Gender-related effects of expanded adult male circumcision programs in Southern Africa: The impact of power dynamics and potential risk compensation on heterosexual HIV transmission

Kyeen M. Andersson, MD, PhD

Post-Doctoral Fellow

Division of Health Policy & Administration, Yale School of Public Health

Co-Authors: Douglas K. Owens, MD & A. David Paltiel, PhD

Background: Male circumcision is being added to comprehensive HIV prevention programs

- Current HIV prevention is not enough
  - » ~7,400 new infections/day UNAIDS 2008
  - » Preventive vaccines & microbicides not yet available
- Adult male circumcision: an effective 'vaccine' available now
  - » Affordable, safe, acceptable Lagarde et al 2003, Scott et al 2005, Quinn et al 2006
  - » Three randomized controlled trials in Africa showed circumcision reduced female-to-male (FTM) HIV transmission by ~60% Auvert et al 2005, Bailey et al 2007, Gray et al 2007
- Urgent need for research to inform decisions regarding implementation of circumcision programs

Potential complications to circumcision scale-up: gender-specific protection, risk behavior, & power

- Potential for risk behavior to increase ('risk compensation', 'behavioral disinhibition') threatens program success
- Male circumcision is a gender-specific intervention
  - » Circumcised men receive direct protection, women do not
  - » Circumcised men may feel 'protected' and increase their risky behaviors
- Power to negotiate safe sex is also gender-specific in African settings
  - » Women have less power to negotiate condom use with their partners Pettifor et al 2004, Ackermann et al 2002, Simbayi et al 1999
- Potential impact on women is unknown

HIV transmission models & the impact of prevention programs

- Mathematical model to simulate course of HIV epidemic
- Useful when historical precedents lacking: circumcision programs never used before…
- Important for national prevention program policy-making, particularly for countries with limited resources
- Allow sensitivity analysis on important parameters: help to answer ‘what if’ questions

Study questions

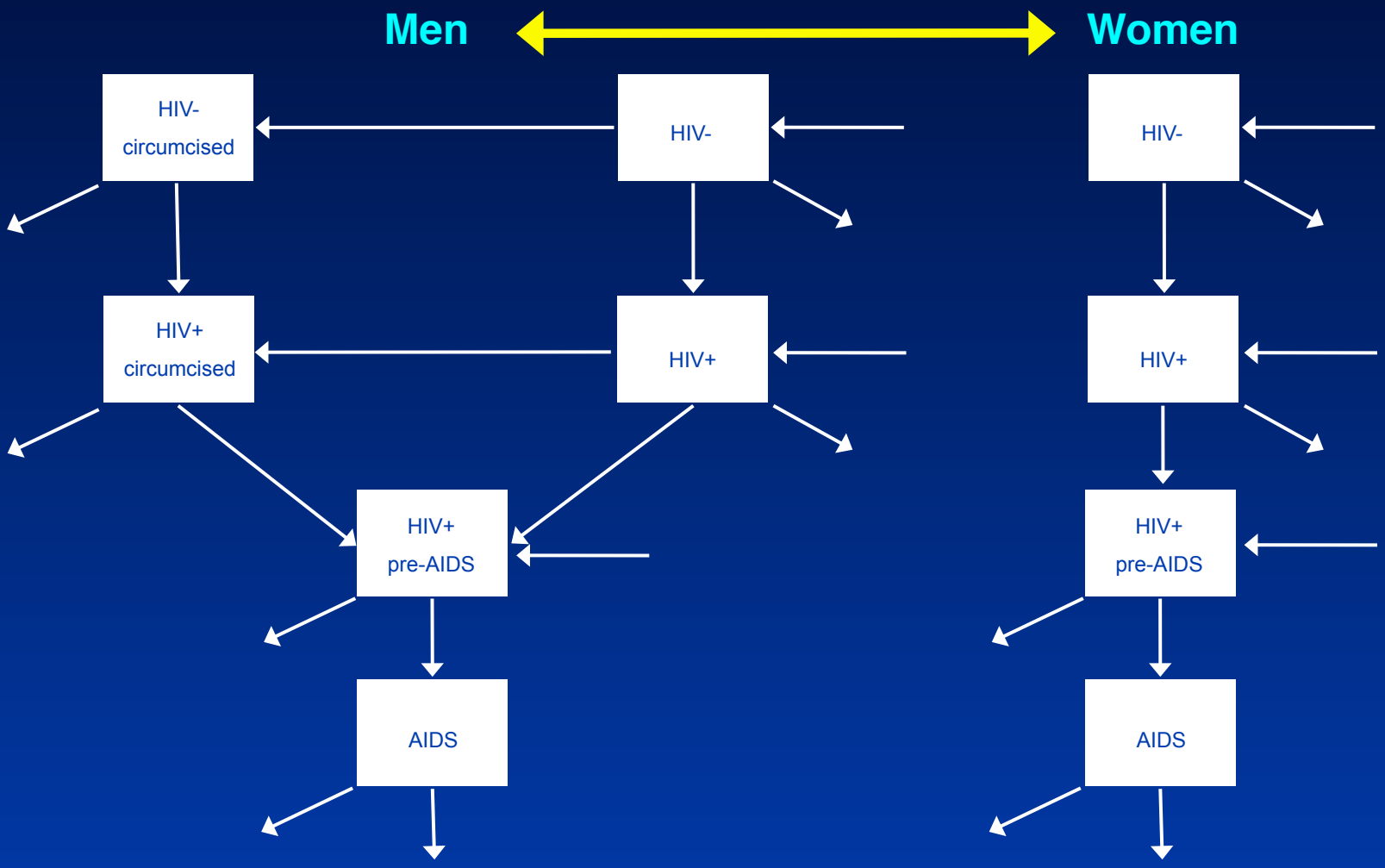
- What impact would a modest circumcision program have on a developing country epidemic?
  - » 5 year program, 20 year horizon, varying coverage goals
- How might changes in risk behavior influence these outcomes?
  - » Changes in post-circumcision condom use
- What are the population benefits of a protective intervention for men in settings where women have less power to negotiate safe sex?
  - » Gender-based power to negotiate condom use

