

Uganda: Developing subnational estimates of HIV prevalence and the number of people living with HIV

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▶ **To cite this version:**

Joseph Larmarange. Uganda: Developing subnational estimates of HIV prevalence and the number of people living with HIV. JC2665E, Unaids. 2014, pp.22-22. ird-03897883

HAL Id: ird-03897883
https://ird.hal.science/ird-03897883

Submitted on 14 Dec 2022

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UGANDA

DEVELOPING SUBNATIONAL ESTIMATES OF HIV PREVALENCE AND THE NUMBER OF PEOPLE LIVING WITH HIV

UNAIDS / JC2665E (English original, September 2014)

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METHODOLOGY NOTE

Developing subnational estimates of HIV prevalence and the number of people living with HIV from survey data

Introduction

Significant geographic variation in HIV incidence and prevalence, as well as programme implementation, has been observed between and within countries. Methods to generate subnational estimates of HIV prevalence and the number of people living with HIV are being explored in response to the urgent need for data at smaller administrative units, in order to inform programming that is aligned with local community needs.

This guidance note describes existing methods to generate subnational estimates of HIV prevalence and the number of people living with HIV from survey data, with a particular focus on the development of maps of estimates at second administrative level through the prevR model *(1)* as a data visualization resource. Although HIV estimates at the first administrative level can be generated through various methods and sources for countries with available data, HIV estimates at the second administrative level are not currently available. Estimates at the second administrative level generated through prevR must be interpreted with caution; however, they provide an indication of the status of the epidemic subnationally within a country. A more complex method for estimating HIV prevalence and other variables at the second administrative level is being further developed, which will be integrated with existing Joint United Nations Programme on HIV/AIDS (UNAIDS) estimation processes.

prevR

Applying the prevR method to generate maps of estimates of the number of people living with HIV (aged 15–49 and 15 and older) and of HIV prevalence (aged 15–49) at the second administrative level was recommended by participants at a technical consultation on methods for generating subnational estimates. This consultation, held in Nairobi, Kenya, 24–25 March 2014, was convened by the HIV Modelling Consortium, the UNAIDS Reference Group on Estimates, Modelling and Projections and the UNAIDS Task Force on Hotspots. It served as a follow-up to the July 2013 consultation on identifying populations at greatest risk of infection, which focused on geographic hotspots and key populations.

The countries to which this method was applied were selected based on the availability of data from Demographic and Health Surveys (DHS) or AIDS Indicator Surveys (AIS), which included georeferenced and HIV testing data gathered since 2009. Beginning in 2009, the displacement of DHS cluster data[1] was restricted to the second administrative level *(2)*.

1. In DHS surveys, clusters (groupings of households) are georeferenced, with a random displacement of latitude and longitude. Urban clusters are displaced by a maximum of 2 km and rural clusters by a maximum of 5 km, with 1% displaced 10km. Please see reference 2 for details. Displacement is restricted to within a country and to survey regions, and, since 2009, has also been restricted to the second administrative level, where possible.

Method

The survey data have been spatially distributed using a kernel density approach with adaptive bandwidths based on a minimum number of observations in order to generate estimates of HIV prevalence among people aged 15–49 years. This method was described in detail elsewhere *(1)* and was implemented in the prevR package (in R language).

The basic principle of the prevR method is to calculate an intensity surface of positive cases and an intensity surface of observations. The ratio of positive cases to observations results in the prevalence surface.

The intensity surface of observations is expressed as the number of observations per surface area (per square degree or per square km, depending on the coordinate system). The volume below this surface is equal to the total number of observations in the dataset. This surface indicates how observations are distributed from a scatterplot on a continuous surface.

For each administrative unit, the integral of the intensity surface is calculated (i.e. the corresponding volume below this surface) to obtain the number of distributed observations in that administrative unit.

Results are merged per administrative unit and uncertainty bounds are calculated as 95% confidence intervals based on the distributed number of observations (through kernel density estimations) per unit. This confidence interval is wider in less-surveyed areas and narrower in areas with several survey clusters.

The spatial distribution of the population is based on LandScan, which is used to generate the spatial distribution of the population aged 15 to 49 and the population aged 50 and over, adjusted to estimates of the total population aged 15 to 49 and 15 and older from Spectrum.[2]

The spatial distribution of HIV prevalence and people living with HIV was estimated using prevR and DHS data. Prevalence among the population 50 years and older was computed using a prevalence ratio derived from UNAIDS estimates produced using Spectrum software *(3)*.

Finally, estimates were adjusted to UNAIDS estimates of the number of people living with HIV aged 15–49 and 15 and older *(3)*. National estimates obtained by aggregating subnational estimates of the number of people living with HIV and HIV prevalence generated using this method will, therefore, match UNAIDS estimates.

