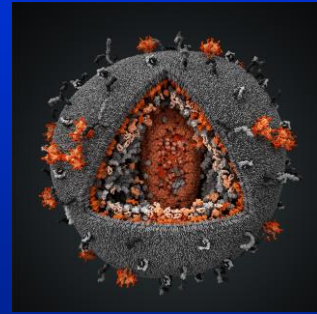


Effective strategies for HIV prevention in gay men: The next decade

Tony Hughes
Scientific Director
New Zealand AIDS Foundation

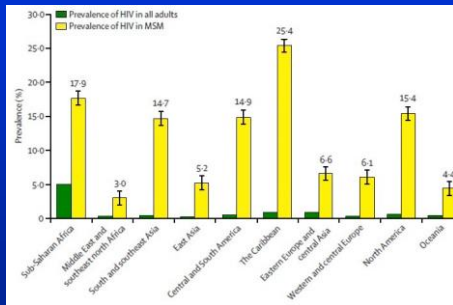
Thirtieth Anniversary HIV Clinical Update Meeting,
Auckland City Hospital, Auckland, 8 May 2015.

Science: What is driving HIV spread between gay men?



By permission: visuosciencecompany.com

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



Adapted from: Beyrer, C., et al. *Lancet* 2012; 380: 367-377; Thematic issue published online 20 July.

Elevated risk for HIV infection among MSM in low and middle-income countries 2000–2006



- "To investigate the global epidemic of HIV among MSM and the relationship of MSM outbreaks to general populations, we conducted a comprehensive review of HIV studies among MSM in low- and middle-income countries."
- "Using studies from all countries, MSM had a 19.3 (95% CI 18.8–19.8) times higher odds of having HIV compared with background populations."
- "Very low-prevalence countries had the highest OR of infection in MSM compared with the general population; in very low-prevalence countries the OR was 58.4 (95% CI 56.3–60.6); in low-prevalence countries it was 14.4 (95% CI 13.8–14.9); and in medium- to high-prevalence settings it was 9.6 (95% CI 8.9–10.2)."
- "Overall, the odds of having HIV infection are markedly and consistently higher among MSM than among the general population of adults of reproductive age across Asia, Africa, the Americas, and the Former Soviet Union."

Borzi, S., et al. *PLoS Med* 2007;4:e1539.

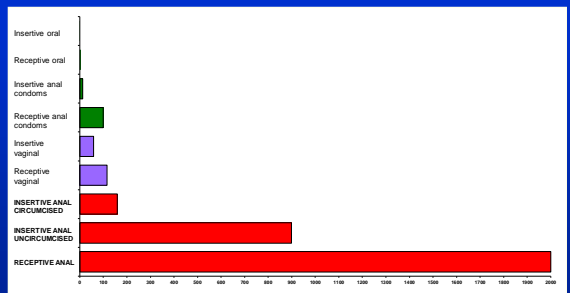
MSM have a 140 times higher risk for newly diagnosed HIV and syphilis compared with MSW in New York, 2008



- "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)."

Pathela, P., et al. *J Acq Imm Def Syn* 2011; 58: 408–414.

HIV risk for different male-to-male sexual activities relative to receptive anal sex without condoms



Biggley, White and Boff (2010); Patel et al (2014); Luby et al (2014); Boff et al (2009); Bi et al (2010); Vargasa et al (2002); Peterson and Abramson (1997); Smith et al (2005); European Study Group on Heterosexual Transmission of HIV (1995).

High HIV transmission risk through anal intercourse

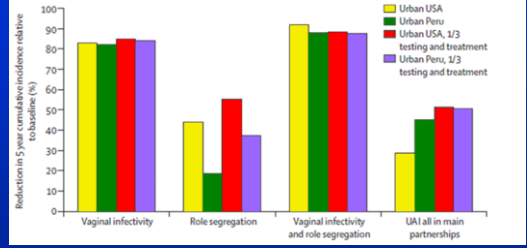
HIV transmission risk through anal intercourse: systematic review, meta-analysis and implications for HIV prevention

Abstract Objective: To estimate the risk of HIV transmission through anal intercourse (AI) compared with vaginal intercourse (VI) in developed countries. Design: Systematic review, meta-analysis and implications for HIV prevention. Setting: Developed countries. Participants: Studies reporting the risk of HIV transmission through AI compared with VI. Results: 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 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).

Baggaley, R. F., et al. *Int J Epidemiol* 2010; 39: 1048-1063; Jin, F., et al. *AIDS* 2010; 24: 907-913.

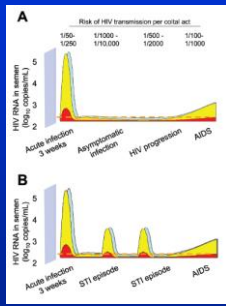
An individual-based computer simulation model for HIV infection in urban MSM in USA and Peru



"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"

Adapted from: Beyrer, C., et al. *Lancet* 2012; 380: 367-377.

Sharply increased HIV transmission risk with acute infection and in the presence of STIs



Cohen, M.S., Pledger, C.D. *J Infect Dis* 2005; 191: 1391-1393.

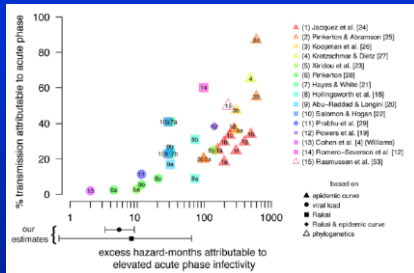
Role of acute HIV infection in the sexual transmission of HIV

Role of acute and early HIV infection in the sexual transmission of HIV
 Miller, W., et al. *Curr Opin HIV AIDS* 2010; 5: 277-282.

Abstract
 Acute HIV infection (AHI) is characterized by high viral loads and is associated with increased infectiousness. In men, the peak viral load is estimated to occur at 17 days in plasma and at 30 days in semen. The high concentration of virus during acute HIV infection leads to increased infectiousness, possibly as much as 26 times greater than during chronic infection. Other biological factors, including concomitant sexually transmitted infections, also contribute to enhanced viral transmissibility.

