THE HENRY J. KAISER FAMILY FOUNDATION

HIV/AIDS

HIV/AIDS POLICY FACT SHEET

Understanding the New UNAIDS Estimates

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Introduction

In November 2007, the Joint United Nations Programme on HIV/AIDS (UNAIDS) and the World Health Organization (WHO) released updated estimates on the global HIV/AIDS epidemic.[1,2] While updated global and regional estimates are released biennially, the most recent update contained significant revisions, including, for example, a major revision downward in the number of people estimated to be living with HIV/AIDS worldwide compared to prior published estimates, and prior figures have been adjusted. Data on the number of new infections and AIDS deaths were also revised, and new information about trends in the epidemic was made available. The changes were attributed to several factors including refinements in methodology, increased data availability from many countries, and a growing knowledge about the natural history of HIV disease, all of which enhance the understanding of the epidemic and facilitate policy and planning efforts moving forward.

Due to the significance of these revisions and to help provide context for interpreting them, this policy brief presents an overview of:

- The new estimates and how they compare to prior estimates
- What the new estimates mean for an understanding of the epidemic's trajectory; and
- The major factors that drove the revisions

Definitions of key terms used are provided in a table below.

What Changed With The New Estimates?

In the most recent report by UNAIDS/WHO, new global (and regional) estimates were released for 2007 and prior year estimates, going back to 2001, were revised (new country-level estimates for the year 2007 are expected in June 2008). Because of revisions to prior year figures, the new data cannot be compared to earlier, published reports. Key indicators revised include:

- The number of people living with HIV/AIDS (global and regional HIV/AIDS prevalence numbers)
- The percent of the population with HIV (global and regional HIV/AIDS prevalence rates)
- The number of people newly infected with HIV (global and regional HIV incidence)
- The number of AIDS deaths (global and regional)

Table 1 presents a summary of each major change; how it compares to the prior year's published estimate; the resulting revision to the prior year's estimate; and, after accounting for prior year adjustments, how to interpret recent trends in the epidemic.

Both "point estimates" and "ranges of uncertainty" are provided where available. Ranges of uncertainty are important to consider whenever estimates are used, and the estimates developed for many diseases include a significant amount of uncertainty.[3] UNAIDS first began to publish uncertainty intervals, or "plausibility bounds" with estimates in 2003.[4] Plausibility bounds provide a lower and upper bound interval within which the indicator is expected to lie, taking into account data quality issues and assumptions used. As estimates change over time, a new figure can be examined to see whether its plausibility bound overlaps with that of a prior estimate; overlap suggests that the new estimate may not actually be different from the prior estimate.

What Were the Main Factors Driving The Recent Changes?

As noted above, estimates are used to measure many diseases, due to varying data quality and availability. To develop estimates, researchers often use complex models, which incorporate available data as inputs and use assumptions based on the latest available knowledge about a disease, to produce estimated model outputs. In the case of HIV/AIDS, models are used to develop estimates of prevalence, incidence, and mortality globally and throughout the world, even in countries with robust surveillance systems such as the United States. Models are "interrelated:" with any model, a change to a key model data input or assumption will impact other parts of the model, including the model's outputs. This is what occurred with the most recent revisions in HIV/AIDS estimates. The main factors that contributed to the revisions are:

1. **The availability of more data from more countries:** While this is always a factor in the development of estimates each year, this year marked the availability of significantly more data, particularly from nationally representative, population-based, household surveillance efforts. In addition, these data were newly available from some countries that have large shares of the global total of people living with HIV/AIDS. For example, 70% of the downward revision in the estimated number of people living with HIV/AIDS globally is due to a reduction in India's estimate (the second largest country in the world) and to reductions in several countries in Africa.
2. **The use of new assumptions:** New surveillance information and greater knowledge of HIV disease itself led to revisions in key assumptions used to develop the estimates:
   a. The increasing availability of data from countries that have conducted national surveillance studies led to a change in the way estimates are developed for countries that have not yet conducted such studies, but do have data from antenatal clinics (ANCs), considered to be a critical sentinel surveillance site. In countries with generalized epidemics (prevalence is over 1 percent), ANC data are used to extrapolate HIV prevalence to the country-level. However, as with all sentinel surveillance, there is concern that it may over-represent HIV prevalence. In prior years, data from rural ANCs were adjusted downward to address this concern. Now, data from both rural and urban ANCs are adjusted downward. This has the effect of lowering overall country-level prevalence estimates and, in turn, regional and global prevalence totals.
   b. The survival time (time from HIV infection to death) of people with HIV has been lengthened due to changes in assumptions both about those who have access to antiretroviral treatment and those who do not. First, antiretroviral treatment has extended the lives of people with HIV who have access to such treatment; as access increases, this assumption applies to more people. Second, several recent studies from

Table 1: Comparison of Estimates

Indicator	New Published Estimate for 2007[1]	Prior Published Estimate for 2006[5]	Adjusted Estimate for 2006[6]	Interpretation
Prevalence Number: Number of people living with HIV/AIDS	33.2 million (30.6–36.1)	39.5 million (34.1–47.1)	32.7 million (30.2–35.3)	• New estimate less than prior year's published estimate; ranges of uncertainty overlap • Prior year estimates have been revised downward • New estimate does not mean that the number of people living with the disease has fallen; rather, prior estimates are now believed to have been too high and have been revised downward • After prior year adjustments, the number of people living with HIV is still estimated to have increased over time • The growing number of people living with HIV is attributable to several factors including continuing new HIV infections, people living longer with the disease after they become infected, and overall growth in the world's population
Prevalence Rate: Percent of population infected with HIV	0.80% (0.7%–0.9%)	1.00% (0.9%–1.2%)	0.80% (0.7%–0.9%)	• New estimate less than prior year's published estimate; ranges of uncertainty just overlap • Prior year estimates have been revised downward • New estimate does not mean that the global prevalence rate has decreased; rather, prior estimates are now believed to have been too high and have been revised downward • After prior year adjustments, it is now believed that the global prevalence rate has remained stable since 2001
Incidence: Number of New HIV Infections	2.5 million (1.8–4.1)	4.3 million (3.6–6.6)	2.7 million (1.7–4.0)	• New estimate less than prior year's published estimate; ranges of uncertainty overlap • Prior year estimates have been revised downward • After prior year adjustments, it is now believed that the number of new infections is on the decline, after having peaked in the late 1990s • Declining HIV incidence is attributable to several factors including natural trends in the epidemic and to HIV prevention efforts in some settings
AIDS Deaths	2.1 million (1.9–2.4 million)	2.9 million (2.5–3.5 million)	2.1 million (2.0–2.5 million)	• New estimate less than prior year's published estimate; ranges of uncertainty do not overlap • Prior year estimates have been revised downward • After prior year adjustments, it is now believed that AIDS deaths rose throughout course of epidemic until about 2005 and have started to decline slightly since then • Recent declines in deaths are attributable in part to growing global access to antiretroviral therapy • HIV remains leading cause of death worldwide

multiple countries have now shown that the survival time for those who do not have access to treatment is longer than previously thought, and has been revised up from 9 to 11 years. These new assumptions have the effect of lowering HIV incidence and mortality estimates (see below).

3. **The use of HIV prevalence to infer HIV incidence and mortality:** One of the greatest challenges to tracking the HIV epidemic is the significant limitation in measuring incident (new) HIV infections, a challenge in all countries. This is due both to the lack of standard HIV diagnostic tools—tests used to determine if someone is infected with HIV—that can determine when that person was infected, and to the high number of people with HIV (an estimated eight out of 10 globally) who do not know they are infected. These low levels of awareness of HIV serostatus are the result of the long incubation period of HIV, during which symptoms may not be present, the lack of testing capacity in many places, and the persistence of HIV-related stigma. On the other hand, surveillance systems can determine what share of people in a given setting or population has HIV at a particular point in time (HIV prevalence). Therefore, prevalence has always been used to infer incidence and mortality. To illustrate, if HIV prevalence is the known or estimated indicator, assumptions about the length of time between infection and death can be used to infer how many new infections and deaths occurred in a given year. If the number of years a person is expected to live with HIV disease increases, then current prevalence can be assumed to be the result of a greater share of infections that occurred longer ago; in other words, less infections per year would be needed to reach the current prevalence. Similarly, fewer deaths would be expected to occur in that year. With the most recent estimates, not only did the prevalence estimate change (as described above in 2a), which alone would have driven changes in incidence and mortality estimates determined through modeling, the survival assumption changed (see 2b), further driving these changes.