Soweto, South Africa: population 1.1 million

Methods: Modeling circumcision program impact on the HIV epidemic in Soweto

- Epidemic model for heterosexual HIV transmission in African settings
- Incorporate gender differences in negotiation of condom use
- Incorporate effects of implementing expanded adult male circumcision prevention programs
- Modest program coverage targeting additional 10-20% of *uncircumcised* males each year for 5 years
- Examine changes in post-intervention condom use for circumcised males
- Simulate program outcomes over 20-year period to predict the number of infections prevented and changes in HIV prevalence

Modeling the impact of male circumcision on heterosexual transmission

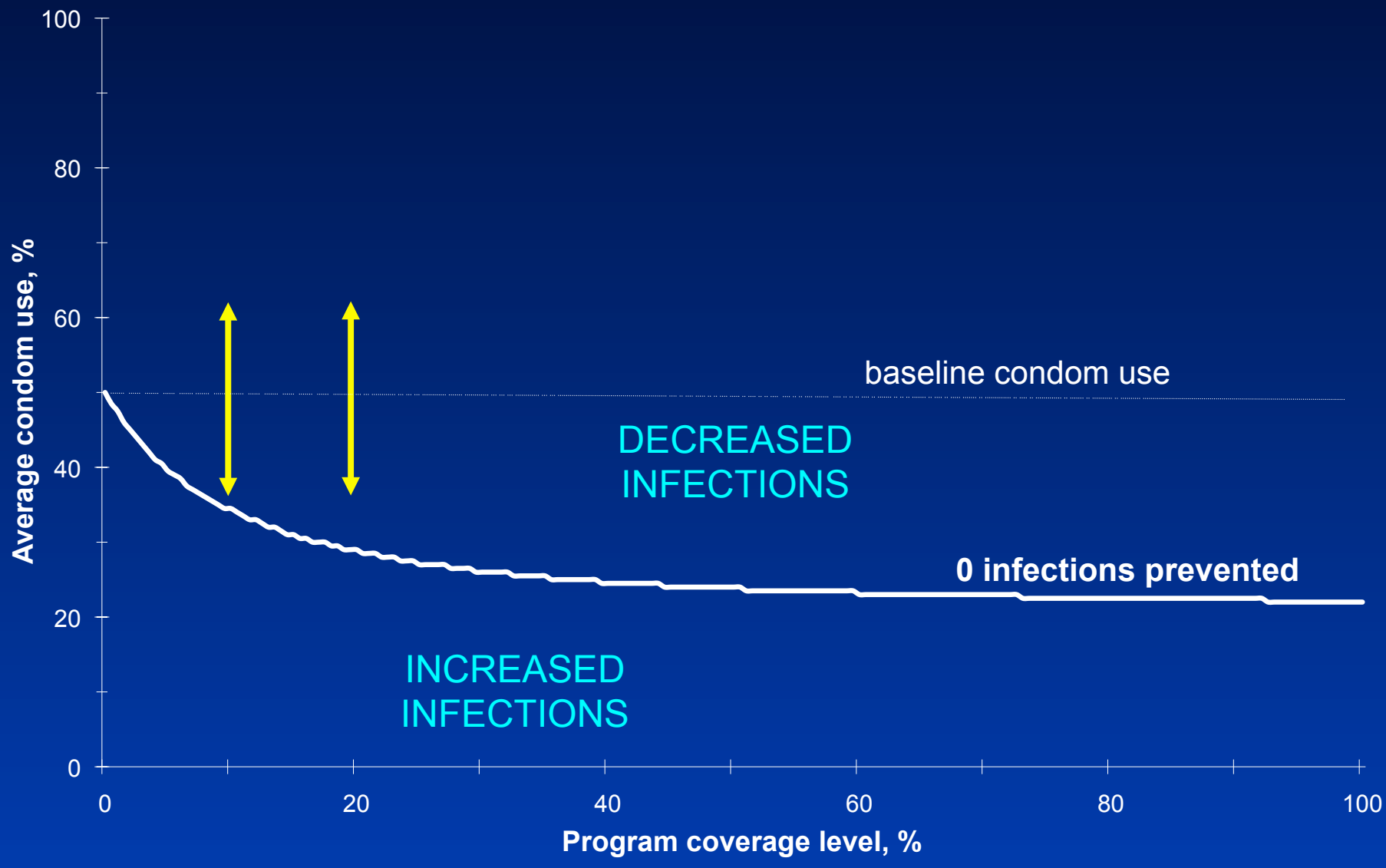


Each box represents the number of men or women in a particular state at a particular time, such as the number who are HIV positive or negative, and for men, circumcised or uncircumcised.