- "Persons with acute HIV infection often exhibit markedly elevated viral loads, often exceeding one million copies/ml."
- "The heightened viral load in infected blood during AHI is mirrored in genital secretions. In men, the peak viral load is estimated to occur at 17 days in plasma and at 30 days in semen."
- "The high concentration of virus during acute HIV infection leads to increased infectiousness, possibly as much as 26 times greater than during chronic infection."
- "Other biological factors, including concomitant sexually transmitted infections, also contribute to enhanced viral transmissibility."

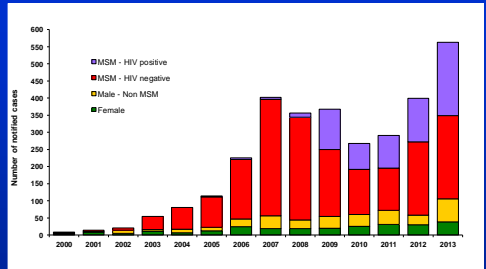
Proportion of HIV transmission due to acute infectivity



Note: Published estimates of the proportion of incidence attributable to early transmission (M_{early}) versus the assumed excess hazard-months attributable to divergently elevated acute phase infectivity (M_{acute}). Shapes indicate whether M_{acute} was determined from epidemic growth rates, viral load trajectories and viral load-infectivity relationships, the Rukwa retrospective cohort, phylogenetics, or a combination thereof. Points reflecting studies that published more than one result are identified with letters. Points and error bars below the x-axis indicate our estimated M_{acute} from the Rukwa retrospective cohort data and based on viral load trajectories; we do not specify a sexual network model and therefore do not estimate M_{early} in this study.

Bellan, S. E., et al. "Reassessment of HIV-1 Acute Phase Infectivity." Fig 7. March 17, 2015. DOI: 10.1371/journal.pmed.100180.

Notified cases of infectious syphilis by sexual orientation and HIV positive status, Victoria, Australia, 2000 - 2013



Source: Be Laine Tay, Epidemiology and Surveillance Section, Department of Health, Melbourne, Victoria, 8 April 2014.

Note 1: A total of 475 infectious syphilis cases were notified in MSM in Victoria in 2013, and this was the highest annual number since the Department of Health electronic records began in 1991. This is a 37% increase from 2012 and a 127% increase from 2010. Around half (214) of the MSM cases in 2013 are in HIV positive MSM, and of these, a significant proportion are re-infections.

Note 2: HIV status was added to the enhanced surveillance form in 2009. Information on HIV status was not systematically collected previously. Excludes cases where sexual orientation was not reported or unknown.

Enhanced surveillance of infectious syphilis in New Zealand sexual health clinics



- "Following a rise in cases of infectious syphilis in New Zealand, national enhanced surveillance at sexual health clinics was initiated. All public sexual health clinics reported monthly on the number of cases seen, and completed a coded questionnaire on each case."
- "In 2011, 72 cases of infectious syphilis were reported. The majority (83%) were among men who have sex with men who were mainly infected in New Zealand and had an ethnic profile similar to all New Zealanders."
- "Overall, 18% of men who have sex with men were HIV positive. Resurgent syphilis in New Zealand disproportionately affects men who have sex with men, amongst whom HIV is prevalent. Men who have sex with men should be aware of the risks and symptoms of syphilis and encouraged to have regular sexual health checks including serology testing. Control of syphilis should be included in the strategy to check HIV spread."

Pudica, R. et al. *Int J STD AIDS* 2013; 24: 791-798.

Lymphogranuloma venereum in MSM: Evidence of local transmission in New Zealand



- "The diagnosis of LGV was made in four MSM in Auckland over a 3-month period in 2013 and more recently in one MSM in the Waikato in 2014. All of the five cases presented with signs and symptoms consistent with rectal LGV infection including pruritus, anal discomfort or bloody rectal discharge. Four of the cases did not have a history of recent overseas travel and were likely to have acquired their infection locally."
- "The majority of cases in these outbreaks were MSM co-infected with HIV with high risk sexual behaviour and a high rate of concomitant sexually transmitted infections. All cases in our series reported high-risk sexual behaviour and concomitant sexually-transmitted infections were noted, with cases 1, 2, 4, and 5 co-infected with *N. gonorrhoeae* and cases 1, 2 and 3 co-infected with HIV."
- "A recent multi-centre case-control study from the United Kingdom reported that 89% of all cases were co-infected with HIV and identified unprotected receptive anal intercourse as the key factor for rectal LGV (Adjusted OR 10.7, 95%CI 3.5-32.6)."

Basu, I. et al. *NZ Med J* 2015; 128: 25-28.

Protective effect of condoms for HIV and STI prevention

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

Australian Society for HIV Medicine. "Australian condom tracing manual" 2010. 4th edition. Endorsed: Royal Australian College of Physicians

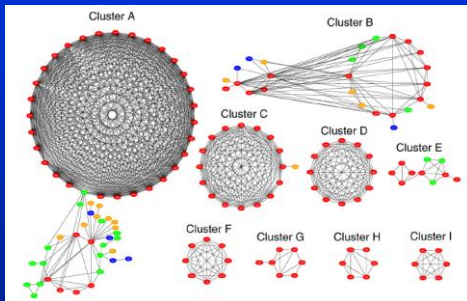
Investigation of an HIV transmission cluster in MSM centred in South Wales, United Kingdom



- "In February 2007 a MSM, diagnosed HIV positive at Cardiff Royal Infirmary, reported 62 sexual contacts in the previous 6 months. Of the first nine contacts tested, five were HIV positive."
- "Of the 123 individuals in the sexual network, all were men who had sex with men (MSM) except for seven men who self-identified as bisexual and five heterosexual women. Fifteen new cases of HIV were diagnosed, all were men."
- "The sexual network was distributed over South and West Wales extending into England, with high reported rates of unprotected anal intercourse, previous HIV tests and concurrent sexually transmitted infections."
- "Partner notification revealed a relatively young, well-educated HIV network with high-risk behaviour and ongoing transmission despite previous knowledge and awareness of HIV. This analysis adds to the evidence supporting HIV partner notification in MSM."

