Development of the software packages, EPP v2 and Spectrum, and Measuring and tracking the epidemic in countries where HIV is concentrated among populations at high risk of HIV

Report of a meeting of the UNAIDS Reference Group for Estimates, Modelling and Projections held in Sintra, December 8-10th 2004

TECHNICAL REPORT AND RECOMMENDATIONS

UNAIDS

Introduction

The Reference Group
The Joint United Nations Programme on HIV/AIDS (UNAIDS) Reference Group on "Estimates, Modelling and Projections" exists to provide impartial scientific advice to UNAIDS and the World Health Organization (WHO) on global estimates and projections of the prevalence, incidence and impact of HIV/AIDS. The Reference Group acts as an 'open cohort' of epidemiologists, demographers, statisticians, and public health experts. It is able to provide timely advice and also address ongoing concerns through both *ad hoc* and regular meetings. The group is co-ordinated by a secretariat based in the Department of Infectious Disease Epidemiology, Imperial College London (www.epidem.org).

Aims of meeting
The primary aim of this meeting was to bring together experts to produce recommendations for changes and improvements to be made to the software packages (EPP and Spectrum) used by UNAIDS and national AIDS programmes to produce HIV estimates. This work built on a previous meeting held in Glion in May 2004 supported by WHO and UNAIDS.

Approach
The meeting featured both presentations of recent data and discussions in smaller working groups, which focused on specific technical issues. Presentations included overviews of estimates from across regions of the sizes of groups associated with high exposure and a concomitant high prevalence of HIV, such as injecting drug users, sex workers, clients of sex workers, and men who have sex with men. Other presentations addressed routes of HIV acquisition and mortality rates of HIV-infected people. Summaries of the current developments of EPP v2 and Spectrum were presented.

The meeting was attended by 33 experts from 14 countries (see Appendix II for a list of participants). Each contributed, not only data, insights and analysis, but also worked hard to produce a set of recommendations for UNAIDS and WHO, drafted at the meeting. We would like to thank them for their hard work and attendance at the meeting.

The recommendations drafted at Reference Group meetings give UNAIDS and WHO guidance on how best to produce estimates of HIV/AIDS, an opportunity to review current approaches and also help to identify information needs (earlier reports are published on the Reference Group website www.epidem.org). They are typically drafted with an explicit timeframe for follow-up work that is subsequently reported on by the Reference Group secretariat to ensure a response to all recommendations. This transparent process aims to allow the statistics and reports published by UNAIDS and WHO to be informed by impartial, scientific peer review.

Wednesday 8th December 2004 Working group 1: Improving definitions and estimates of the size of groups at high risk

We need to know where HIV infection is concentrated in the population, and we need to know how common are different risk factors, so that prevention and treatment programmes can be targeted effectively. Knowledge of the sizes of different groups of individuals who are at higher risk of HIV infection is required by different organisations (e.g. programme planners and advocacy groups), who have different requirements. Improving the accuracy of estimates requires improvements in methods and their implementation, whilst tracking changes over time requires consistency in the methods used.

To estimate the number of people living with HIV/AIDS, it is essential that the same definition of each at-risk group is used when assessing the number of people in that group, and the prevalence of HIV within the group. Unfortunately this is often not the case, resulting in unreliable estimates. It is important that HIV prevalence estimates are representative of the groups to which they are applied: often it is the highest-risk individuals who are surveyed, and the prevalence of HIV amongst them applied to the whole group, thus overestimating the total number of HIV infections.

Another important consideration is that overlap between risk-groups (e.g. sex workers who are also injecting drug users) needs to be quantified. One reason is that double-counting can overestimate the number of individuals at risk. Another is that individuals who belong to more than one risk group can be consequently at very high risk of infection, and can also be an important conduit between risk groups, facilitating rapid transmission of HIV.

A major difficulty when planning studies, and when comparing results from different studies, is that definitions of population groups often differ. To some extent, this reflects the particular local social context. Nevertheless, it was agreed that guidelines would be of value in increasing comparability. Those guidelines focus on those aspects of behaviour that are most associated with current risk of HIV acquisition and transmission.

<u>Definitions of the population groups of interest</u>
Injecting drug users (IDU)
For purposes of planning and evaluating HIV control interventions, the number of *injecting* drug users who are *currently* active is of most interest. Often, surveys count both non-injecting drug users and injecting drug users together, and often count former drug users and current drug users together. However, non-injecting drug users are at much lower risk of HIV infection. Former injecting drug users are also of less interest, because they do not represent increased HIV transmission risk, although their risk of having acquired HIV will be increased. However, in some settings, surveillance systems which use population-based surveys collect data on all drug users, but as long as the same criteria are used for estimation of the size of the at-risk group, and the prevalence of HIV in that group, then that does not undermine estimates of the number of HIV-positive people, although it provides a poor representation of current HIV risk.

