

Determinants of microbicide impact: model predictions from an African setting

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Introduction

The impact on HIV transmission of a microbicide will vary:

- Between different epidemiological settings;
 - Among populations with different levels of sexual activity;
 - Between groups with different underlying patterns of condom use;
- Mathematical modelling with context specific data, can be used to explore how impact varies with patterns of microbicide distribution, uptake and use

Study aims

- Estimate the potential impact of an efficacious microbicide used in Cotonou, Benin (W.Africa)
- Identify how impact varies for:
 - Different levels of microbicide HIV and STI efficacy;
 - Different levels of microbicide coverage and patterns of use;
 - Different initial levels of HIV infection.

Steps in analysis

- Compilation of existing epidemiological, behavioural and intervention specific data (4 city study AIDS Suppl. 2001, Alary et al AIDS 2000, 2002)
- Development of dynamic population model
- Fitting of model to HIV and STI prevalence data (FSW, clients and general population)
- Estimated impact on HIV transmission over two years of:
 - different hypothetical scenarios of microbicide coverage and use

Summary of sexual behaviour: Cotonou, Benin - West Africa (1998)

- Sexually active population is 310,000
- Nearly all men circumcised (~100%)
- Average number of sexual partners per year in males and females ~1.7
- 35% males report > 1 partner in past month
- Approximately 1% women of reproductive age are sex workers, and
- 12% men report buying sex in past month
- Average number clients per sex worker 13 per week
- Average number of sex workers per client 2-3 per month

Distribution of reported condom use (1998)

- Within **regular** partnerships:
 - 4.1% report frequent condom use
- Casual** partnerships:
 - 50% report not using condoms
- Commercial** sex partnerships:
 - 56% clients report using condoms in last sex act
 - Consistency of use:
 - 'Always' 39%
 - 'Sometimes / often' 35%
 - 'Never' 26%

Ongoing intervention activity and estimates of coverage

SIDA2 STD clinic, Cotonou, established 1993

- Dedicated clinic for sex workers, providing free STD screening & treatment (reach ~50% FSW)
- Outreach to FSW (enhanced 1998) & Clients (started 2000) – prevention activities and promotion of condom use

General population

- STD treatment through public clinics
- 46% females report using services if have STD

HIV/STI infection (98/99)

HIV prevalence:

- Sex workers 41%
- Clients 9%
- General population ~3% (males and females)

STI prevalence:

- Gonorrhea: 21% (SW), 5% (Clients), 1% (general population)
- Chlamydia: 3.5% (SW), 2.7% (Clients), 2% (general population)

Key features of model

- Deterministic dynamic model of HIV transmission and two other STI
- Describes the patterns of sexual behaviour in Cotonou
- Compartmental model - population is divided into 8 male and female sub-groups according to patterns of sexual behaviour and condom use
- Incorporates population mobility and HIV morbidity and death
- Includes role of high viraemia and STI infection in facilitating HIV transmission
- Includes female sex work and concurrent partnerships

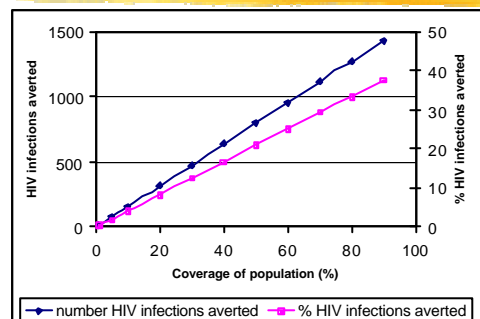
Microbicide inputs for baseline estimates of impact

- Microbicide efficacy:
 - 50% HIV & 50% gonorrhea and chlamydia
- 20% women have access to microbicides (both SWs and other women)
- Microbicide used 50% of time when condom is not used
- 10% migration from the condom
- For Analysis, assume condoms are 85% HIV/STI efficacious

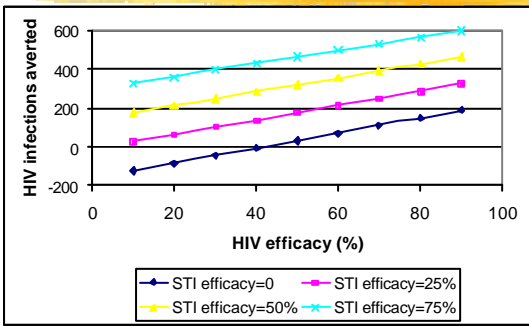
Baseline microbicide impact estimates

- Reduce SW HIV prevalence from 41% to 39% in 2 years, and
- Reduce HIV prevalence in other risk groups by less than 1%
- Averts 319 HIV infections in whole population in 2 years (8.4% of HIV infections that would occur otherwise)
- Greatest percentage of infections averted is in males 9.7%

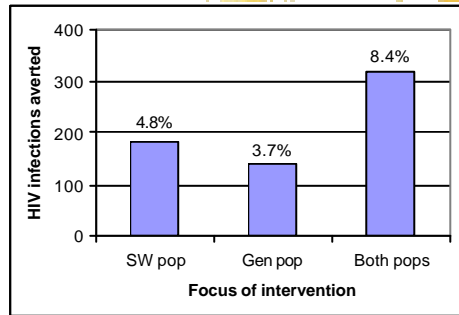
Impact of increasing microbicide coverage



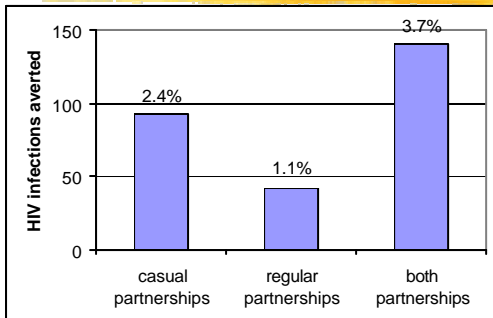
Impact by microbicide HIV and STI efficacy



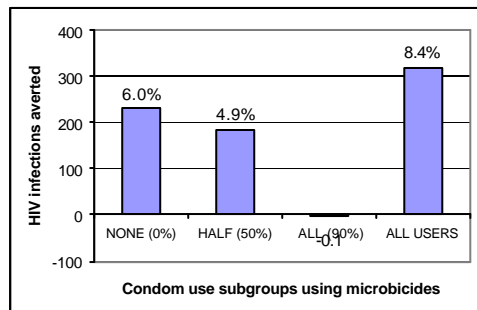
Impact of focusing microbicide distribution to FSWs or general population



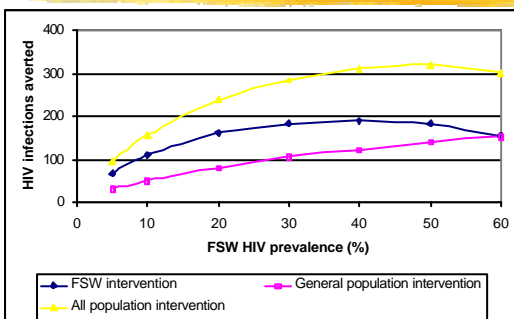
Impact by patterns of microbicide use in casual and regular partnerships



Impact by when women with different levels of condom consistency use microbicides



How impact varies with the initial HIV infection



Conclusions

- Findings context specific
- Illustrates how models can be used to look at impact and its determinants
- Highlights benefits to men as well as women
- Increasing gains with increasing HIV/STI efficacy
- Benefits of targeted and general microbicide distribution
- Importance of microbicides

Next steps

- Preliminary, illustrative results
- Explore issue more, as part of EU funded research with International Family Health
- Further analysis will also consider microbicide distribution in other settings (South Africa, Bangladesh)