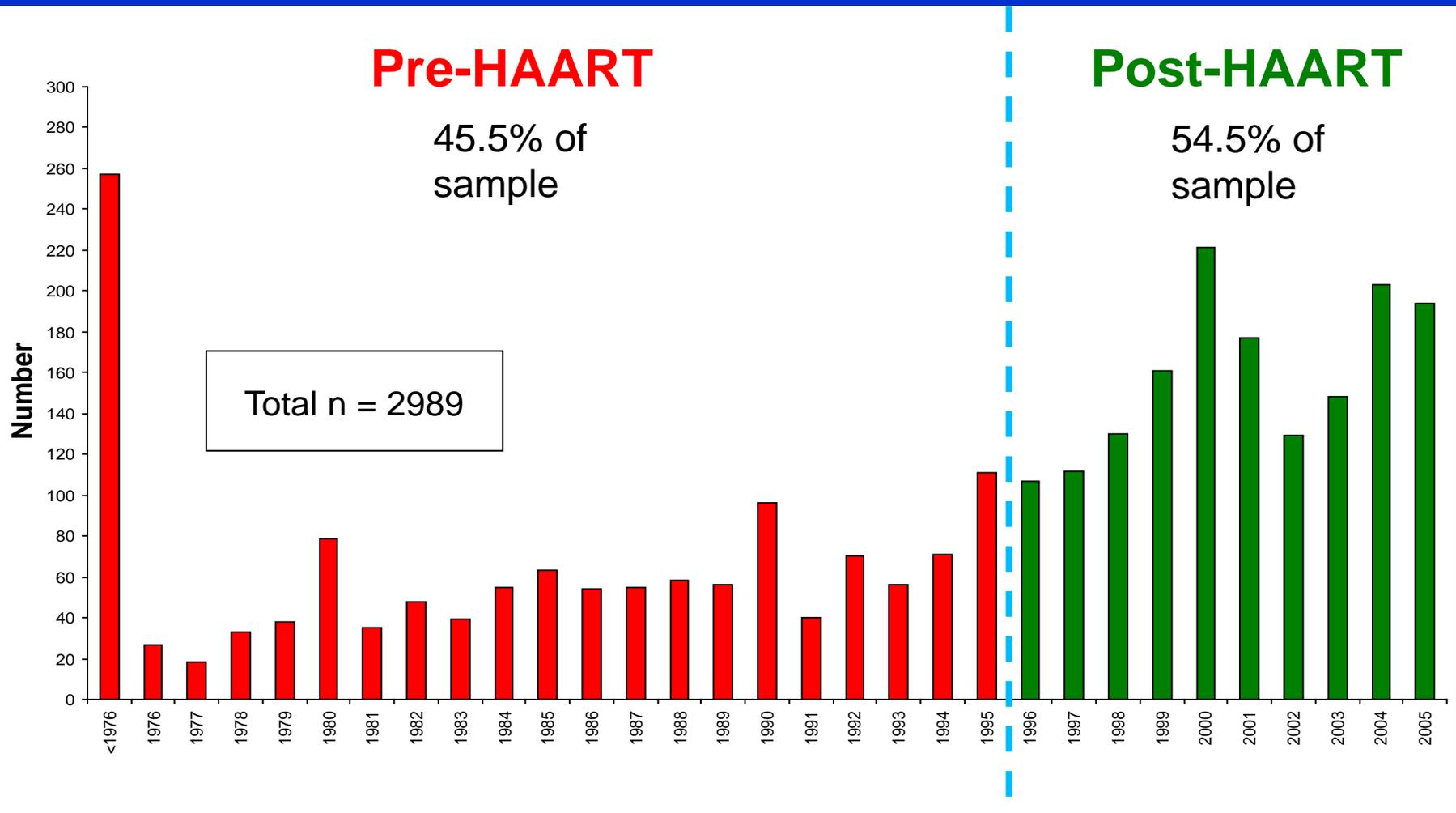
GAPSS 2008: Condom use for anal sex with casual partners in the last six months



Saxton, P. Dickson, N. and Hughes, T. "GAPSS 2008 : Findings from the Gay Auckland Periodic Sex Survey." Auckland: New Zealand AIDS Foundation 2010.

Saxton, P. et al. "How often do gay and bisexual men in New Zealand use condoms for anal sex with casual partners, and has this changed over time?" New Zealand Sexual Health Society Conference, 15-17 Oct 2009, Bay of Islands.

