Projections of Global AIDS Epidemiology

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Issues to consider in projecting the future incidence of HIV, AIDS deaths and treatment need.

- Behaviour change interventions
- Societal changes
- Treatment and transmission
- Strategies for patient management
- Treatment Guidelines – individual versus public health priorities
Projections for aids2031

• Can we predict patterns of HIV incidence across the range of countries? How much could emerging epidemics, changes in risk behaviour and slower growing epidemics influence the spread of infection.

• Tipping points for incidence – changes in behaviour moving us below or above risk of spread.

• Current infections will progress over next 20 years.

• Resistance spread at worst will be on timescale of previous pandemic - how much a concern for now?
The natural course of incidence and prevalence of a local HIV epidemic over time – from epidemic to endemic

\[ R_t = R_0 > 1 \]
\[ R_t < 1 \]
\[ R_t = 1 \]
Impact of interventions depends epidemiological context
Combining interventions can have synergies

Overall 30% reduction transmission effect of circumcision in men (60% for men)

50% reduction in partner numbers

Increased heterogeneity

Increasing contacts, transmission likelihood, duration

Tipping point $R_0=1$
CURRENT PATTERNS OF HIV SPREAD – STABILISING OR DECLINING PREVALENCE

ANALYSIS OF COUNTRIES FOR GLOBAL FUND EVALUATION
GLOBAL PREDICTIONS FOR AIDS2031 – USING FUTURES INSTITUTE MODEL FITTED TO PREVALENCE ESTIMATES IN 2001 AND 2007
Annual new HIV infections (adults 15-49 yrs) 22 countries Representing 85% cases.

Assumes efficacy from Futures Institute Impact Matrix (systematic reviews of efficacy)

Current trend – continue increasing trends in coverage
Expanded response - coverage at 80% by 2015
Annual AIDS deaths (adults 15-49 yrs)

AIDS deaths in adults (15-49 yrs)

- Current trends
- Targeted response
- Expanded response

PREDICTIONS OF THE IMPACT OF TREATMENT AND STRATEGIES FOR CASE FINDING, INITIATION & MANAGEMENT
Modelled decline in CD4+ cells – 5 realisations from 1000

- **Mean**
- **Individual simulation**

CD4 count (number/microlitre) vs. Time since infection
Presentation earlier than suggest, high ANC referral, Initiation based upon symptoms

Impact of ART on survival extrapolated from ART-Link

- No ART
- ART - worst
- ART - middle
- ART - best
- Not HIV infected

Cumulative all-cause deaths per 1000 infected

Time since infection
Model of scaled up ARV and VCT in Zimbabwe – prevention of infections dramatically reduces treatment need for 2030 (Hallett et al 2008)
Future treatment need in Zimbabwe:

Universal access ‡ 110,000 on treatment in 2010; 670,000 in 2030
IMPACT OF TREATMENT GUIDELINES ON PEOPLE IN NEED AND EARLY INITIATION ON TRANSMISSION
Impact of treatment guidelines and treating earlier

Progression Patterns

Eligibility at CD4 < 200

- Infection to Eligibility: 8.2
- Eligibility to AIDS Death: 1.5
- Infection to AIDS Death: 10.5

Eligibility at CD4 < 350

- Infection to Eligibility: 1.7
- Eligibility to AIDS Death: 7.9
- Infection to AIDS Death: 10.5
Impact of treatment on incidence – earlier treatment

Year

Incidence (/100 pyar)

No ART
ART at CD4=200
ART at CD4=350
ART at CD4=500
Timing of treatment to eliminate infection

Early infectiousness and heterogeneity in risk determine whether test and treat can ‘eliminate’ HIV

Relative transmissibility/cumulative infections

Total new infections generated by a case

- 10
- 5
- 2
- 1
- 0.5

Point needed to treat for elimination

Time since infection (years)

$R_0$

10

5

2

1

0.5
Conclusions

• Moving to endemic infection levels
• Treatment need in 2008-2013 driven largely by those currently infected.
• Societal changes can bring down infection levels – but current interventions are inadequate.
• Less intense, complex patient management reduces effects of treatment, but need to weigh individual and public health approaches