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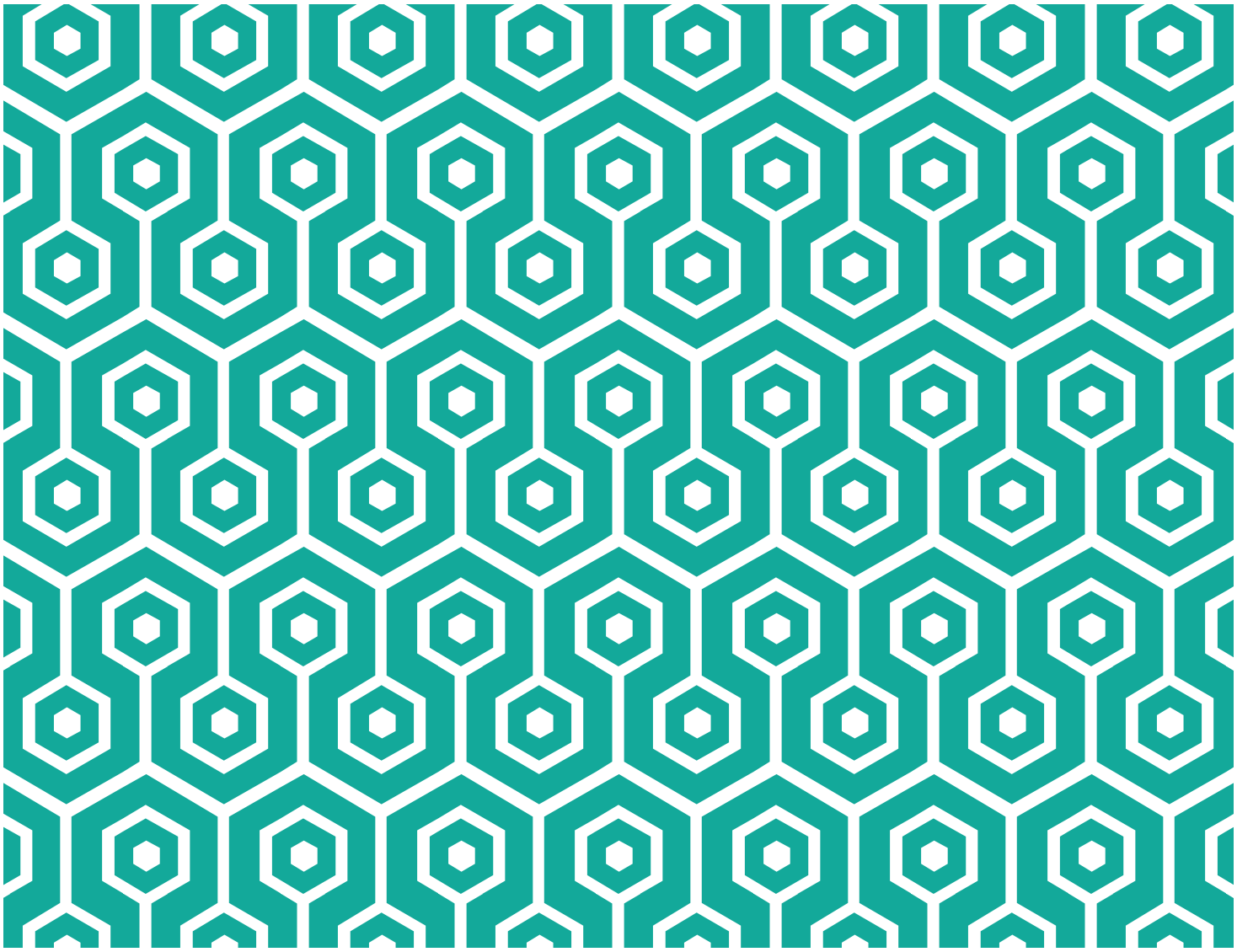
Methods for deriving UNAIDS estimates



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How does UNAIDS compile the HIV data and estimates used in its publications?

The data that UNAIDS routinely publishes are compiled through two processes: the Global AIDS Response Progress Reports (GARPR) in which data are compiled on antiretroviral therapy, HIV-related behaviours, policies, expenditure data, and other indicators measuring progress toward global commitments. The second process is the HIV modelled estimates which produces the estimated number of new infections, people living with HIV and AIDS-related deaths among other variables. For both processes the data is produced by countries and submitted to UNAIDS at the end of March every year.

Why does UNAIDS produce HIV estimates instead of actual numbers?

Modelled estimates are required because it is impossible to count the exact number of people living with HIV, people who are newly infected with HIV or people who have died from AIDS-related causes in any country. Knowing this for certain requires testing every person for HIV regularly and investigating all deaths, which is logistically impossible and ethically challenging. Modelled estimates and the lower and upper bounds around these estimates provide a scientifically appropriate way to describe HIV epidemic levels and trends.

UNAIDS publishes revised global, regional and country-specific modelled estimates to track the HIV epidemic annually.

How are the HIV estimates calculated?

Country teams use UNAIDS-supported software to develop estimates annually. The country teams comprise primarily epidemiologists, demographers, monitoring and evaluation specialists and technical partners.