Men who have sex with men (MSM)
This is the most difficult group to estimate. From the point of view of HIV transmission, it is the behaviour patterns that are of interest, rather than the individuals' sense of group identity. Rather than seeking to estimate the total number of men who have anal sex with other men (and the HIV prevalence amongst that group), it is recommended to focus on estimating the number of MSM who have multiple sex partners, particularly those who "cruise" to obtain many partners in high-risk settings, either in physical locations or using the internet. Surveys need to target those high-risk settings.

Commercial sex workers
The nature of sex work varies greatly across the globe and in some settings it can be difficult to achieve a definition of a sex worker as distinct from a member of the general population. With this in mind, it was recommended that the definition be used in countries with concentrated epidemics such as Asia, Europe and South America, where sex work can be more readily defined. There need to be separate definitions for different types of sex worker.

- *Female* sex workers need to be divided into *direct* sex workers, who may be brothel-based or street-based, and *indirect* sex workers, who have other sources of income that allow them to also sell sex (e.g. in massage parlours or karaoke bars, or who are beer promotion girls). Note that there may be different, region-specific definitions of "direct" and "indirect": e.g. in Thailand, direct sex workers are brothel-based and indirect ones are street-based.
- *Male* sex workers need to be considered as a separate group from men who have sex with men (MSM), although there may be men who have both commercial and non-commercial sex with other men. Male sex workers may have more-risky behaviour than men who have only non-commercial sex with other men. In addition, male sex workers may also have female sexual partners, and thus provide a 'bridge' to the heterosexual population. Unlike female sex workers, there is no direct/indirect distinction for male sex workers.
- *Third-gender* sex workers are another distinct group, which needs to be considered in countries where it is relevant, which is predominantly in South Asia (India, Pakistan, Bangladesh) and Indonesia.

Clients of sex workers
It is usually only feasible to study clients of female sex workers, although where possible it is desirable also to make estimates for clients of male sex workers and third gender sex workers. The prevalence of clients can be estimated by estimating (i) the average number of transactions an individual sex worker has per week or per month; and (ii) the average number of visits that a client makes to any sex worker. The total number of transactions as reported by sex workers should equal the total number of transactions as reported by clients.

<u>Future research</u>
Key areas for future research into risk groups were identified as:

- Studies examining ways to find multipliers for other ways of cruising (internet, phone etc.) and validation studies to examine the extent to which these methods produce good estimates.
- Better surveillance for MSM populations and HIV prevalence.
- The HIV-infection risks of partners of members of high-risk groups.
- Clients of high class sex workers (indirect sex workers).

Incorporation of questions relating to risk behaviours (such as sex-worker usage) into general population surveys (e.g. DHS) was recommended.

Wednesday 8th December 2004 Working group 2: Recommendations related to prevalence of risk groups in different regions

This working group was charged with making recommendations of valid ranges of the prevalence of different HIV risk groups by geographical region, to be used in auditing HIV prevalence estimates produced by software. Hence, the appropriateness of currently-available estimates and inter-country comparisons were reviewed.

Countries within regions often share similarities, and it may be useful to compare results from one country with those from other countries in the region, to assess their plausibility. However, it is important to be aware that there can be important differences between countries in a region (e.g. Brazil and Argentina differ in important ways from Central American countries), and so comparisons have to be made intelligently.

When comparing results, it is important to know what were the definitions of the groups sampled: e.g. the number of individuals who have ever injected drugs will be much higher than the number of current injecting drug users.

As mentioned above, when calculating the number of people living with HIV/AIDS, it is important to be cautious when applying local data on HIV prevalence to a national scale. This is because they may not be representative. In particular, local data are often collected from locations associated with the highest risk, sometimes because they are collected from major cities and sometimes because studies are targeted at locations that are believed to be highest risk. This means that applying local data on HIV prevalence in a risk group to the total number of individuals estimated to be in that risk group in the whole country can greatly overestimate the number of HIV cases. It is important that estimates of the prevalence of individuals in a risk-group and the prevalence of HIV within that risk group come from similar locations – and, ideally, the same locations.