GAPSS/GOSS 2006: Year of first anal sex



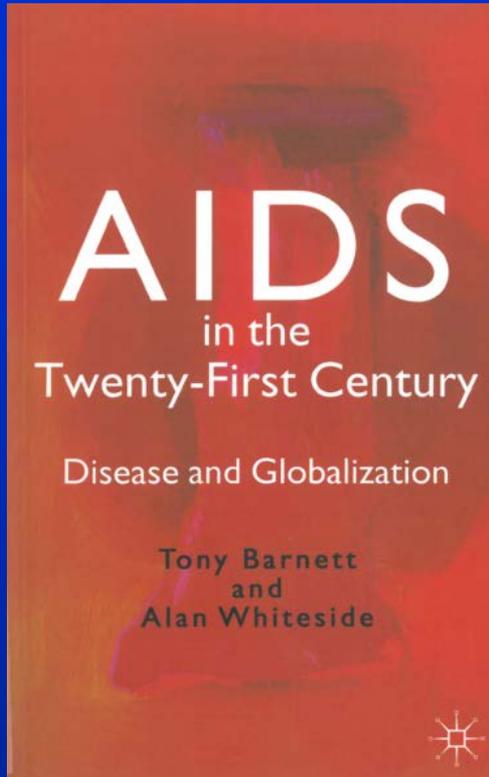
Hughes, T. et al. "Getting in early: Condom use at first anal sex between males is associated with better current health outcomes." AIDS Impact Conference, 1-4 July 2007. Marseille, France.

Are HIV prevention campaigns being delivered at the level required to ensure impact?

“They are not sufficient. Every five years comes a new generation and they need to hear the prevention messages with as much passion as previous generations. How can we expect people to change such a powerful behavior – sex – without a societal commitment to change?”

Does anyone on the planet *not* know what Coca Cola is? Yet they market their product with million-dollar campaigns each year for just a few points of market share, while we do virtually nothing to market prevention.”

Dr Donna Futterman, Director of the Adolescent AIDS Programme, Children’s Hospital at Montefiori, the Bronx, New York.



“An epidemic is *par excellence* a collective event.”

Tony Barnett and Alan Whiteside 2002
In: “AIDS in the Twenty-First Century:
Disease and Globalization”
Palgrave Macmillan