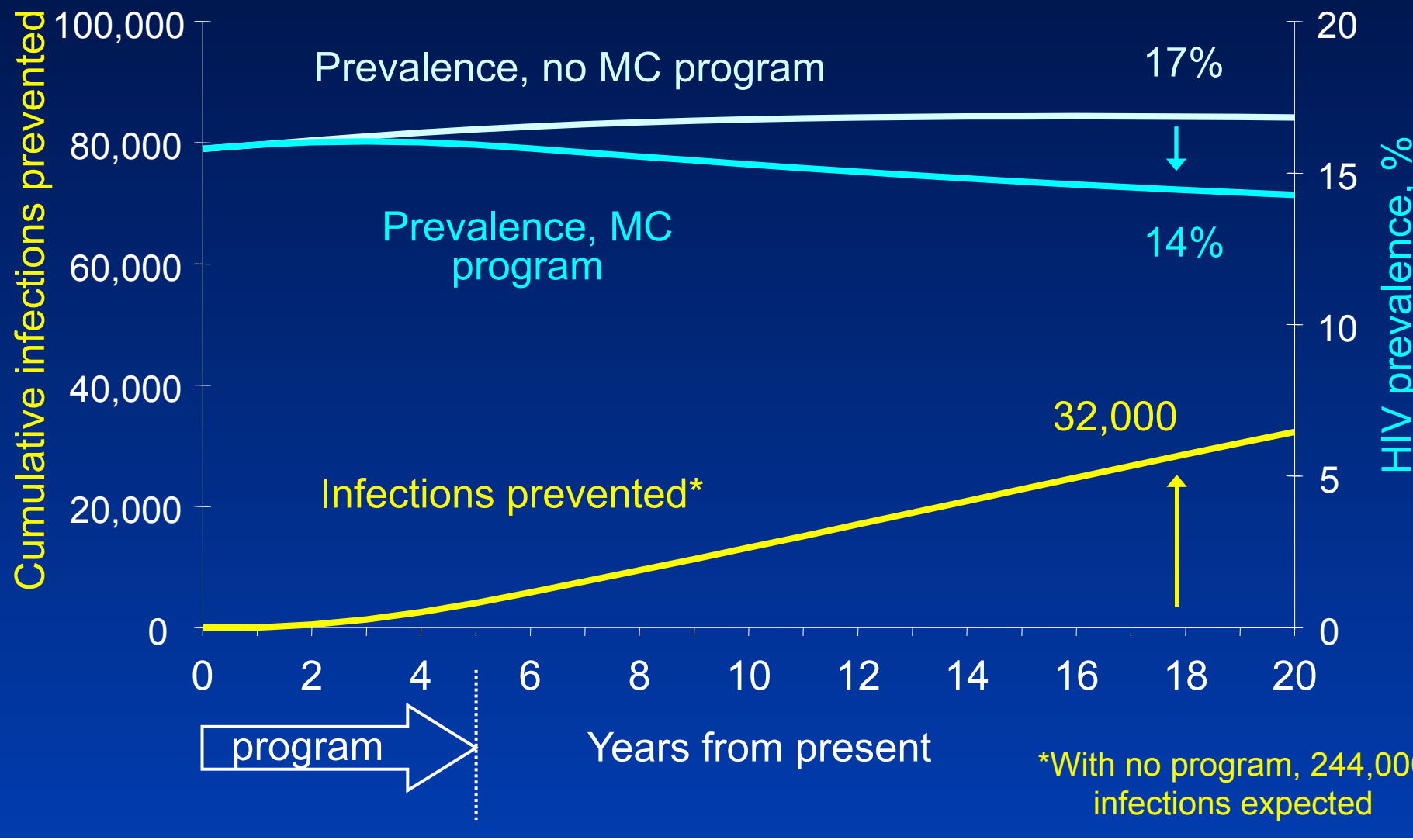
Selected Soweto model inputs and assumptions

- Initial sexually active, anti-retroviral naïve population: 823,000 Statistics South Africa 2004 & assumption, based on WHO/UNAIDS report 2006
- Initial HIV prevalence: 12% (males), 20% (females) Shisana et al 2005
- Varying disease progression & infectivity values from Ugandan data Quinn et al 2000, Gray et al 2001, Morgan et al 2002, Gray et al 2003, Wawer et al 2005
- Circumcision decreases FTM transmission by 61% Auvert et al 2005
- Circumcision levels of 35%, with campaigns covering an additional % of uncircumcised adult males each year Shisana et al 2002, Pettifor et al 2005
- Baseline probability of condom use, 50% Simbayi et al 2004, Pettifor et al 2004, Pettifor et al 2005, Shisana et al 2005, Andersson et al 2009
- Male-negotiated condom use in heterosexual partnerships & gender differences in post-circumcision risk compensation Assumption, based on Simbayi et al 1999, Pettifor et al 2004, Ackermann et al 2002
- Number of sexual partners per year, 0-3 depending on disease stage Simbayi et al 1999, Andersson et al 2009, and assumptions