Recommendations for specific risk groups follow. A critical recommendation that applies to all groups is that it is essential to survey the current behaviour of individuals, not whether they have exhibited the particular risk behaviour at some point in their past.

Injecting drug users (IDU)
It is the number of *current* IDU that is important, rather than the number of people who have ever injected drugs. Regional averages of the prevalence of current IDU should be used for comparison to country-specific estimates. Data that are used for regional estimates should be made available to others; ideally they should be published in peer-reviewed journals and cited. Many currently published estimates do not appear to have a foundation in country-specific data. The prevalence of IDU varies widely in response to a number of factors, some of which can change rapidly – such as the state of the economy, and the availability and cost of particular drugs – and some of which change more slowly – such as cultural and historical patterns.

Men who have sex with men (MSM)
It is particularly important the estimate the prevalence of currently active MSM, rather than those who have ever had sex with men, e.g. a recent study found that 20% of men reported ever having had sex with men, whilst only 3% had done so recently.

For the regions, Asia, Latin America & Caribbean, and Europe, the prevalence of currently-active MSM with HIV risk behaviour is likely to be in the range 2%-5%, with a typical point estimate of 3%. These may also be reasonable estimates for the Middle East & North Africa region, but this is much less certain. For sub-Saharan Africa the prevalence is not known.

In regions where third gender persons are found, it is important to note that they are often not considered to be men, and so survey participants need to be asked separately if they have had sex with third gender individuals.

HIV prevalence in MSM is most often measured among the most sexually active members of the MSM population. Applying these estimates to the total MSM population results in an overestimate of the number of HIV cases.

Female sex workers (FSW)
Patterns of sex work are varied within and between regions, and estimates of the prevalence of FSW depend greatly upon the definition used. Most estimates of the prevalence of FSW do not distinguish between direct and indirect sex workers, whose HIV risk may be very different. Also they often omit sex workers from rural areas. The typical prevalence range for FSW is 0.3%-1.5% of adult women in all regions except sub-Saharan Africa, where the typical range is 0.5%-3.5%, with direct sex work being relatively less common than elsewhere.

Clients of female sex workers
If a country has survey data on the proportion of men who are clients of FSW, then that estimate can be used as a lower bound. If there are data on sex workers, then these can be used to calculate the number of clients, based upon the size of the FSW population, and the number of transactions.

Where these data are lacking, data on the number of men with a current or recent STI can be used as a proxy. Although this will be an overestimate, it is not clear by how much.

Typical prevalence ranges for clients of FSW are 2%-5% of men for Western Europe, Eastern Europe, and Central Asia; and 5%-10% for other parts of Asia and for Latin America and Caribbean. There are no good data for Middle East and North Africa, but a range of 2%-5% is recommended. For sub-Saharan Africa, typical ranges are 4%-10% in the western region, 8%-15% in the central region, and 2%-10% in the southern region; note that the definition used for the western and central regions is more expensive than the definition used for the southern region.

Wednesday 8th December 2004 Working group 3: Generating / improving estimates by modes of transmission and age

1. How to estimate HIV prevalence and incidence by mode of transmission?

There are two considerations: firstly, the quantification of HIV infection acquire through different routes, and, secondly, the identification of risk of exposure rather than risk group *per se*.

Estimation of the HIV incidence and prevalence by mode of transmission (MoT) should be covered in training workshops, and provides an important link to prevention planning. It is appropriate to both concentrated and generalized epidemics, but there need to be guidelines (regional averages) for countries on behavioural data. For some risk groups (e.g. IDU), reviews have been conducted, but for others this work still needs to be done.

To estimate the prevalence of infection by different modes of transmission, it was recommended to use the output from EPP.

Estimation of incidence by mode of transmission can be done with EPP, but these estimates are sensitive to the estimated time spent in risk groups, and provide little information relevant to planning interventions. It is preferable to use the standard incidence model, of the form $I = S*[1-(1-p*q)^n]$ where I is incidence, S is the proportion of the population at risk of infection, p is the probability of transmission per exposure-to-infection event, q is the prevalence of infection, and n is the typical number of potential exposure events per year.

To use this incidence model, a range of data are required, which differ according to the route of transmission, examples of which are listed below.

Sexual transmission (heterosexual, MSM, sex work)
- Number of partners in last year
- Condom use
- STI prevalence
- Prevalence of male circumcision
- Number of commercial sex transactions in last year

Injecting drug users (IDU)
- No. people with whom needles shared in last year
- Number of needles shared "per partnership"

Nosocomial (hospital-acquired)
- Transfusion
- Needle-stick injury

Mother-to-child transmission (MTCT)
- Net fertility rate of women by age.
- Exposure to PMTCT interventions.