Knapper, C.M. et al. *Sex Transm Infect* 2008; 84: 377-380.

HIV transmission clusters: London, 1994-2003.



Fraser, L. et al. Episodic sexual transmission of HIV revealed by molecular phylogenetics. *PLoS Med* 2008; 5: e50.

The increase in global HIV epidemics in MSM



- "Epidemics of HIV in men who have sex with men (MSM) continue to expand in most low, middle, and upper income countries in 2013 and rates of new infection have been consistently high among young MSM."
- "The high per act transmission probability of receptive anal intercourse, sex role versatility among MSM, network level effects, and social and structural determinants play central roles in disproportionate disease burdens. HIV can be transmitted through large MSM networks at great speed. Molecular epidemiologic data show marked clustering of HIV in MSM networks, and high proportions of infections due to transmission from recent infections."
- "Addressing the expanding epidemics of HIV in MSM will require continued research, increased resources, political will, policy change, structural reform, community engagement, and strategic planning and programming, but it can and must be done."

Beyer, C. et al. *AIDS* 2013; 27: 2665-2676.

It is extremely important to recognise that everyone who transmits HIV or STIs 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 and STI transmission will spark a self-propagating decrease in spread over time because there will be less people who can pass these infections on to others.

- ### Key drivers of HIV spread between gay and bisexual men
- (1) Very high HIV acquisition risk from unprotected receptive anal intercourse.
 - (2) Extreme infectiousness in the acute/early HIV infection stage.
 - (3) Strong effect of high HIV prevalence levels on rates of HIV transmission.
 - (4) Significant role of sexual network structure – frequent multi-partnering, short gaps between partners, concurrent relationships and group sex.
 - (5) Importance of a small group of superspreaders in accelerating HIV and STI transmission.
 - (6) Presence of a widely diffused subset of individuals with undiagnosed HIV infection.
 - (7) Heightened risk of HIV acquisition and transmission in presence of STI co-infections.
 - (8) Substantial effect of high substance use, and especially of methamphetamine, on rates of unprotected anal sex.
 - (9) Major influence of the internet in supercharging partner availability and choice since 2000.

Strategy: What will work best to control HIV spread?

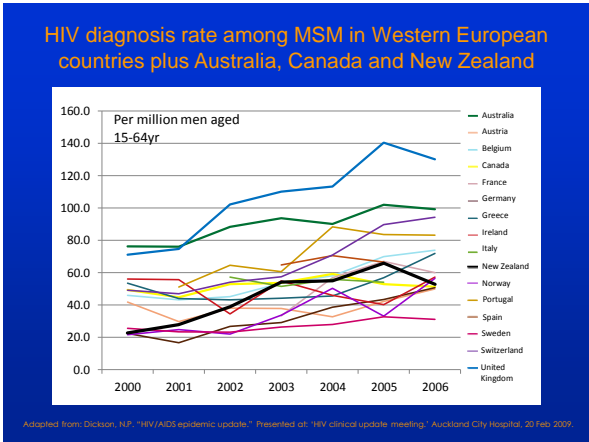


"Strategy... starts with an existing state of affairs and only gains meaning by an awareness of how, for better or worse, it could be different. This view is quite different from those that assume strategy must be about reaching some prior objective."

"This is why as a practical matter strategy is best understood modestly, as moving to the 'next stage' rather than to a definitive and permanent conclusion. The next stage is a place that can be realistically reached from the current stage."

Prof Lawrence Freedman, Kings College, London.

Professor Lawrence Freedman, 2013. In: Strategy - A History, page 411, Oxford University Press.



Ongoing HIV-1 transmission among men who have sex with men in Amsterdam: A 25-year prospective cohort study

Of 1642 HIV-1-negative individuals, 217 seroconverted during follow-up. HIV-1 incidence rates strongly decreased from 8.6/100 person-years in 1985 to 1.3/100 person-years in 1992; remained relatively stable around 1.0/100 person-years between 1992 and 1996, and slowly increased to 2.0/100 person-years in 2009 (P=0.14, linear trend 1996-2009).

Reports of unprotected anal intercourse (UAI) increased significantly from 1996 onwards. HIV-1 seroconversion was associated with receptive UAI with casual partners, more than five sexual partners, a history of gonorrhoea (all in the preceding 6 months), and a lower educational level.

Itolice et al. AIDS 2011, 25:493-501

A resurgent HIV-1 epidemic among MSM in the era of potent antiretroviral therapy in the Netherlands

The joint effect of HAART and risk behaviour on HIV incidence has been previously studied using mathematical models and empirical data. Although based on different assumptions, all these studies come to the same conclusion regarding the potential for an increase in risk behaviour to offset the benefits of HAART in reducing transmission.

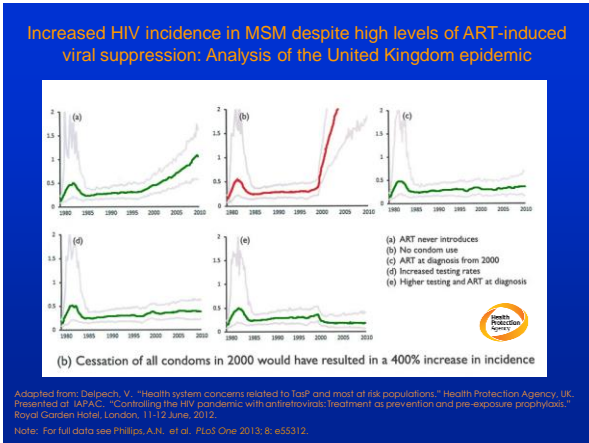
Since 1996, when HAART became widely used in the Netherlands, the risk behaviour rate has increased by 66% in MSM.