The software used to produce the estimates is Spectrum—developed by Avenir Health (www.avenirhealth.org)—and the Estimates and Projections Package, which is developed by the East-West Center (www.eastwestcenter.org). The UNAIDS Reference Group on Estimates, Modelling and Projections provides technical guidance on the development of the HIV component of the software (www.epidem.org).

For countries where HIV transmission is high and HIV has spread among the general population, available epidemiological data typically consist of HIV prevalence results from surveillance among pregnant women attending antenatal care clinics and from nationally representative population-based surveys. Because antenatal clinic surveillance is performed

regularly, these data can be used to inform national prevalence trends, whereas data from population-based surveys—which are conducted less frequently but have broader geographical coverage and also include men—are more useful for informing national HIV prevalence levels. For a few countries in sub-Saharan Africa that have not conducted population-based surveys, HIV prevalence levels are adjusted based on comparisons of antenatal clinic surveillance and population-based survey data from other countries in the region. The HIV prevalence curves and annual numbers of people on antiretroviral therapy are then used to derive an estimate of HIV incidence trends.

In countries with low-level HIV epidemics where HIV transmission occurs largely among key populations at higher risk of HIV infection (such as people who inject drugs, sex workers or gay men and other men who have sex with men), the data from repeated HIV prevalence studies—usually focused on key populations—are most often used to inform national estimates and trends. Estimates of the size of key populations are increasingly derived empirically in each country or, when studies are not available, based on regional values and consensus among experts. Other data sources—including population-based surveys, surveillance among pregnant women and HIV case reporting data—are used to estimate the HIV prevalence in the general, low-risk population. The HIV prevalence curves and numbers of people on antiretroviral therapy are then used to derive national HIV incidence trends.

For many countries in western and central Europe and North America and in Latin America and the Caribbean that have insufficient HIV surveillance or survey data—but have strong vital registration and disease reporting systems—HIV case reporting and AIDS-related mortality data are used to directly inform trends and levels in national HIV prevalence and incidence. These methods also allow countries to take into account evidence of underreporting or reporting delays in HIV case report data, as well as the misclassification of deaths from AIDS-related causes.

The assumptions in the models about patterns of HIV transmission and disease progression are used to obtain age- and sex-specific estimates of the number of people living with HIV, the number of people newly infected with HIV and the number of people dying from AIDS-related causes as well as other important indicators. These assumptions are based on systematic literature reviews and analyses of raw study data by scientific experts. Demographic population data, including fertility estimates, are derived from the latest revision of the United Nations Population Division's World Population Prospects.

Final country-submitted files containing the modelled outputs are reviewed at UNAIDS by the Strategic Information and Monitoring Division to ensure that the results are sound and comparable across regions and countries and over time.

Why does UNAIDS include ranges of HIV estimates?

The software calculates uncertainty bounds around each estimate that define the range within which the true value (if it could be measured) lies. Narrow bounds indicate that an estimate is precise, and wide bounds indicate greater uncertainty regarding the estimate.

In countries using HIV surveillance data, the quantity and source of the data available partly determine the precision of the estimates; countries with more HIV surveillance data have smaller ranges than countries with less surveillance data or smaller sample sizes. Countries in which a national population-based survey has been conducted generally have smaller ranges around estimates than countries where such surveys have not been conducted. In countries using HIV case reporting and AIDS-related mortality data, the number of years of data and the magnitude of the cases reported or AIDS-related deaths observed will contribute to determining the precision of the estimate.

The number of assumptions required to arrive at the estimate also contributes to the extent of the ranges around the estimates: in brief, the more assumptions, the wider the uncertainty range, since each assumption introduces additional uncertainties. For example, the ranges around the estimates of adult HIV prevalence are smaller than those around the estimates of HIV incidence among children (which require additional data on the probability of mother-to-child HIV transmission). The latter are based on prevalence among pregnant women and the probability of mother-to-child HIV transmission.

UNAIDS is confident that the actual numbers of people living with HIV, people who are newly infected with HIV or people who have died from AIDS-related causes lie within the reported ranges. Over time, more and better data from countries steadily reduces uncertainty.

Can the latest estimates be compared with previously published estimates?

The latest estimates cannot be compared with previous year's estimates. Country teams create new Spectrum files every year. The files may differ from one year to the next for two reasons. First, new surveillance and programme data are entered into the model; this can change HIV prevalence and incidence trends over time, including for past years. Second, improvements are incorporated into the model based on the latest available science and understanding of the epidemic. Because of these improvements to the model and the addition of new data to create the estimates for each year, the results from previous years cannot be compared with the results from this year. This is why a new full historical set of estimates is created each year, enabling a more accurate description of trends over time.

Why do UNAIDS estimates differ to those published in the Lancet HIV in July 2016?

The Institute of Health Metrics and Evaluation (IHME) released a set of 2015 HIV estimates as part of the Global Burden of Disease (GBD) Study. These estimates were published in The Lancet HIV journal in July 2016. The GBD study used all-cause mortality data in countries to inform the HIV estimates. The GBD study team also used the publicly available UNAIDS Spectrum files released in 2015 which rely on surveillance and antiretroviral data available through December 2014. The 2015 estimates published by IHME are therefore projections.