Table 2: Definitions of Key Terms

Term/Concept	Definition*
Disease Surveillance	The systematic and ongoing collection and analysis of data for public health purposes and the timely dissemination of public health information for assessment and public health response as necessary.
Incidence	The number or proportion of new cases/people with a disease occurring within a specific population during a specific period of time—e.g., the number of new HIV infections or number of new AIDS cases occurring in the last year. The denominator is the population at risk and the numerator is the number of new cases during the specified period of time.
Incubation (or Latency) Period	The time from infection to the onset of symptoms. Infection may be detectable through diagnostic tests during this period but not be apparent to the infected individual. For example, someone with HIV may be infected for years before any symptoms develop.
Population-based surveillance	Surveillance conducted at a household level that is representative of the population overall. While population-based surveillance is considered nationally representative, it may not include sufficient numbers of those at "high risk" (or may not include them at all) and such information is often better obtained through sentinel (e.g., clinic-based) surveillance. In addition, household surveys are expensive and complicated and generally cannot be undertaken on a regular basis.
Prevalence	The number or proportion of cases/people with a disease or condition at a specific point in time—e.g., the number of people living with HIV, at any disease stage, including AIDS or the percent of a population infected with HIV.
Sentinel surveillance	The collection and analysis of disease data from designated institutions, providers, or facilities, such as sexually transmitted disease (STD) clinics or antenatal clinics (ANCs). Such data, however, may not be representative of the general population which instead is better measured through the use of population-based household surveys. In addition, sentinel surveillance can lead to overestimates of disease among those at high risk.
Survival Period	Time from infection with a disease (one that generally leads to premature mortality) to death.
Window Period	The time from infection to detection of infection. This is highly dependent on the types of diagnostic tools available. For example, in the case of HIV, standard diagnostic tests cannot detect whether someone is infected until several weeks after infection. While there are other tests available that can detect infection earlier, they are not generally used in diagnostic efforts.

*Sources: UNAIDS; NIH; CDC; AEGiS.

References

1 UNAIDS, *2007 AIDS Epidemic Update;* December 2007.
2 UNAIDS, "Revised HIV Estimates," *Fact Sheet;* November 2007.
3 Mathers CD, Salomon JA, Ezzati M, Begg S, Vander Hoorn S, Lopez AD, "Sensitivity and uncertainty analyses for burden of disease and risk factor estimates" *Global Burden of Disease and Risk Factors,* ed. , 399–426. New York: Oxford University Press; 2006.
4 UNAIDS refers to these ranges as plausibility bounds not formal statistical confidence intervals (CI) because not all sources of error can be accounted for through CI. See: Grassly NC, Morgan M, Walker N, Garnett G, Stanecki KA, Stover J, Brown T, Ghys PD, "Uncertainty in estimates of HIV/AIDS: the estimation and application of plausibility bounds" *Sexually Transmitted Infections 2004;*80(Suppl 1); Morgan M, Walker N, Gouws E, Stanecki KA, Stover J, "Improved plausibility bounds about the 2005 HIV and AIDS estimates" *Sexually Transmitted Infections* 2006;82(Suppl III).
5 UNAIDS, *2006 AIDS Epidemic Update;* December 2006.
6 UNAIDS, personal communication, November 2007.
7 WHO/UNAIDS/UNICEF, *Towards Universal Access, Scaling Up Priority HIV/AIDS Interventions in the Health Sector, Progress Report;* April 2007.

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