2. Estimation of HIV prevalence by age

The default age-distribution of HIV infections used in Spectrum is applicable to generalized epidemics, and is not appropriate for concentrated epidemics, in which individuals tend to be younger than currently indicated by Spectrum. A discussion of the use and estimation of HIV age-distribution (particularly in young people) should be included in estimation workshops.

Country-specific age-distributions of HIV cases (summed over all modes of transmission) can be derived from HIV/AIDS case reports, VCT, blood donor data, etc. However, research needs to address whether these data sources provide unbiased estimators of age distribution. It may be informative to compare the overall age distribution of HIV cases with the age distributions for specific risk groups estimated form sentinel surveillance.

3. Dealing with uncertainty in estimates

Calculation of plausibility bounds for mode-of-transmission estimates is relatively straightforward, requiring a range of input values for resampling. Calculation of plausibility bounds for age-distribution estimates is much more challenging, and further work is required.

4. Future research

Research needs to address whether these data sources such as HIV/AIDS case reports, VCT, and blood donor data provide unbiased estimators of age distribution. It may be informative to compare the overall age distribution of HIV cases with the age distributions for specific risk groups estimated form sentinel surveillance.

Calculation of plausibility bounds for age-distribution estimates requires further work.

Friday 10th December 2004 Working group 1: Development of EPP v2

EPP v2 is close to completion, with the addition of major changes including the implementation of a likelihood-based fitting algorithm that will allow poor fits to be highlighted, and the option of allowing different sites to have different prevalence level parameters that are automatically estimated as part of the epidemic curve fit. This meeting proposed further refinements to be implemented in the short and medium terms.

Note that only prevalence should be estimated, not incidence, due to the sensitivity of incidence estimates to assumed rates of turnover in high-risk groups. Furthermore, projections should only be short-term, i.e. five years. It is not recommended that EPP v2 be used for projections beyond five years, especially as ART is being introduced widely.

1. Changes to be made to EPP v2 within the next month

High risk groups
The "STI" group should be removed, as it serves to increase confusion in some settings, such as where the prevalence of individuals reporting an STI in the recent past is used as a proxy for the prevalence of clients of sex workers.

It may be desirable to allow the proportion of the total population that is in each high-risk group to change over time. If a simple scheme can be devised then it could be implemented rapidly.

Additional non-AIDS mortality may be experienced by high-risk groups, compared with the general population. This is most clearly the case for injecting drug users, and for that group it was recommended that the user be allowed to specify an increased non-AIDS mortality rate.

Mortality rates of injecting drug users (IDU)
Injecting drug users may experience a higher rate of non-AIDS mortality than the general population (e.g. due to overdose), and this should be incorporated into EPP. (It was not recommended to include this feature for any other high-risk group.)

It was recommended that the extra non-AIDS mortality be implemented additively, i.e. the per-capita mortality rate of the risk-group be of the form (a+b) where a is the mortality rate of the general population and b is the additional mortality attributable to being an IDU. This means that there are clearly separable components. The intention is to avoid users specifying excessively high total mortality rates, as may occur if the additional mortality were specified multiplicatively and a multiplier derived from the specific mortality ratio (SMR) were used. This would be particularly likely if the SMR used came from a study of a group of IDU from a country with a low 'background' mortality rate in the general population, resulting in a high SMR, which were then applied to a country with a much higher background mortality rate.

Both components of the mortality rate ('background' and IDU-specific additional mortality) can be country-specific. At this stage, the suggested default value of b (the

IDU-specific additional mortality) was 1% per year. Regional estimates are a subject for future research.

Output of incidence

Incidence and prevalence should be presented on separate axes, with the units clearly defined: i.e. prevalence is % (of total population); incidence is % per unit time (of uninfected population).

The incidence rate should use the uninfected population as the denominator, in keeping with standard use of this rate in epidemiology. It was noted that there is potential for confusion if rapid transmission results in saturation in (e.g.) IDU, with the numerical value of incidence (% per year) transiently exceeding that of prevalence (%), but this can be easily addressed.

Audit checks for concentrated epidemics

Ratios
- A female:male ratio should be added. It should be checked against the female:male ratio for reported AIDS cases.
- The low risk:high risk ratio should be retained.