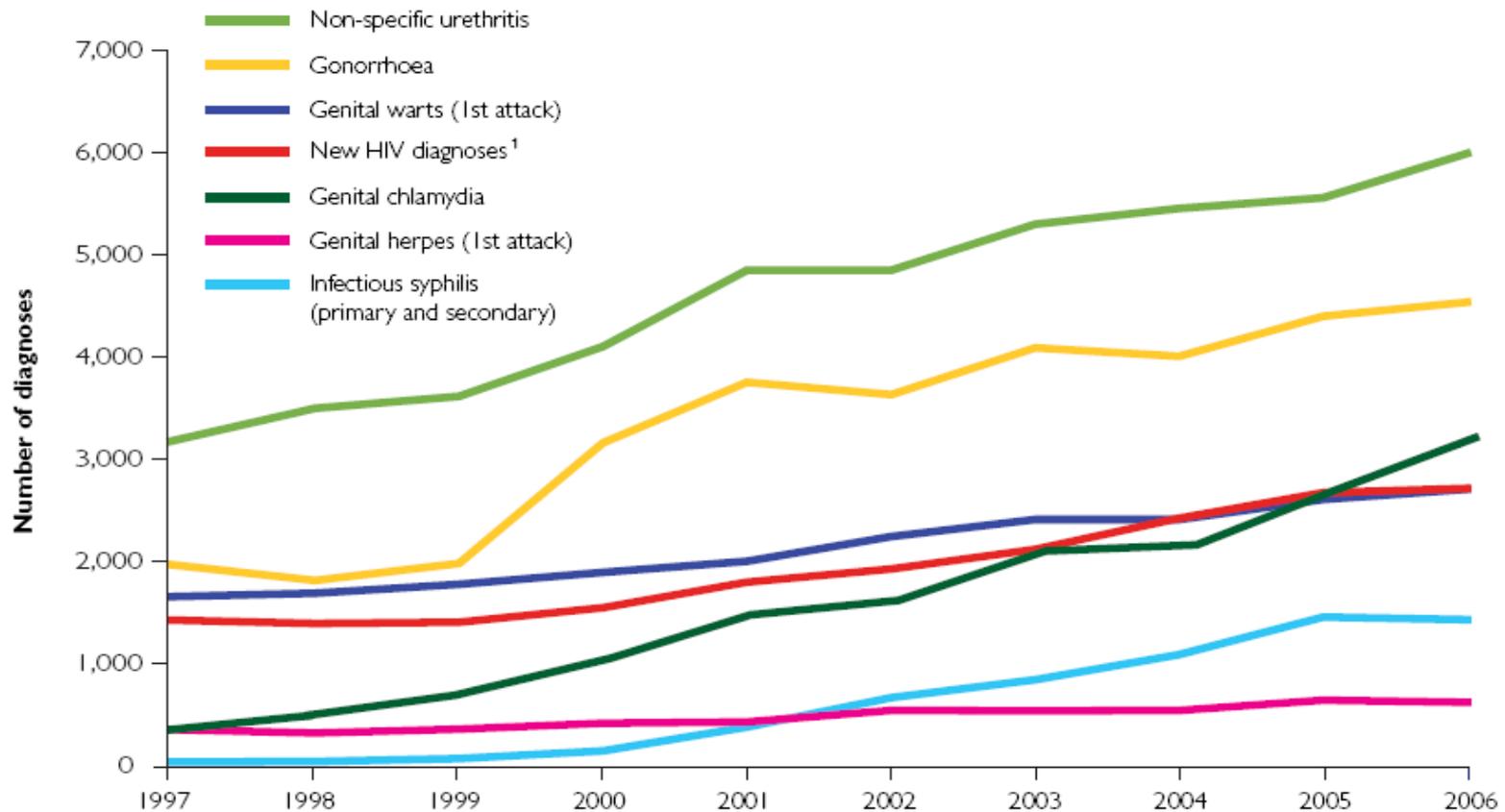
It is extremely important to recognise that everyone who transmits HIV increases the future infection risk for other gay and bisexual men. Over time one single episode of unprotected anal sex can be the direct cause of a large network of new infections.

The corollary also applies. A significant reduction in HIV transmission will spark a self-propagating decrease in spread over time because there will be less people who can pass HIV on to others.

Six key drivers of HIV spread in the MSM population

- (1) Very high HIV acquisition risk from unprotected receptive anal sex.
- (2) High transmission probability in the acute/early HIV infection stage.
- (3) Significant role of sexual network structure – influence of frequent multi-partnering, concurrency and group sex.
- (4) Importance of the internet in sharply increasing partner availability since 2000.
- (5) Strong positive feedback effect of HIV prevalence levels on rates of HIV spread.
- (6) Heightened risk of HIV acquisition and transmission in presence of STI co-infections.

Diagnoses of HIV and selected STIs among MSM in the United Kingdom, 1997-2006



¹ Rates of new HIV diagnoses from 2003 onwards are adjusted for reporting delays

STI data from genitourinary medicine clinics and HIV/AIDS diagnoses

Protective effect of condoms for HIV and STI prevention

Sexually Transmitted Infection	Protective effect of condoms
HIV Gonorrhoea Chlamydia Hepatitis B Syphilis Epididymitis	High High (unless pharyngeal) High High High (if lesions covered by condom) High (where sexually transmitted)
Chancroid Lymphogranuloma venereum Mycoplasma genitalium Trichomoniasis	Probably high Probably high Probably high Probably high
Herpes Warts	Moderate (depends on site of lesions) Moderate
Hepatitis C Donovanosis Hepatitis A	Unknown Probably low Very low (transmission is faecal-oral)

Conclusion: The way forward

- (1) Actively promote universal condom use for anal sex to prevent HIV and STI spread in the MSM population.
- (2) Encourage regular testing for HIV and STIs in the MSM population.
- (3) Facilitate early HIV and STI treatment in the MSM population.
- (4) Implement vaccination for STIs wherever possible in the MSM population.