UNAIDS estimates are based on the estimation files developed by countries in 2016 and include data through December 2015. The UNAIDS estimates are the result of a collaborative process with engagement of the national authorities, partners and other stakeholders in countries. As such, UNAIDS estimates are typically the official government estimate. Countries and partners should feel confident UNAIDS estimates are the most accurate data available for monitoring the AIDS epidemic.

How does UNAIDS determine the number of people receiving antiretroviral therapy?

Systems for registering people starting antiretroviral therapy (ART) vary by country. In most countries facilities have registries that record the number of people starting on antiretroviral therapy, those who have stopped and those currently receiving ART. These registries are either computer based or paper based. In either case, the results are compiled and sent to provincial and national level on a routine basis.

UNAIDS requests countries to submit these data by age and by sex on 31 March every year, through an online reporting tool called GARPR. Specialists within the ministry of health or national AIDS coordinating agency in each country are responsible for submitting the data through the GARPR reporting tool. The country team enters data into the tool and, once agreed by country authorities, these data are officially submitted through the online tool alerting UNAIDS that the country has completed the entry process. The tool has a number of quality checks to avoid data entry errors.

In collaboration with the World Health Organization and UNICEF and other stakeholder partners, UNAIDS reviews the data submitted by countries through the GARPR online tool. These data are validated in a three step process in which the data are first compared to previously reported data to identify any anomalies by age group, sex or sub-national area. Second, ART data submitted in GARPR are compared to the results submitted by countries with other sources of information such as data submitted to the US Government or the Global Fund reporting systems. Finally, any queries are sent back to the country for clarification and

revisions if necessary. These results arethe same data which are entered into Spectrum for children (less than 15 years of age) and by sex for adults (15 years of age or older) to derive ART coverage.

Are there any challenges in collecting antiretroviral therapy data?

There are some challenges in collecting ART data. In some instances for example, some facilities may not have been able to meet the submission deadline. In other instances, such as Western European and North American countries, the data on the number on ART are only collected once every few years and so the countries are typically unable to report the latest year's data.

The data submitted on ART and programmes providing ART to prevent mother to child transmission of HIV are only as good as the health information systems available in the country. In some countries these systems are well-resourced and include the ability to avoid double-counting people who have changed facilities (for example in countries with registries that identify people who have transferred facilities or where individuals have unique identifying codes). In other countries the systems are weaker and do not have the ability to accurately remove people who might have changed facilities, dropped out of facilities or died.

UNAIDS and partners are working actively with countries to improve these systems through the development of improved health information systems and improved use of the data produced in those systems.

How is antiretroviral therapy coverage measured?

Since 2013, UNAIDS has provided the number and estimates of the proportion of adults and children living with HIV who are on antiretroviral therapy (rather than estimates of the proportion of adults and children eligible according to national or international guidelines who are on antiretroviral therapy). This coverage reflects the recent WHO recommendations of starting antiretroviral therapy among everyone diagnosed as HIV-positive.

The number of people living with HIV is calculated based on models and compiled through the HIV estimates process described above.

Why are estimates for some countries missing from UNAIDS' AIDSinfo or the publications?

UNAIDS aims to publish data and estimates for all countries. Estimates are only created for countries with populations of 250,000 or greater. For the countries with populations of 250 000 or more that did not submit estimates, UNAIDS developed estimates using the Spectrum software that were based on published or otherwise available information. These estimates contributed to regional and global totals but were not included in UNAIDS' reports or website.

In countries with low-level epidemics, the number of pregnant women living with HIV is difficult to estimate. Many women living with HIV in these countries are sex workers, people who use drugs or sexual partners of people who use drugs or gay men or other men who have sex with men, and thus they are likely to have different fertility levels than the general population. UNAIDS does not present estimates of mother-to-child HIV transmission or estimates related to children infected with HIV through mother-to-child transmission in some countries with concentrated epidemics unless adequate data are available to validate these estimates.

Incidence trends are also not available for some countries. If there are not enough historical data to confidently state whether a decline in incidence has occurred, UNAIDS will not publish earlier data to avoid users making inaccurate inferences about trends. Specifically, incidence trends are not published if there are fewer than four data points for the key population or if there have been no surveillance data for the past four years.

Finally, in a few instances, UNAIDS will not publish country estimates when further data or analyses are needed to produce valid estimates. More information on the UNAIDS estimates and the individual Spectrum files for most countries can be found on the UNAIDS website (www.unaids.org).

Additional sources of information

For a description of the indicators and Global AIDS Response Progress Reporting process please go to:
https://aidsreportingtool.unaids.org/static/docs/GARPR_Guidelines_2016_EN.pdf

For a summary description of the HIV estimates methods and processes please go to:
http://www.unaids.org/sites/default/files/media_asset/2016_methods-for-deriving-UNAIDS-estimates_en.pdf

For a full technical description and journal publications on the HIV estimates please go to:
www.epidem.org

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