In conclusion, there is an increase in HIV transmission among MSM in the Netherlands, in spite of earlier diagnosis and subsequent effective treatment. The most effective intervention is to bring risk behaviour back to pre-HAART levels.

Bosmer, D. et al. AIDS 2008; 22: 1071-1077.

Impact of ART on HIV transmission at population level

Author(s)	Key comments and conclusions on sexual behaviour in MSM
Bower et al. 2002	Significant efforts should be made to prevent risk behaviour increasing because even small increases will overcome the effect of ART on reducing HIV transmission.
Law et al. 2001	Apparently large decreases in infectiousness as a result of treatment can be counterbalanced by much more modest increases in unsafe sex.
Katz et al. 2002	Any decrease in per-contact risk of HIV transmission due to ART use appears to have been counterbalanced or overwhelmed by increases in the number of unsafe sexual episodes.
Velasco-Hernandez et al. 2002	HIV spread is extremely sensitive to changes in risky sex. Our findings demonstrate unequivocally that it is imperative that the usage of ART should be tightly coupled with effective risk-reduction strategies that substantially reduce levels of risky sex.
Xindou et al. 2003	A reduction of 75-99% in infectivity caused by ART will be counterbalanced by increases of 50% (range 30-80%) in risky behaviour with steady partners. Prevention measures should address unsafe behaviour.
Bolly 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.
Wilson et al. 2008	The risk of HIV transmission in MSM is high over repeated exposures. If the claim of non-infectiousness in effectively treated patients is widely accepted, and condom use subsequently declines, there is potential for a substantial increase in HIV incidence.
Habel 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.
Charoebou et al. 2011	Also of concern is the potential for changes in behavior among MSM to lead to increased transmission risk, thereby offsetting any potential gains and creating the spectre of resistant strains of HIV.
Sorenson et al. 2012	The results of our sensitivity analyses indicated that a reduction in condom use to 50% from 75% among all urban infected MSM negated the benefits of the test and treat intervention.
Wilson 2012	Natural experiments suggest that there are limitations to the benefits of treatment as prevention. Before large portions of HIV/AIDS budgets are shifted to this strategy in place of traditional prevention approaches, these limitations need to be considered.
Phillips et al. 2013	The promotion of condom use among negative as well as HIV positive MSM remains vital to ensure the benefits of ART in reducing transmission of HIV are not undermined.
Bood et al. 2013	Behavioral changes may mitigate the benefits of test-and-treat, and future research should explore implications of these behavioral changes.



Vaccination: Primary prevention of infection at the whole population level

What is Passive Immunity? www.winegeek.com

Universal precautions: Primary prevention of infection in the hospital setting

Hand washing is the best way to prevent infections!

1 Rub hands with soap under running water.
2 Apply soap to palms, fingers, and wrists.
3 Rub hands together for 20 seconds.
4 Rinse hands well.
5 Dry hands with paper towel.
6 Use the towel to turn off the tap.

http://www.stginc.on.ca/Performance_Patient_Safety/Patient_Safety_Indicators/Hand_Hygiene_Compliance

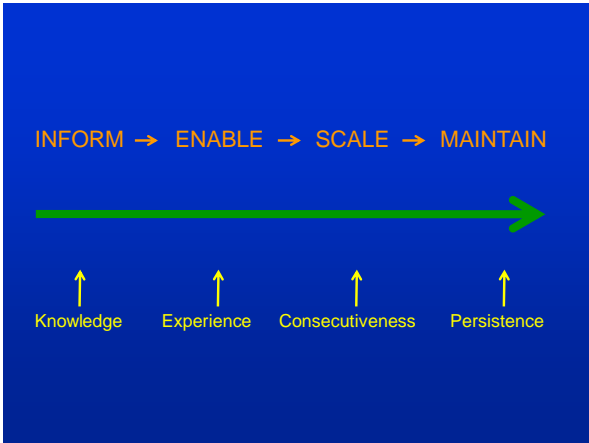
Maximising the effectiveness of HIV prevention for MSM

"Basic prevention tools are still and will always be the first step and most effective if used. For sexually active gay and bisexual men who are HIV-negative, that means getting tested for HIV and sexually transmitted infections at least once a year and using condoms correctly and consistently."

"For sexually active gay and bisexual men who are living with HIV, that means using condoms correctly and consistently and being on effective antiretroviral therapy to stay healthy and reduce the risk of spreading HIV to partners."

"We must reach all people at risk...with these proven HIV education, testing, and prevention strategies. Today, many young MSM don't realise HIV remains common, serious, and deadly. They may underestimate their personal risk or minimize the difficulty of managing a lifelong chronic disease."

Dr Jonathan Mermin, Director, National Centre For HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, Centres for Disease Control and Prevention.
From: "CDC e-HAP FYI Updates." September 28, 2013.



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 Montefiore, the Bronx, New York.

Futterman D.C. "Focusing on adolescent AIDS in the Bronx" 2012. Available from <http://www.thetbody.com/resources/writtenby/doffutterman.htm#top> [Accessed 3 October 2013].

Primary prevention of HIV infection is as important as treatment

"Have we come to depend so much on the panacea of the antimicrobial that we have forgotten the lessons of Semmelweis, Pasteur and Lister? Prevention of infection must be as important as treatment, and this will require effort on a global scale."

"It may yet be the simplest preventive measures that have the greatest effect for the least cost."

Dr Susan Maddocks, Deputy Editor, "Antimicrobial resistance: Global problems need global solutions." Medical Journal of Australia, 18 March 2013

Canadian consensus statement on HIV and its transmission in the context of criminal law, May/June 2014



- "Condoms are a cornerstone of HIV prevention. Latex and polyurethane condoms act as an impermeable physical barrier through which HIV cannot pass. When used correctly and no breakage occurs, condoms are 100% effective at stopping the transmission of HIV because they prevent the contact between HIV-containing bodily fluid and the target cells of an HIV-negative individual."
- "Studies at a population level have also shown that even when factoring in possible instances of incorrect use or breakage, the consistent use of condoms dramatically reduces the possibility of HIV transmission."
- "Where a condom is used, anal-penile intercourse poses a negligible possibility of transmitting HIV regardless of the HIV-positive individual being on effective antiretroviral therapy."