Regional ranges of risk-group's sizes and HIV prevalence
- Regional ranges should be included in the current version of EPP. The correct region will be automatically selected when the country is chosen, using UNAIDS's definitions of regions.
- Linking of audit checks for population size with those for HIV prevalence is desirable and will happen *de facto* when regional ranges of population size and HIV prevalence are implemented.
- It was suggested that appropriate ranges should be the inter-quartile range.

Generalized epidemics
- Since EPP does not explicitly consider the gender of individuals, the input of HIV prevalence should be modified to remove the gender dimension, and only allow input of urban/rural data.
- The audit check page will be hidden for generalized epidemics.

Concentrated epidemics
- In concentrated epidemics, the general population characteristics page will be hidden.

2. Changes to be made to EPP v2 over the longer term

Incorporation of measured incidence data

For the next few years, the data will be limited, so they should just be used for an audit check. As data become more plentiful, EPP should be developed to use them as an input to be used for fitting. There will need to be a future discussion on how to use incidence data from ANC and other sources.

Incorporation of anti-retroviral therapy (ART)

- Incorporation of ART, to allow for differential survival of those on therapy, requires addition of another model compartment, plus data on the rate at which patients are placed on ART, which will change over time, and data on the mortality rate whilst on ART.
- People on ART also need to be included in prevalence estimation.
- A draft version of EPP v2 incorporating ART is to be completed June/July 2005 for testing.
- It was noted that changing the distribution of HIV+ survival times due to ART will affect the incidence that is calculated from the prevalence, and that this would cause discrepancies between EPP and Spectrum.
- Also it was noted that as ART guidelines change, and more HIV+ people go on to ART sooner, the increase in survival time will be greater.

Incorporation of uncertainty into EPP

The major sources of uncertainty are (i) the sizes of high risk groups and (ii) HIV prevalence within those groups. In the short term, two runs of EPP should be completed: one with low estimates of high-risk group size and HIV prevalence, and the other with high estimates, to produce a range of estimates for concentrated epidemics. This needs to be discussed during the training workshops in March 2005, and guidelines provided. In the longer term, consideration should be given to allowing ranges to be specified as inputs, to automate the process. It was noted elsewhere that calculating ranges using (i) high estimate of risk group size and high estimate of HIV prevalence and (ii) low estimates of risk group size and HIV prevalence results in too-large a range.

Demographic parameters of EPP v2

UN Pop Div estimates and projections are due at the end of February 2005, and need to be used to update EPP v2's parameter set.

3. Future research

Turnover of high risk groups

Since rates of turnover for different high-risk groups – and for the same groups in different settings – vary widely, and may be highly heterogeneous (e.g. for MSM, with some 'experimenting' for a short time) it was recommended that a review be conducted of the average duration of membership in at-risk populations, by region.

A scheme for allowing the prevalence of high-risk groups to change over time in EPP that is simple to use and robust in operation should b devised.

The continuing increased risk of mortality amongst ex-members of high-risk groups (e.g. due to HBV and HCV in IDU) was raised as an issue which needs to be considered with regard to incorporation into EPP.

IDU-associated additional mortality

Further research will be done to provide tables with weighted average rate, including specification of whether the annual additive excess mortality rate differs according to gender.

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Incorporation of measured incidence data into EPP

There will need to be a future discussion on how to use incidence data from ANC and other sources, for when there are sufficient data for them to be used for fitting.

Anti-retroviral therapy (ART)

A future meeting should discuss:

- Survival functions for those on ART: there needs to be an evaluation of existing cohorts to examine the extent to which log-logistic or log-normal functions may be more appropriate than Weibull, which has too-short a tail (i.e. it underestimates survival). Log-logistic and log-normal can represent heterogeneity in survival time due to differential adherence, differences in regimens, etc, due to its non-monotone hazard.

- Effects of ART on transmission: infectiousness will be reduced but will be non-zero; behaviour change by those on ART and by uninfected individuals may occur (as fear of HIV infection is reduced); resistance of HIV to ART (although not modelled explicitly in EPP) will also affect transmission. As an initial approximation, Tim Brown suggested initially halving the value of the r parameter for transmission from those on ART.

Friday 10th December 2004 Working group 2: Development of Spectrum

1. Linking EPP and Spectrum to ensure demography of high risk groups is captured

The concern is that if only prevalence data are supplied to Spectrum by EPP then the incidence calculated by Spectrum will be too low for groups with high turnover/mortality. It was recommended that EPP also output the force of infection and parameters specifying excess mortality (for IDU), turnover rates, and sizes of high-risk groups.