Acknowledgements

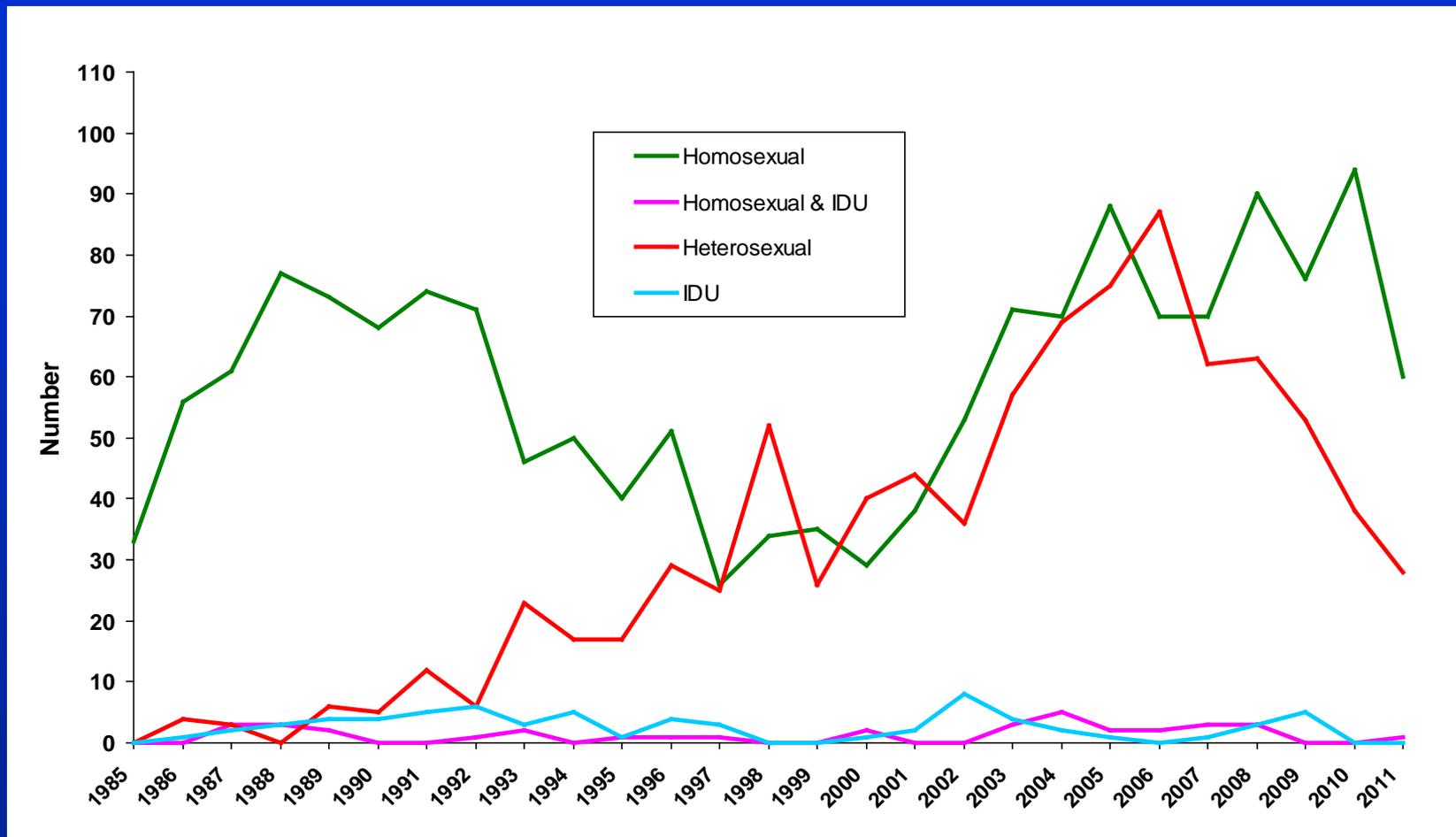
Vern Keller, Library and Information Service, New Zealand AIDS Foundation, Auckland for obtaining the scientific papers used in this presentation and assistance with slide preparation.

Dr Peter Saxton, AIDS Epidemiology Group (Auckland) and Prof Nigel Dickson and Sue McAllister, AIDS Epidemiology Group (Dunedin), Department of Preventive and Social Medicine, University of Otago.

Prof Andrew Phillips, Institute of Epidemiology and Health, University College London, for the permission to use the counter-factual slide from his recent MSM modelling study.

The Ministry of Health for on going funding support to the New Zealand AIDS Foundation.