Louffy, M., et al. *Can J Infect Dis Med* 2014; 25:135-140.

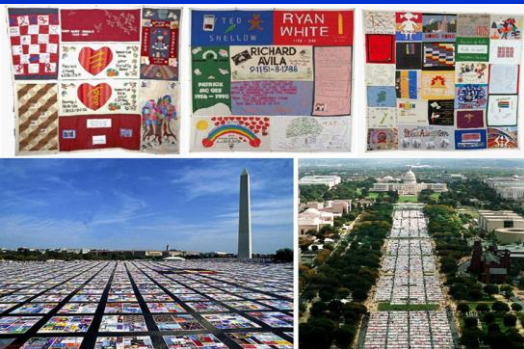
Ten reasons to promote universal condom use by gay men for anal sex



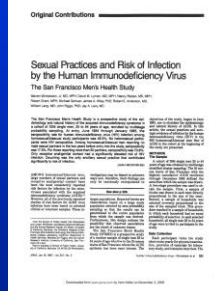
- Effective
- Simple
- Verifiable
- Safe
- Manageable
- Sustainable
- Inexpensive
- Marketable
- Empowering
- Acceptable

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Forgetting our HIV history is a critical mistake



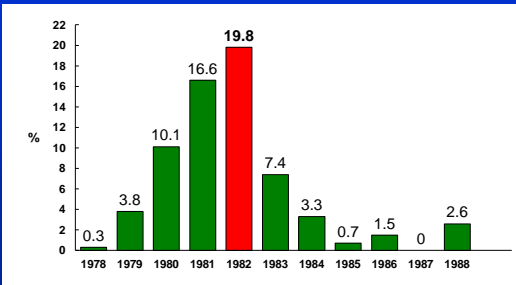
Sexual practices and risk of infection by HIV, San Francisco Men's Health Study, 1984-1985



- "At entry, **June 1984 through January 1985**, the seropositivity rate for human immunodeficiency virus (HIV) infection among homosexual/bisexual study participants was **48.5%**. No heterosexual participants were HIV seropositive".
- "Among homosexual/bisexual men reporting no male sexual partners in the two years before entry to the study, seropositivity was 17.6%. For those reporting more than 50 partners, seropositivity was **70.8%**. Only receptive anal/genital contact had a significantly elevated risk of HIV infection."

Winkelstein, W., et al. *JAMA* 1987; 257: 321-325. Note: The study population was aged 25-54 years.

Annual incidence of HIV infection among 320 Hepatitis B vaccine trial participants, San Francisco, 1978-1988



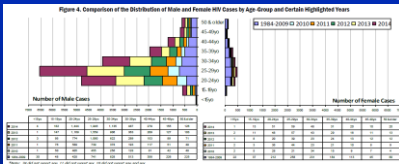
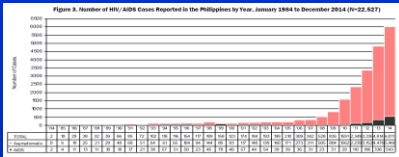
Hessol, NA, Lison, AR, O'Malley, PM, et al. "Prevalence, incidence, and progression of Human Immunodeficiency Virus Infection in homosexual and bisexual men in hepatitis B vaccine trials, 1978-1988." *Am J Epidemiol* 1989;130: 1167-1175.

Many places are not retaining nearly enough freeboard in HIV prevention for gay men



<http://mcgillycuddy.blogspot.co.nz/2009/11/2/phuket-island-thailand.html>

Annual HIV diagnoses in the Philippines, Jan 1984 – Dec 2014



Philippine Dept. of Health, National Epidemiology Centre, Dec. 2014.

Could concentrated HIV epidemics make AIDS unbeatable?

"I'm really concerned about the future of the AIDS epidemic, especially at a time when we are perhaps a little too optimistic because of the huge progress we are making from a technological and scientific perspective."

"As we celebrate the extraordinary progress, we should also be conscious that we will not stop HIV and AIDS by just having more sophisticated drugs and only focussing on the generalised epidemic and not focussing enough on the complexities of the concentrated epidemics."

"The virus will return to being a disease that plagues only certain groups, and the political will to overcome it there may fade. Then the AIDS epidemic will become more and more a sum of these concentrated epidemics."

"In MSM populations, there is no sign [that the HIV epidemic] has decreased. It has either been a stable number of new infections every year for 10 years, or it is an increasing trend. And this, in western Europe at least, is in the context of basically free and easy access to therapy and services."

"We are a bit in disarray. We don't know quite what it is that we should do. Here we are, we have all the technology, we have extraordinary scientific progress, and we just cannot translate that into making a difference in these populations."

"If we do not deliver the right response, we will fail to deliver an end to AIDS."

Could concentrated HIV epidemics make AIDS unbeatable?
 Reuters Health and Science Correspondent, Kate Kelland,
 4 November 2013.
 Dr Michel Kazatchkine,
 U.N. Special Envoy for HIV/AIDS in Eastern Europe,
 Joint United Nations Programme on HIV/AIDS,
 Geneva, Switzerland.

Actual HIV prevalence in a community sample of MSM in Auckland, New Zealand



Saxton, P., et al. *BMC Public Health* 2012; 12: 92.



"There's nothing you should crowdsource more than an epidemic. It has [an] urgency where we need every person working on it."

Prof Pardis Sabetti, Centre for Systems Biology, Harvard University. In: Brady Dennis, "Sense of urgency heightens over Ebola crisis." *Washington Post*, 28 August 2014.

In New Zealand our HIV prevention programme is evolving year by year and building on what has gone before. Our strategy is to use all of the prevention tools at our disposal to the maximum extent possible, in the particular circumstances that apply in this country, without allowing them to undermine each other.