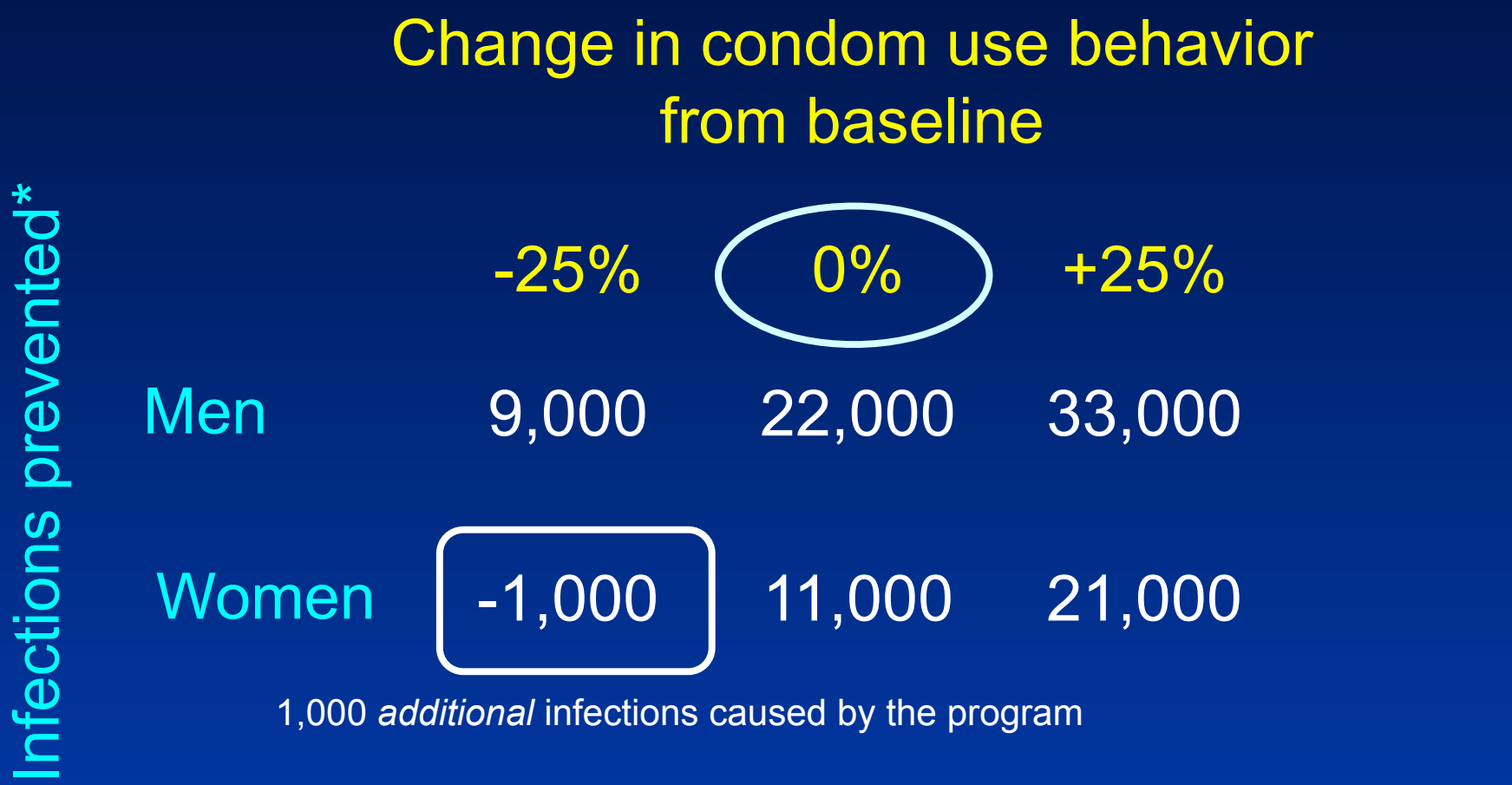
Results: Equivalent combinations of program coverage level and risk behavior change



Impact of a 5-year expanded circumcision program targeting additional 10% males/year