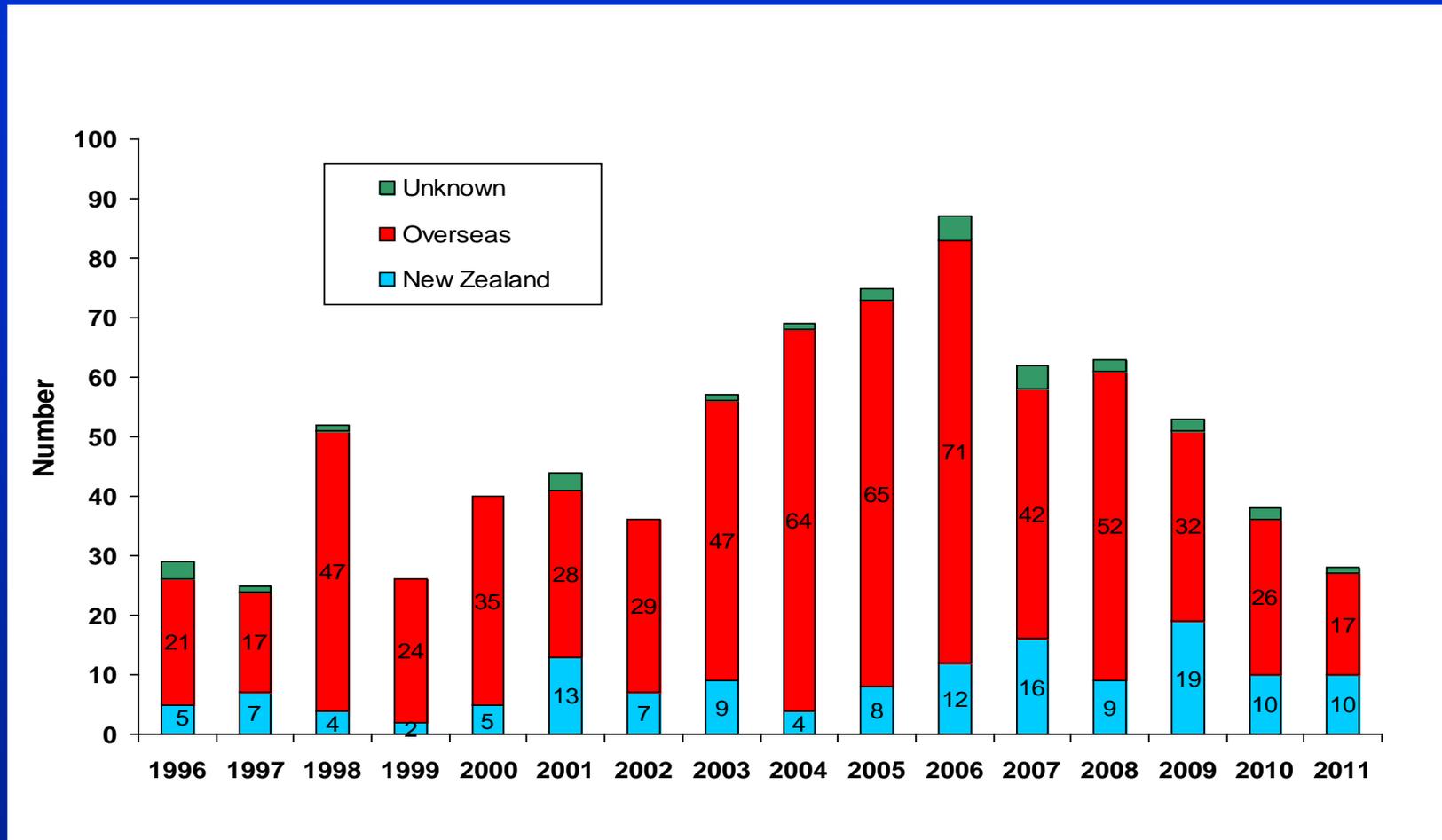
Annual HIV diagnoses in New Zealand by antibody testing, 1985-2011



Data provided by AIDS Epidemiology Group, Department of Preventive and Social Medicine, University of Otago.
Graph produced by Research, Analysis and Information Unit, New Zealand AIDS Foundation, March 2012.