Our primary prevention programme for sexually active gay and bisexual men is universal condom use for anal sex. That is not negotiable because HIV and STI rates in gay men will be many times higher if condom use is not maintained.

Universal condom use for anal sex is still by far the most effective population level strategy that we have to ensure that sexually active HIV negative gay and bisexual men remain negative.

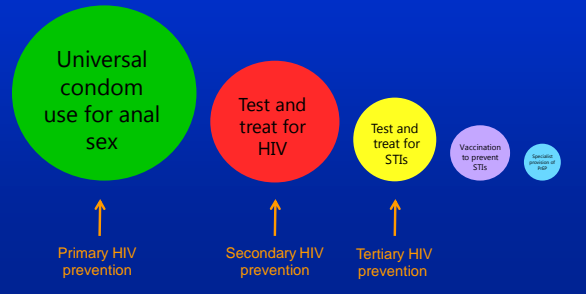
Key strategic insights for effective HIV prevention in gay men

- (1) Accepting that sexually active gay men are the population group at highest risk from HIV and STIs.
- (2) Understanding that almost all HIV transmission between gay men occurs through unprotected anal sex.
- (3) Recognising that the primary "outcome target" for HIV prevention is the goal of keeping HIV negative gay men from becoming infected in the first place.
- (4) Understanding that "primary prevention" – prevention for negatives – must therefore be prioritised at the highest possible level.
- (5) Recognising that condom use is not just a matter of individual choice but a critical issue of collective responsibility for the health of all other sexually active gay men.

Conclusion: A comprehensive HIV prevention strategy for gay and bisexual men

- (1) Promote universal condom use for anal sex to prevent HIV and STI spread in the MSM population.
- (2) Encourage frequent testing and ongoing linkage to care for HIV and STIs in the MSM population.
- (3) Facilitate immediate HIV and STI treatment in the MSM population.
- (4) Implement across-the-board vaccination for STIs in the MSM population.
- (5) Support specialist provision of PrEP for high risk HIV negative MSM where clinically indicated.

Comprehensive HIV prevention for gay and bisexual men: The next decade



Acknowledgements

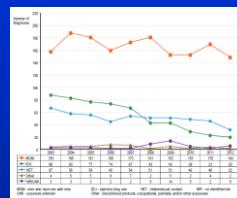
Vern Keller, Library and Information Service, New Zealand AIDS Foundation, Auckland for obtaining the scientific papers used in this presentation and assistance with slide preparation.

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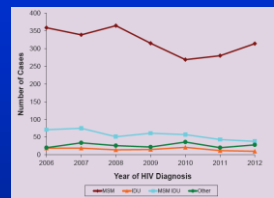
The Ministry of Health for on going funding support to the New Zealand AIDS Foundation

New HIV diagnoses in males, British Columbia, Canada: 2003-2012.



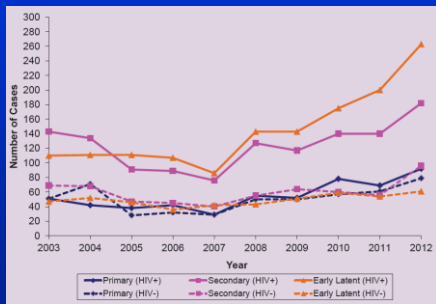
BC Centre for Disease Control 2013. "HIV in British Columbia: Annual Surveillance Report 2012."

New HIV diagnoses, San Francisco, US: 2006-2012.



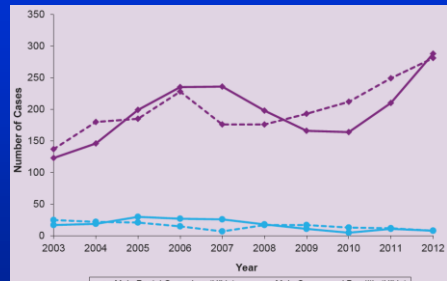
San Francisco Department of Public Health. "HIV/AIDS Epidemiology Annual Report 2012."

Syphilis among MSM by HIV serostatus in San Francisco, 2003-2012



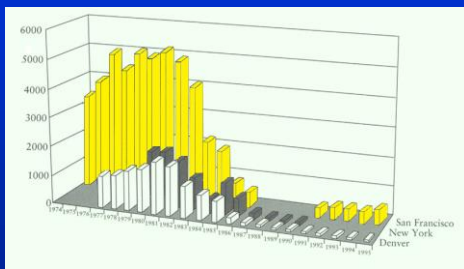
San Francisco Department of Public Health, "HIV/AIDS epidemiology annual report," 2012.

Rectal gonorrhoea cases in MSM by HIV serostatus in San Francisco, 2003-2012



San Francisco Department of Public Health, "HIV/AIDS epidemiology annual report," 2012.

Rectal gonorrhoea cases in males in San Francisco, 1974-1995



Doll, L.S. and Ottrow, D.G. in Holmes, K.K. et al, editors. Sexually transmitted diseases 1999 3rd ed. New York: McGraw-Hill, 1999. Fig 11-1:152.

Swiss statement – Jan 2008



Vernazza, P. *Bulletin de médecine* 1998; 3: 165-167

iPreX trial – Dec 2010



Grant, R.M. et al. *PLoS One* 2010; 5: 20079

HPTN 052 trial – Aug 2011



Cohen, M. S. et al. *N Engl J Med* 2011; 365: 493-503

PARTNER study – Feb 2014



http://www.aidsmap.org/Partners-2014-PARTNER_2k.pdf

Pre-exposure prophylaxis (PrEP) stops 86% of HIV infections in PROUD study

PROUD study
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Published: 24 February 2013

Key messages:

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CR #1 2015

Source: www.aidsmap.org/PROUD-study

Cairns, G. NAM aidsmap, 24 February 2015.

Pre-exposure prophylaxis also stops 86% of HIV infections in Ipergay study

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CR #1 2015

Source: www.aidsmap.org/Ipergay-study

Cairns, G. NAM aidsmap, 24 February 2015.

