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# Consultation on estimates of mortality due to HIV/AIDS

Recommendations from a meeting of the UNAIDS Reference  
Group on Estimates, Modelling and Projections held in Boston,  
USA, 4 April 2012

## RECOMMENDATIONS



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The meeting of the UNAIDS Reference Group on Estimates, Modelling and Projections (the 'Epidemiology Reference Group') was organised for UNAIDS by the UK secretariat of the Reference Group ([www.epidem.org](http://www.epidem.org)) based at Imperial College London. Participants of the meeting are listed at the end of this document. The recommendations in this document were arrived at through discussion and review by meeting participants and drafted at the meeting.

Kelsey Case, May 2012

## Introduction

The Joint United Nations Programme on HIV/AIDS (UNAIDS) *Reference Group on Estimates, Modelling and Projections* exists to provide impartial scientific advice to UNAIDS, the World Health Organization (WHO) and other partner organisations 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.

### *Aim of the consultation*

The aim of this consultation was to review and discuss the methods used to estimate mortality due to HIV in the Global Burden of Disease 2010 (GBD 2010), compared to the methods used by UNAIDS to produce estimates of AIDS deaths.

The specific objectives were to identify the differences in these two approaches and the results obtained, and to understand and account for the differences in the estimates obtained.

### *Approach*

This consultation featured presentations detailing the methods used to generate estimates of mortality due to HIV/AIDS and presentations addressing the main issues and questions for the other group followed by group discussion. The meeting agenda is included in Appendix I.

The meeting was attended by 33 experts, including demographers, statisticians, epidemiologists and mathematical modellers who all worked to review the methods used by both groups and produce a set of recommendations drafted at the meeting. The list of participants is included in Appendix II.

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](http://www.epidem.org)). This transparent process aims to allow the statistics and reports published by UNAIDS and WHO to be informed by impartial, scientific peer review.

## **Background for the consultation on estimates of mortality due to HIV**

The Global Burden of Disease study (GBD) began in the late 1980s with the first set of estimates of the burden of a wide range of diseases, including HIV, produced as part of the GBD 1990.<sup>1</sup> These GBD studies have continued since 2000 with updates produced by the World Health Organization (WHO) in collaboration with a variety of organisations and institutions. The most recent, the GBD 2010 Study is led by a consortium including the Institute for Health Metrics and Evaluation (IHME), the University of Washington, Harvard University, the University of Queensland and WHO. This study uses updated methods and endeavours to conduct a systematic assessment of global data with the aim to provide comparable estimates of the burden of diseases, injuries and risk factors for 1990, 2005 and 2010.<sup>2</sup> The GBD 2010 includes estimates of mortality due to HIV/AIDS.

UNAIDS/WHO support countries in producing estimates and projections of HIV to allow for a better understanding of local HIV epidemics, so that countries can monitor progress, design evidence-informed responses and support prevention planning and decision making for HIV. Countries use their surveillance, survey and programme data in combination with technical software [the Estimates and Projection Package (EPP) and Spectrum] to generate national estimates and projections of HIV prevalence and various other outputs including AIDS deaths. These estimates are modified and revised as new data are collected and new research and knowledge emerge.

The GBD study and UNAIDS use different approaches to estimate mortality due to HIV/AIDS and thus produce different results. Following a review and comparison of these two sets of estimates, a Consultation was held in April 2012 to review and discuss in detail the methods used by each group and identify and understand the differences between the two approaches and the results obtained and generate recommendations in order to improve the methods used and the results obtained.

## Recommendations

The following details the consensus recommendations derived during this consultation for each group, and for both groups, in order to improve estimates of mortality due to HIV/AIDS. Recommendations for the future and going forward are also included.