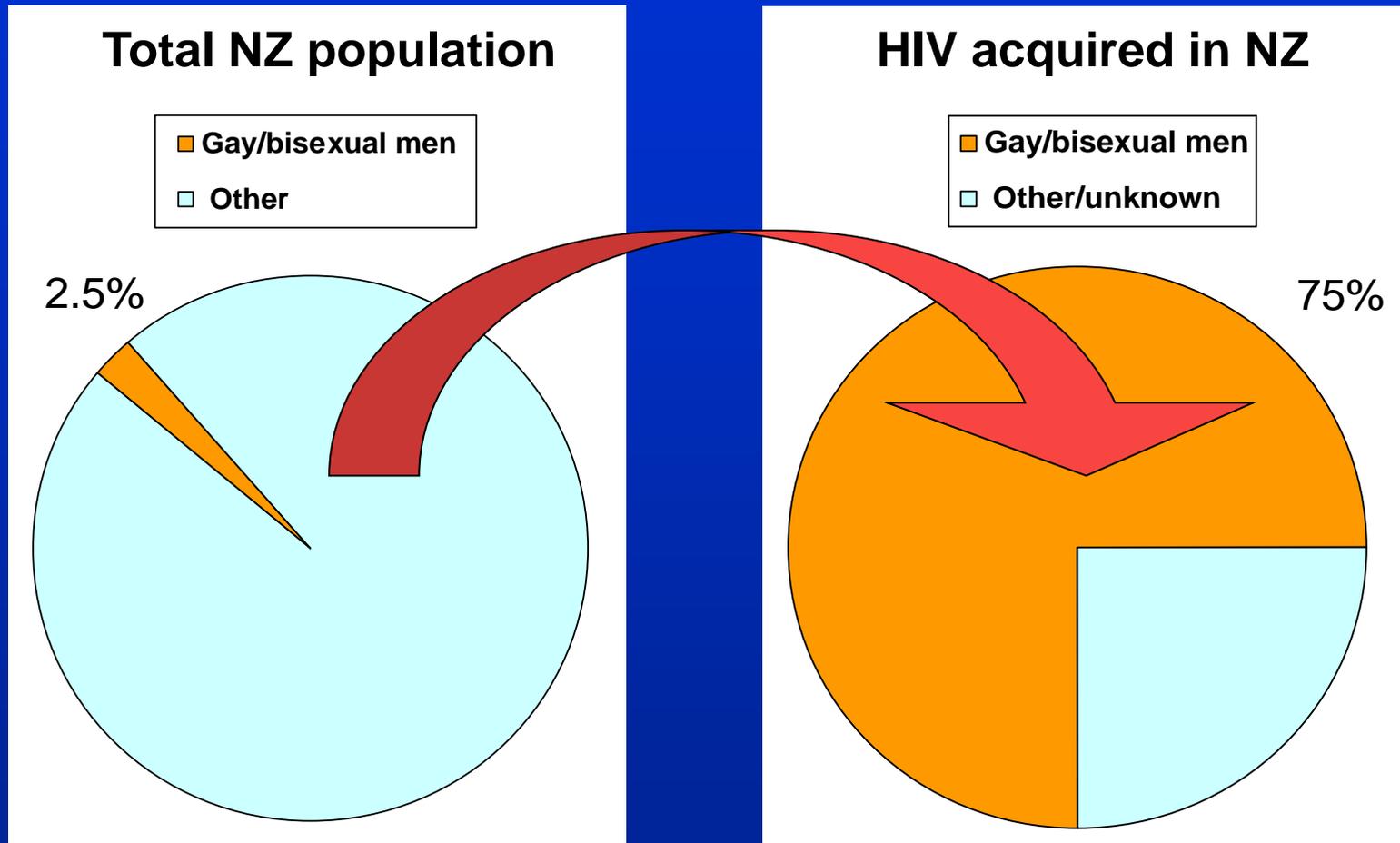
Note: Does not distinguish between infections acquired in New Zealand and overseas.

Annual heterosexual HIV diagnoses by antibody testing in New Zealand, 1996-2011



Data provided by AIDS Epidemiology Group, Department of Preventive and Social Medicine, University of Otago.
Graph produced by Research, Analysis and Information Unit, New Zealand AIDS Foundation, March 2012.

HIV diagnoses by antibody testing in 2011 where infection occurred in New Zealand



Data provided by AIDS Epidemiology Group, Department of Preventive and Social Medicine, University of Otago.
Graph produced by Research, Analysis and Information Unit, New Zealand AIDS Foundation, March 2012.

Note: In 2011, **59** people diagnosed with HIV were thought to have been infected in New Zealand of whom **44** (74.6%) were MSM, 11 (18.6%) other, and 4 (6.8%) unknown.