Forty five percent of PrEP users at a San Francisco clinic report using condoms less often

AIDS MEDS
45% of PrEP Users at SF Clinic Report Using Condoms Less Often

By Stephen Ross

San Francisco, CA (December 10, 2014) – A survey of 500 PrEP users at a San Francisco hospital found that 45 percent reported using condoms less frequently since starting PrEP, the San Francisco Business Times reports. Clinicians at the Kaiser Permanente Medical Centre in San Francisco surveyed 90 of the approximately 500 people who have started PrEP at the hospital.

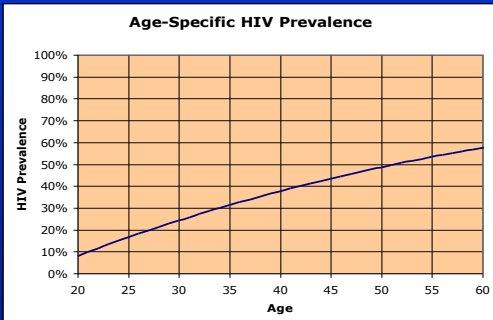
CR #1 2015

Source: www.aidsmap.org/PrEP-users-at-SF-clinic-report-using-condoms-less-often

Ryan, B. AIDS MEDS, 10 December 2014.

- "A survey of users of Truvada (tenofovir/emtricitabine) as pre-exposure prophylaxis (PrEP) at a San Francisco hospital found that 45 percent reported using condoms less frequently since starting PrEP, the San Francisco Business Times reports. Clinicians at the Kaiser Permanente Medical Centre in San Francisco surveyed 90 of the approximately 500 people who have started PrEP at the hospital."
- "Forty-five percent of the surveyed PrEP users reported using condoms less frequently since starting Truvada, while 5 percent reported using them more, and 50 percent reported no change. No one reported an increase in sexual partners. There have been no new cases of HIV among all 500 PrEP users at the hospital."
- "Two individuals among the 500 taking PrEP at the hospital, both of them men who have sex with men (MSM), have contracted hepatitis C virus (HCV), [and] it is reasonable to assume the men did so sexually, because neither reported any other risk factors, such as sharing injection drug needles or works."

Projected burden of HIV disease among MSM:
HIV incidence rate of 1.9%



Stall, R., Mills, J.C., Marshall, M. Re-emerging HIV epidemics among MSM in the United States and other industrialized nations. University of Pittsburgh, USA; 16th International AIDS Conference, Toronto Canada, 13th August 2006.

Running in place: implications of HIV incidence estimates among urban MSM in the US and other countries



- "We calculated a mean incidence rate of 2.39% for MSM in the United States, which if sustained within a cohort of MSM, would yield HIV prevalence rates of approximately 40% at age 40. These extrapolations overlap published HIV prevalence rates for MSM younger than age 40 in the United States. HIV incidence rates in the 2–3% range will adversely affect the health of gay male communities for decades to come."
- "Thus, given the very high stakes of the fight against AIDS among MSM, arguments in favour of HIV prevention nihilism should have little attraction in comparison to invitations to help find ways to improve prevention efforts so that the AIDS epidemic will no longer be reproduced across generations of gay men."

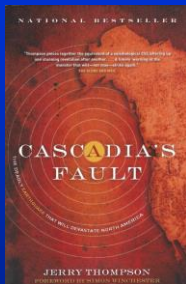
Stall, R., et al. AIDS Behav 2009; 13: 615-629.

Why are some jurisdictions now acting as though we have no useful core of professional knowledge in the field of HIV prevention for gay men, when the community-designed behaviour change programmes from the mid-eighties were among the most successful interventions in the history of public health?

Despite the underlying biology, population level risk of HIV transmission in the acute infection stage is context dependent. One size does not fit all, and transmission risk varies greatly in different social contexts.

The shorter the gaps between new partners the greater the amount of population level onward transmission risk in the acute infection stage.

What does an effective social movement look like?



"Similar blunders are a relatively homogeneous people," Douglas continued. "They're all very much in touch with their local identity and a strong oral tradition." Logan had to be a quiet and intense man, however, in 1911, taking most of his children, their other around evidently told this story to their children and grandchildren, which may have been why they knew what to do when the same thing happened again in 2010.

"Large village was the village closest to the epicenter of the earthquake," Douglas continued. "The first four earthquake waves, very strongly. And in fact it damaged about 25 percent of their structures. The first tsunami was carried in the northern part of Blaine's Island only eight minutes after the earthquake," he said. "They had very, very little time."

But because their oral history had been kept alive, they knew exactly what had to be done. According to Douglas' interview in Large town that "when you find a really long, straight coastline, you immediately grab your children, help grab your car and get yourself up to high ground. And not only did they go to high ground, they actually had an entire temporary village—materials to make an entire temporary village up there. They had pens, they had blankets for needs, they had water, they had food." "This was a total, almost instant. And in fact, I think of it, however, was the conclusion to be very close to the north shore near the waves."

"The same were witnesses," said Douglas. "In Large village every single house was completely wiped off the face of the earth. The only thing left was the concrete foundation." "The boat had been completely destroyed. They lost their animals, they lost their fields." But "And I know how bad it is, but "Oh a single one, someone, child— not a single old person— died," Douglas said. "That was"

Thompson, J. 2011 In: "Cascadia's fault: The deadly earthquake that will devastate North America." Harper Collins Publishing Ltd, Canada.

Both primary and secondary prevention require ongoing individual action

"Prevention of HIV infection necessitates individual action, usually requiring people to continually make positive health choices. Social context affects individual behavior and often negatively influences the effectiveness of biomedically based preventive interventions."

"Treatment as prevention is similarly complex, given that only one quarter of HIV-infected people in the United States have successfully navigated the care continuum to achieve an undetectable viral load with ART. Thus, health interventions are failing 75% of infected persons in this country and larger percentages in other countries - a situation that cannot be allowed to continue."