### Recommendations for both IHME & UNAIDS to improve estimates of mortality due to HIV/AIDS

Consensus recommendations identified at this Consultation in order to improve both the UNAIDS and IHME estimates of mortality due to HIV/AIDS:

- **Further investigation in country-specific discrepancies**  
Both groups to review in detail the countries with widely varying all-cause mortality estimates to identify and account for the differences where possible. Demographers should review both sets of estimates.  
*Follow-up: IHME, UNAIDS, UNPOP*
- **Further research into differences in estimates for West Africa**  
Both groups would like a better understanding of what is happening in West Africa (less agreement in this region, compared to others, between the two sets of all-cause estimates). There is the potential for systematic bias in the sibling history data from West Africa – how kinships and omissions are handled is far more complex in this region due to widespread polygamy.  
*Follow-up: IHME to explore this in more detail*
- **Further research into the sex differential**  
Both groups want more information on sex ratios. UNAIDS has already identified the need to look into the sex ratios in Zambia, Mali and Côte d’Ivoire (in the first instance) including differential access to treatment and the sex and age patterns of infection. Further information is needed here. The sex ratios in the verbal autopsy and vital registration data were closer to 1 which is not in agreement with the sex ratios from DHS data.  
**Specific recommendations:**
  - Compare mortality estimates for countries that have very good vital registration data
  - Further research into the sex ratios from DHS data*Follow-up: UNAIDS, IHME, Rob Dorrington (South Africa)*
- **Data sharing**  
IHME and UNPOP to compare sources of data and identify whether there are any data sources that the other group does not have.  
*Follow-up: IHME to provide the vital registration and verbal autopsy data*  
*Follow-up: Haidong Wang, Patrick Gerland, Francois Pelletier to compare data sources*
- **Analyse “the squeeze” in more detail**  
The amount of squeezing is a function of the uncertainty, the greater the uncertainty the greater the squeeze. Both groups need to analyse the squeezing that occurs in more detail.  
**Specific recommendations:**
  - Analyse HIV in relative terms to other causes of mortality, pre-squeeze and post-squeeze, to identify what is growing/shrinking
  - Use South Africa as a country in which to examine the squeeze in more detail*Follow-up: IHME, Futures Institute, Rob Dorrington*

## Recommendations to improve UNAIDS estimates of mortality due to HIV/AIDS

Consensus recommendations identified at this Consultation in order to improve the UNAIDS estimates of mortality due to HIV/AIDS:

- **Use the mean of the posterior distribution instead of the maximum likelihood curve**  
The EPP component of Spectrum currently takes the maximum likelihood curve; it is recommended that the mean of the posterior distribution is used instead as the summary distribution is more representative. This may also help to reconcile some of the country-specific differences between UNAIDS and IHME estimates.  
*Follow-up: UNAIDS to update and provide the full distribution by age and sex (adults and children) for IHME to use for estimates of mortality due to HIV.*
- **Generate guidelines for how to constrain curve fitting in EPP**  
In the majority of countries, curve fitting is relatively unconstrained pre-HIV (Nigeria, for example). In order to produce more precise estimates, greater consideration is needed for rules or guidance on how to constrain curve fitting. Countries will require a set of general guidelines and recommendations for how to impose limits on curve generation and conditions on prevalence.  
*Follow-up: UNAIDS Reference Group to address this topic*
- **Further investigation into the UNAIDS HIV/AIDS mortality estimates in Latin America**  
Further investigation is needed reconciling the discrepancy in deaths between UNAIDS estimates and country registration systems in some countries in Latin America. In the first instance, examine the effect of the use of the mean of the posterior distribution (instead of the maximum likelihood curve) in countries where there are discrepancies.  
*UNAIDS to continue work in this area*
- **Explore “the squeeze” in more detail**  
Identify countries where the squeeze – the constraint of cause-specific mortality to fit into all-cause mortality (the *envelope*) whereby the amount of squeezing is a function of uncertainty – is greater than in other countries. Explore how the data and parameter estimates would need to be changed to fit into the squeeze.  
*Follow-up: Futures Institute*

## Recommendations for IHME estimates of mortality due to HIV/AIDS

Consensus recommendations from this consultation in order to improve the IHME estimates of mortality due to HIV/AIDS:

- **Use the UNAIDS estimates of HIV-related mortality** (using the mean of the posterior distribution) for countries without good vital registration data. Continue to use the corrected vital registration data for HIV-related mortality in countries where there are very good registration systems. Work to reconcile the differences for countries that are not in agreement.  
*Follow-up: UNAIDS to provide the full distribution by age and sex for adults and children combined*
- **Further research in correlations in cause of mortality to fill the envelope**  
Look at different correlations for causes of death (between 0-1) and identify how the basic arbitrary choice influences the squeeze that then occurs.  
*Follow-up: IHME to investigate*
- **Further analysis of age-specific mortality estimates**  
Further analysis and investigation of age-specific mortality due to HIV/AIDS. Implement 100% HIV prevalence and compare the age-specific mortality patterns to the Alpha network pattern.  
*Follow-up: IHME to investigate*