A question for future research to address is the relationship between the estimates of the force of infection produced by EPP and Spectrum.

2. Changes to be made to Spectrum within the next month

DHS data should be fitted for the specified years, with the pattern recalculated pattern nearby years.

The regional table should be restricted to +/- 5 years of base population year (passed by EPP). The range table should be restricted to the years 2003-2005. Updating should be considered later.

Outputs should be restricted to prevent extrapolations too far into the future, in which the population distribution will have changed. This requires Spectrum to 'know' the current year.

PMTCT and ART program coverage should be allowed to be input as numbers or rates, according to the user's preference. Effectiveness should be user-adjustable.

PMTCT and ART program benefits should be expressed in terms of increased life expectancy, not DALYs. This is because prevalence-based DALY (from current year deaths and current year prevalence by stage) is not the WHO DALY standard, which is incidence-based, but it is complicated to estimate ART benefits for an incidence based DALY.

Ranges of HIV prevalence estimates for concentrated epidemics should be specified using a lookup table.

Integration with Workbooks requires a standardized interface, so that estimates from Workbooks can be automatically imported into Spectrum.

New UN Pop Div estimates and projections are due end February 2005; It was proposed to add a button to Spectrum to recalculate projections using these new data.

3. Changes to be made to Spectrum over the longer term

Anti-retroviral therapy (ART)
The impact of ART on HIV epidemiology needs to be incorporated into Spectrum.

Prevention of mother-to-child transmission (PMTCT)
PMTCT to be incorporated.

Data-sets for concentrated epidemics
Working group 1 (EPP) noted that many Spectrum parameters are estimated for generalized epidemics, and hence it performs poorly for concentrated epidemics, e.g. in regard to orphans.

Default adult HIV-positive median survival time
This should be determined by (i) current age and (ii) age at sero-conversion.

Age-prevalence relationship
This is complex, and changes as the epidemic progresses, interacting with a changing sex ratio of infection. This needs more research, for both generalized and concentrated epidemics.

4. Future research

The relationship between the estimates of the force of infection produced by EPP v2 and Spectrum needs to be investigated.

HALE (health adjusted life expectancy) might be a suitable measure for the benefits of ART programs.

Friday 10th December 2004 Working group 3: Use and interpretation of EPP v2 versus workbooks

1. Recommendations for current use

Concentrated epidemics
Workbooks should be used to estimate current prevalence for countries with concentrated epidemics whilst EPP v2 is in development. They should also be used where time-series prevalence data are unavailable. This maintains the focus on the data sources and their uncertainty.

For concentrated epidemics, do not project beyond the last year of data (this means that projections often will not be to the present day).

EPP v2 should be used to examine historical trends, where data are available.

Risk groups that must be included in the Workbook
1. Clients of female sex workers
2. Female sex workers
3. Men who have sex with men
4. Injecting drug users

5. Some representation of less exposed population, either,
    - sexual partners of these high exposure populations, or,
    - lower-risk populations in general.

Where prevalence is unknown for some risk groups
Use data from groups that are believed to have a similar HIV risk, (e.g. STI prevalence data for MSM) and adjust estimates based on your belief about relative risk, if those data are available.
Do not use data from other countries: if there are no data available then no estimate should be made. Where available, intelligent use should be made of country-specific data, regardless of sample size.

Overlapping risk groups
Be aware that measured HIV prevalence among pregnant women is often used for low-risk women. However, high-risk women (female IDU and FSW) also get pregnant and they increase the HIV prevalence estimate that is applied to low-risk women.

Individuals belonging to more than one risk group (e.g. female IDU and FSW) can lead to over-counting. The simplest way to avoid this, and to ensure that inputs into Workbooks are easy to understand, is to specify intersections as separate cells in the Workbook: e.g. (i) IDU, (ii) FSW, (iii) FSW-who-are-also-IDU.

Low-risk groups
If you there are prevalence estimates for low risk groups, then categorize based on those risk groups. If those data are not available, then include specific categories for the sex partners of high-risk groups. This is probably time dependent, so that longer running epidemics will primarily use data from low-risk groups whilst in more recent epidemics, the worksheets should include populations for partners of high risk groups (e.g., MSM, IDU, sex workers).

Ante-natal clinic (ANC) data should not be used as proxy for HIV prevalence among low-risk men. Rather, it should be calculated explicitly, including using data for ex-high-risk men or partners of high-risk women. However, HIV prevalence among low-risk men could be derived from ANC data if there are also data on the ratio of male to female HIV prevalence, to allow adjustment to be made.