Dr Anthony Fauci, and Dr Hilary Marston, Office of the Director, National Institute of Allergy and Infectious Diseases, Bethesda, Maryland, USA. In: New England Journal of Medicine 2014; 6: 495-498.

Unfolding chronology of a harm

"Any intervention after the fact we term reactive. And virtually anything before it is broadly labelled preventive. Use of the binary distinction sometimes tends to mask the range of choices available within the preventive category. Not only can we choose which pre-cursor of X to focus upon, we can also choose to intervene at many different moments in the unfolding chronology."

"As the unfolding chronology of any one harm provides so many potential moments for intervention and so many contributing pre-cursors upon which one might focus, how should practitioners go about choosing when and where to intervene? Assuming they want to produce the maximum risk mitigation for the minimum price, then they will seek to identify the following combination:

- a **moment** within the unfolding chronology;
- an **object** upon which to focus (one of the pre-cursors or factors which lead to the harm);
- a **method** for intervention (tools, technologies, or approach), where this combination of moment, object, and method
 - falls within their jurisdiction, or within the jurisdiction of available partners;
 - is both resource-efficient and effective in mitigating the harm; and
 - provides minimal (harmful) side-effects."

Sparrow, M.K., "The character of harm: Operational challenges in control." Cambridge University Press, 2008.

Evidence-based public health: Not only whether it works, but how it can be made to work practicably at scale



- "[Public health must operate at large scale, addressing the needs of large populations across clinical, behavior, and structural platforms, and necessarily entails crucial operational issues, variability, and complexity as well as consideration of resource requirements and sustainability."
- "[S]ince no single intervention will be sufficient, the fundamental challenge is **maximizing the collective effectiveness of the optimal set of interventions**. That gives rise to a higher level of complex questions: What is the best set of interventions for particular settings? How should the interventions be organized and delivered within existing systems? What will it take to execute them on an ongoing, sustainable basis? With what effort and cost? What strategies are needed to best reach those most in need?"

Shelton, J.D., *Glob Health Sci Pract* 2014; 2: 253-258.

What is the 'gold standard' in public health?

"Does it work is always affected by context. The [clinical medicine] paradigm... asserts that one strength of randomized trials is to answer definitively. Does it work? But for the kinds of complex programs public health must muster, there is generally no absolute answer to that question or to its companion question, 'How well does it work? Rather, the answer must depend on how and in what situation it is done."

"How it might be made to work practicably at scale is the key question for public health."

"While I really do appreciate randomized studies, perhaps my biggest concern is the 'hierarchy' whereby some colleagues place controlled trials at the top of a pyramid as manifestly the best evidence. For understanding public health programming, I see that as quite misguided. Randomized studies help us to understand some things, but they are only one piece of the picture in 'triangulating' evidence for programming. And evidence from real-world programming is especially key."

"Thus, to answer the questions well of what, how, and why an intervention may have worked, we need lots of methodologies. Ultimately, some of the 'best evidence' or gold standard comes from programs already operating successfully at scale. For public health programming, there is no absolute methodological hierarchy. We need to respect and use all legitimate methodologies."

Dr James D. Shelton,
Editor-in-Chief,
Global Health: Science and Practice.

Shelton, J.D., *Glob Health Sci Pract* 2014; 3: 141-143.

Primary prevention is essential to control HIV and STI transmission in the MSM population

"At present, the priority given to prevention at national and local levels is woefully inadequate. This is demonstrated by the disparity in spending between HIV treatment and prevention. **£2.9m** will be spent on national prevention programmes in 2011/12. This spending has been static since 2009/10, and is less than half a percent of the **£762m** spent on treatment and care in England in that year."

"This failure to invest persists despite evidence of the savings that prevention work could yield. The Health Protection Agency indicated that each infection prevented would save between £280,000 and £360,000 in direct lifetime treatment costs. This means that if the estimated 3,000 UK-acquired HIV cases diagnosed in 2010 had been prevented, more than **£1.2bn** in lifetime costs, would have been avoided."

Lord Norman Fowler, House of Lords,
Select Committee on HIV and AIDS in the United Kingdom:
"No vaccine, no cure: HIV and AIDS in the United Kingdom."
Official Report, HL Paper 188, pp 1-145, September 2011.

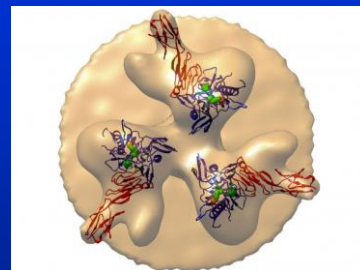
Drug-resistant HIV pandemic is a 'real possibility'



Cooper, C. *The Independent*, 22 May 2014.

- "A new HIV pandemic is 'a real possibility', one of the world's leading authorities on infectious disease has said, warning that a rise of drug resistant strains of the virus could 'reverse progress made since the 1980s' in combating the disease."
- "Professor Jeremy Farrar said that 'the spectre of drug-resistant HIV' threatened to have 'a huge impact' in the next 20 years, if drugs which have made vast improvements to the life expectancy of patients since the 1990s become less effective."
- "While hailing the 'incredible' progress made since the 1980s in treating HIV, Professor Farrar said that resistance to first resort drugs, and also [to] some second and third resort drugs had already occurred, and that drug options for the virus were not 'limitless'."
- "It is not unreasonable that a HIV pandemic could return", he said. "The possibility of a resistancy-driven HIV pandemic is quite real."

Stopping HIV with an artificial protein



Adapted from Michael Parzon et al., *Nature* (2013).

Collier, Jan. "Stopping HIV with an artificial protein." 18 February 2015. *Sciencemag.org*.
Gardner, M.A. et al. "A HIV-inactivating CD4-glycoprotein as a vaccine protection from multiple SHIV challenges." *Nature* 519, 87-91. (05 March 2015) doi:10.1038/nature14264.

Halgren, N.L. "HIV: Tied down by its own receptor." *Nature* 519, 36-37 (05 March 2015) doi:10.1038/nature14205.