## Recommendations for moving forward:

- **Identification of countries that need further investigation**  
Priority countries that will need to be examined in more detail include those where:
  - The mean of the posterior distribution is very different from the maximum likelihood.
  - After processing age-sex draws, the squeezed results are outside the confidence intervals.
- **Bring together demographers, modellers and statisticians more often in the future**  
It was very useful to have all perspectives working together and a great deal was gained as a result. More opportunities should be embraced to continue this in the future.
- **Documentation of methods**  
It is essential to have full documentation of methods and to make these easily available, in order to increase transparency, facilitate knowledge sharing and allow for comparison.
- **Communicate the differences in approaches and results**  
Even if all differences are reconciled between the two sets of estimates, the squeezing of cause-specific mortality to fit into the all-cause mortality envelope approach used for the IHME estimates will result in lower estimates of mortality due to HIV/AIDS compared to the UNAIDS estimates. Therefore, it is recommended that there is a clear communication platform identifying what similarities are shared between the two, the differences between the two, and the areas where more information is needed.

## Appendix I: List of Participants

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**Unable to attend but significant contribution:**

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Paris, France

## Appendix II: Agenda

### UNAIDS Reference Group on Estimates, Modelling and Projections

#### *Consultation on estimates of mortality due to HIV/AIDS*

April 4<sup>th</sup>, 2012, Harvard School of Public Health, Boston

*Chair of the consultation: Geoff Garnett*

This consultation will consist of five sections. The first session will provide an overview of the methods used to estimate mortality due to HIV/AIDS. Sessions 2-5 will consist of two 15 minute presentations, one each from the UNAIDS Reference Group on Estimates, Modelling and Projections, and from the Institute for Health Metrics and Evaluation (IHME). The presentations will raise the main issues and questions addressed to the other group followed by 30 minutes (total) of answers from the other group and 15 minutes for discussion and recommendations for the Global Burden of Disease and for UNAIDS/WHO estimates. The presentations should highlight the major issues that might give rise to the differences in the estimates of mortality and will include specific country examples.

**8:15 - 8:30 am**                    **Welcome, meeting objectives**

**Introductions**

**8:30 – 9:30 am**                    **Session 1: Overview of methods used to generate estimates of mortality due to HIV/AIDS**

- **John Stover:** Methods used to generate UNAIDS estimates of mortality due to HIV/AIDS
- **IHME:** Methods used to generate estimates of mortality due to HIV/AIDS for the Global Burden of Disease Study 2010

**9:30 – 9:45 am**                    **Break**

**9:45 – 11:15**                    **Session 2: Overall mortality, 45q15.**

- UNAIDS Reference Group's issues and questions for IHME presented by Patrick Gerland
- IHME's issues and questions for UNAIDS Reference Group presented by Haidong Wang

**11:15 – 12:30**                    **Session 3: Case fatality rate vs survival curve/epidemic dynamics, including age effects**

- UNAIDS Reference Group's issues and questions for IHME presented by John Stover
- IHME's issues and questions for UNAIDS Reference Group presented by Chris Murray

**12:30-1:30 pm**                    **Lunch**

**1:30 – 2:45 pm**                    **Session 4: Competing mortality, uncertainty surrounding HIV-related mortality and other causes of mortality**

- UNAIDS Reference Group's issues and questions for IHME presented by Neff Walker
- IHME's issues and questions for UNAIDS Reference Group presented by Chris Murray

**2:45 – 4:00 pm**                    **Session 5: ART effects**

- UNAIDS Reference Group's issues and questions for IHME presented by Constantin Yiannoutsos
- IHME's issues and questions for UNAIDS Reference Group presented by Chris Murray

**4:00 – 4:45 pm**                    **Discussion, next steps**

**5 pm**                                    **Close**

## References

1. The global burden of disease: a comprehensive assessment of mortality and disability from diseases, injuries and risk factors in 1990 and projected to 2020. Cambridge: Harvard University Press; 1996.
2. Institute for Health Metrics and Evaluation. Global Burden of Diseases, Injuries, and Risk Factors 2010 Study. <http://www.healthmetricsandevaluation.org/research/project/global-burden-diseases-injuries-and-risk-factors-2010-study> (accessed 31 May 2012).