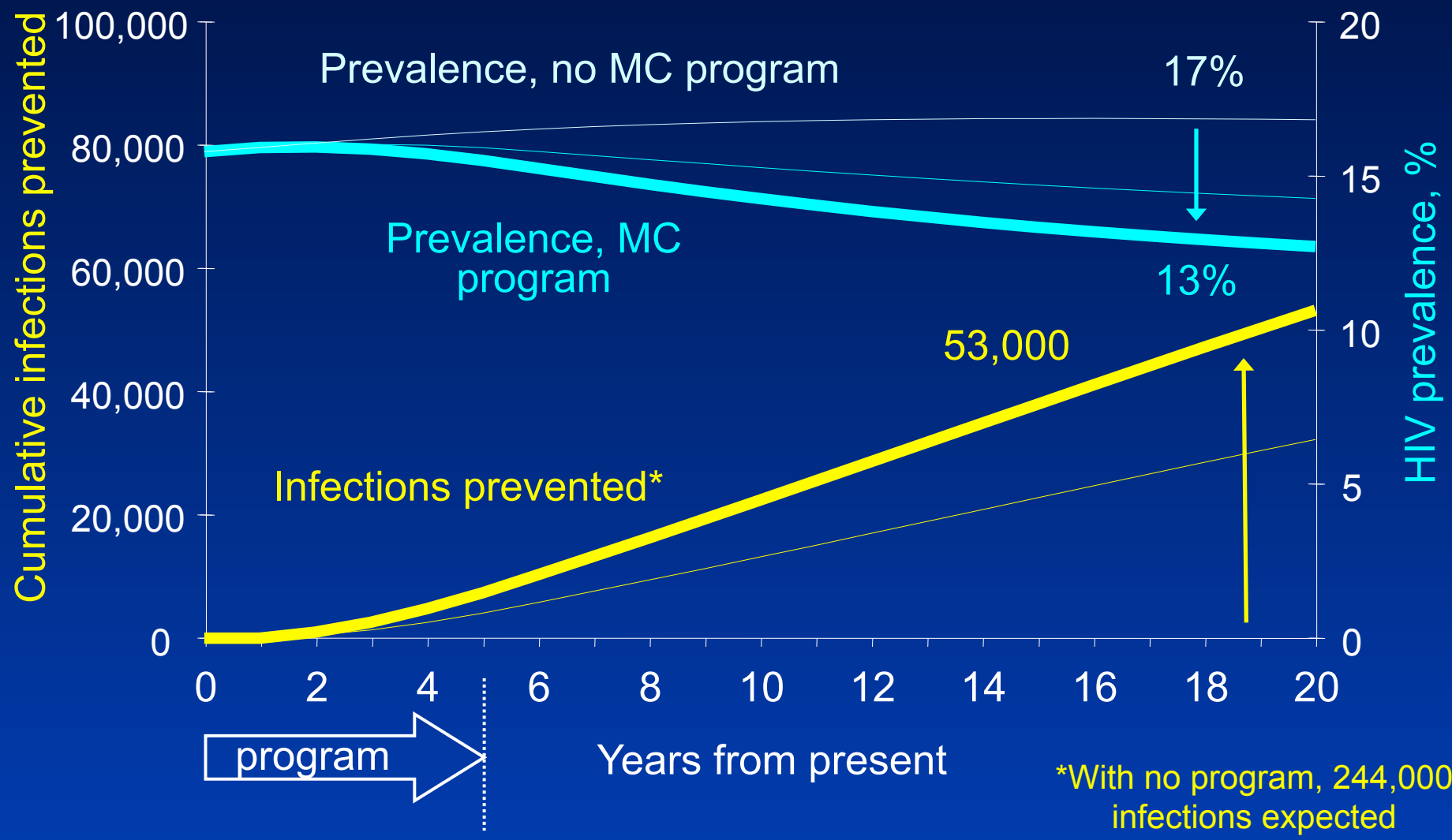


Infections prevented by gender for 5-year, 10% coverage program with changes in risk behavior



*With no program, 142,000 male & 102,000 female infections expected

Impact of a 5-year expanded circumcision program targeting additional 20% males/year



Infections prevented by gender for 5-year, 20% coverage program with changes in risk behavior

Change in condom use behavior from baseline

Infections prevented*

	-25%	0%	+25%
Men	20,000	36,000	49,000
Women	4,000	18,000	30,000

4,000 *net* infections prevented, but infections in women are *increased* for several years of the program

*With no program, 142,000 male & 102,000 female infections expected

Conclusions

- Modest, short-term programs offering male circumcision in Southern Africa may confer substantial health benefits to men and, indirectly, to women in terms of HIV infections prevented
- However, changes in sexual risk behaviors could greatly impact program outcomes and the consequences may be more severe for women
- Women do not receive direct protection from male circumcision and they are more vulnerable to risk compensation in men
- This effect is magnified in societies where women have a decreased ability to negotiate safe sex
- Substantial risk-reduction education needed in programs to expand male circumcision, which should be gender-specific and targeted to both men and women
- Female-controlled methods for HIV prevention are urgently needed

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