For ex-high-risk group members where there are no direct estimates of prevalence, the exit from the high-risk group into the low-risk group should be calculated for the prevalence estimates over time in the high-risk group in the workbook and used in estimates.

Intelligent estimates have to be used: a measured prevalence of zero does not always mean that the high and low bounds of HIV prevalence should be zero for an exposure or risk category.

Projection
Do not use (or promote use) of the projection part of the workbook.

2. Development of Workbooks

The workbook requires a simple curve fitter (gamma, straight line) for the historical curve.

The ranges output by the 2003 Workbook need to be analysed in time for training workshops in Spring 2005.

3. Future research

Plausibility ranges
It was suggested that ranges of numbers of HIV cases calculated using (i) upper estimate of risk group size and upper estimate of HIV prevalence in that group, and (ii) lower estimate of risk group size and lower estimate of HIV prevalence in that group, are too broad, and an alternative approach needs to be investigated.

Appendix I: Meeting Agenda

Wednesday 8th

9:00	***Welcome***	Peter Ghys, Geoff Garnett
Estimating the size of populations at high risk of HIV infection		*Chair: Elisabeth Pisani*
9:10	Review of Prevalence of Injecting drug use: regional estimates (overall and by gender and age groups [15-24 and 25+])	Carmen Aceijas
9:30	Review of Prevalence of Female Sex Workers: regional estimates (overall and by gender and age groups [15-24 and 25+])	Judith Vandepitte
9:50	Review of Prevalence of Patronage of Female Sex Workers: regional estimates (overall and by gender and age groups [15-24 and 25+])	Michel Caraël
10:10	Review of Prevalence of MSM: regional estimates (overall and by gender and age groups [15-24 and 25+])	Carlos Caceres
10:30	*Discussion*	
10:45	*Break*	
Estimating HIV incidence and prevalence by modes of transmission and by age		*Chair: Elisabeth Pisani*
11:15	Estimating HIV transmission due to unsafe injections in Uganda	Richard White
11:35	Estimating HIV transmission due to blood transfusion	Elisabetta Rapiti
11:55	*Discussion*	
12:10	Estimating HIV among Young People in generalized and concentrated epidemics	Neff Walker
12:30	*Discussion*	
13:00	*Lunch*	
14:00	*Working Groups*	
	Group 1: Improving estimates of size of groups at high risk	Rapporteur: Louisa Degenhardt
	Group 2: Regional ranges of prevalence of high risk groups to be used in estimation tools	Rapporteur: Neff Walker
	Group 3: Generating/Improving estimates by modes of transmission	Rapporteur: Nick Grassly
15:30	*Break*	
15:45	***Working Groups continued***	
16:45	**Recommendations from working groups**	*Chair: Geoff Garnett*
17:30	*Close*	

Thursday 9th

	Continued development of tools for producing HIV/AIDS estimates and projections	*Chair: Ian Timaeus*
9:00	Overview of current approaches to estimates and their plausible bounds	Peter Ghys
9:30	May 2004 Reference group recommendations for EPP	Geoff Garnett
9:45	Demo of EPP version 2 and its new features	Tim Brown
10:30	*Break*	
11:00	Demo of EPP version 2 continued	Tim Brown
12.40	Use of Workbooks	Neff Walker
13:00	*Lunch*	
	Complications in countries with concentrated epidemics	*Chair: Peter Way*
14:00	Overlapping of risk behaviours	Elisabeth Pisani
14:20	Non-AIDS mortality among Injecting Drug Users	Louise Degenhardt
14:40	Incidence among ANC in Ethiopia and high risk groups in Cambodia	Wolfgang Hladik
15:00	*Discussion*	
15:30	*Tea/Coffee*	
	Spectrum software and demographic estimates	*Chair: Ian Timæus*
16:00	May 2004 Reference group recommendations for Spectrum	Geoff Garnett
16:20	Spectrum	John Stover
16:40	Net survival from seroconversion to HIV-related death in the absence of antiretroviral treatment: an overview and focus on Kisesa	Ian Timæus
17:00	Net survival from seroconversion to HIV-related death in the absence of antiretroviral treatment: Masaka	Lieve van der Paal
17:20	*Discussion*	
18:00	*Close*	

Friday 9th

	Comparison of empirical estimates of mortality from sibling histories with UNAIDS/WHO projections	Ian Timæus
9:00		
9:20	*Working Groups*	
	Working Group 1: Changes to be made to EPP v. 2 within 1 month and longer term (including plausibility ranges)	Rapporteur: Peter White
	Working Group 2: Changes to be made to Spectrum within 1 month and longer term (including plausibility ranges)	Rapporteur: Dena Schanzer
	Working Group 3: When to use EPP and workbooks for HIV/AIDS estimates? How to interpret results?	Rapporteur: Neff Walker
10:30	*Coffee/Tea*	
11:00	*Working Groups contd*	
13:00	Lunch	
14:00	Recommendations from working groups	*Chair: Geoff Garnett*
16:30	*Tea/Coffee/Departure*	

Appendix II – List of Participants

Carmen Aceijas
Department of Social Science and Medicine
Imperial College London
UK

Tim Brown
East-West Centre, Thai Red Cross Society
Collaboration, Honolulu
USA

Carlos Caceres
Universidad Peruana Cayetano Heredia
Peru

Zhang Dapeng
Division of Epidemiology
Chinese Center for Disease Control and Prevention
27 NanWei Road, Beijing, 100050
China

Louise Degenhardt
University of New South Wales
Australia

Geoffrey Garnett
UNAIDS Epidemiology Reference Group
Secretariat
Department of Infectious Disease Epidemiology
Faculty of Medicine, Imperial College London
Norfolk Place, London, W2 1PG. UK

Nicholas C. Grassly
Royal Society University Research Fellow
Department of Infectious Disease Epidemiology
Faculty of Medicine, Imperial College London
Norfolk Place, London W2 1PG, UK

Wolfgang Hladik
Medical Epidemiologist
Global AIDS Program
Centers for Disease Control and Prevention
Mail Stop E-30, 1600 Clifton Rd
Atlanta, GA 30333, USA

Celia Landmann Szwarcwald
Depto de Informações em Saúde/CICT
Fundação Oswaldo Cruz
Brasil

Rob Lyerla
Strategic Information, UNAIDS
Switzerland

Meade Morgan
Health Scientist
Surveillance & Infrastructure Development Branch
Global AIDS Program
National Center for HIV, STD, and TB Prevention
Centers for Disease Control and Prevention
Mail Stop E-30, 1600 Clifton Rd
Atlanta, GA 30333
USA

Arvind Pandey
ICMR, New Delhi
India

Wiwat Peerapatanapokin
Thailand

Francois Pelletier
UN Population Division
New York
USA

Elisabeth Pisani
Family Health International
Indonesia

Shekhar Reddy
WHO-UNAIDS
India

Dena Schanzer
Modelling and Projection Section
Division of Surveillance and Risk Assessment
Canada

John Stover
Vice President
The Futures Group International
80 Glastonbury Blvd.
Glastonbury CT 06033
USA

Ian Timæus
Centre for Population Studies
London School of Hygiene and Tropical Medicine
UK

Judith Vandepitte
Institute of Tropical Medicine, Antwerp
Belgium

Lieve Van de Paal
MRC Programme on AIDS in Uganda
PO Box 49 Entebbe
Uganda

Neff Walker
UNICEF
New York
USA

Peter O. Way
Chief, International Programs
U.S. Census Bureau
Washington, DC 20233-8860
USA

Peter White
Reference Group Secretariat
Dept Infectious Disease Epidemiology
Imperial College
UK

Richard White
London School of Hygiene and Tropical Medicine
UK

Ping Yan
Chief, Modelling and Projection Section
Centre for Infectious Diseases
Prevention and Control,
Population and Public Health Branch,
Health Canada,
Brooke Claxton Building PL0900-B1
Tunney's Pasture, Ottawa K2A 0K9 Ontario,
Canada

UNAIDS
Michel Carael
France

Peter Ghys
Manager, Epidemic and Impact Monitoring
Strategic Information
Social Mobilization and Information Department
UNAIDS
20 Avenue Appia, 1211 Geneva 27
Switzerland

Eleanor Gouws
Strategic Information, UNAIDS
Switzerland

Karen Stanecki
Senior Adviser on Demographics and Related Data
Strategic Information
Social Mobilization and Information Department
UNAIDS
20 Avenue Appia, 1211 Geneva 27
Switzerland

WHO
Jesus Maria (Txema) Garcia Calleja
Senior Epidemiologist
EC- 2nd Generation Surveillance Project
Department of HIV/AIDS
World Health Organization
20 Avenue Appia, 1211 Geneva 27
Switzerland

Erica Kufa
WHO-AFRO
Zimbabwe

Elisabetta Rapiti
WHO Blood Safety
Switzerland