UNAIDS estimates are midyear estimates. For countries with a DHS conducted during a single year, the estimates are adjusted to the same year. For countries with DHS conducted over two years, estimates are adjusted to UNAIDS estimates for the second year of the survey.

2. Population estimates were obtained through the Spectrum module DemProj. These estimates are based on the United Nations Population Division's World Population Prospects 2012. Some differences may exist between the United Nations Population Division estimates and those obtained through Spectrum. United Nations Population Division estimates are input into Spectrum, and are then adjusted within Spectrum by removing the estimated population of people living with HIV, which is then added back through the estimation process. This process is limited to the 39 high-burden countries.

The main hypotheses of this method are as follows:

- The age structure are uniform across the country.
- Population-based survey data is used only to define the shape of the prevalence surface, while the level of prevalence is defined by UNAIDS estimates.
- The spatial distribution of HIV among people aged 50 and over is equal to the spatial distribution of HIV among people aged 15 to 49.

Quality of the subnational estimates of HIV prevalence and number of people living with HIV generated through prevR

Subnational estimates are accompanied by a quality of estimates indicator and 95% confidence intervals. The estimate quality is categorized based on the following scale:

- Good: estimates are based on observations from the same subnational area.
- Moderately good: estimates are primarily based on observations from the same subnational area.
- Uncertain: estimates are primarily based on observations from a neighbouring subnational area.
- Very uncertain: estimates are based only on observations from a neighbouring subnational area.

The quality of HIV estimates at the subnational level depends on the survey sample size. DHS was designed to be representative at the national and first administrative levels, but, in most countries, not at the second administrative level beyond the DHS regions. The number of observations per subnational area varies significantly. If some subnational areas have been sufficiently surveyed, others may be underrepresented. In that case, HIV prevalence has been estimated using observations from neighbouring areas and is categorized as uncertain or very uncertain. Uncertainty estimates correspond to variations between first administrative level areas and may be inaccurate when local variations are not captured by the survey. Sources of administrative area boundaries used to determine if an observation crossed over a second-level administrative border may have errors, therefore observations near border areas need to be considered as uncertain as to their location.

Areas with a higher relative HIV prevalence (expressed as a percentage) are not necessarily those with a higher absolute number of people living with HIV (represented on the people living with HIV density map) since the spatial distribution of the population is highly irregular.

Confidence intervals complement the quality of estimates indicator. Confidence intervals only take into account that estimates of the prevalence and the number of people living with HIV aged 15–49 are based on a limited number of observations. They do not consider the spatial dimension of the estimates.

How are subnational estimates of HIV prevalence and number of people living with HIV produced using prevR related to the UNAIDS estimation process using Spectrum?

UNAIDS estimates trends of HIV prevalence over time at the national level using multiple data sources including population-based surveys. This report estimates spatial subnational variations of HIV prevalence and the number of people living with HIV for a given year based on a unique population-based survey. Furthermore, the spatial distribution of observations is taken into account here. These two approaches should be considered complementary.

Data sources

The following data were used:

- DHS/AIS (http://www.dhsprogram.com/):
  - Burkina Faso, DHS, 2010,
  - Burundi, DHS, 2010,
  - Cameroon, DHS, 2011,
  - Côte d'Ivoire, DHS, 2011–2012,
  - Ethiopia, DHS, 2011,
  - Gabon, DHS, 2012,
  - Guinea, DHS-Multiple Indicator Cluster Survey (MICS), 2012,
  - Haiti, DHS, 2012,
  - Lesotho, DHS, 2009,
  - Malawi, DHS, 2010,
  - Mozambique, DHS, 2009,
  - Rwanda, DHS, 2010–2011,
  - Senegal, DHS-MICS, 2010–2011,
  - Sierra Leone, DHS, 2008,
  - United Republic of Tanzania, Tanzania HIV/AIDS and Malaria Indicator Survey (THMIS), 2011–2012,
  - Uganda, AIS, 2011 and
  - Zimbabwe, DHS, 2010–2011;

- LandScan for the global population distribution (http://web.ornl.gov/sci/landscan/);

- Administrative boundaries:
  - Global Administration Areas (GADM) (http://www.gadm.org/)
  - Rwanda, the National Statistics Institute of Rwanda (http://statistics.gov.rw/geodata);
  - Gabon and Uganda, Global Administrative Unit Layers (GAUL) (http://www.fao.org/geonetwork/srv/en/metadata.show?id=12691)

- Background layers:
  - Google Maps API (https://www.google.com/maps)
  - OpenStreetMap (http://www.openstreetmap.org/); and

- UNAIDS 2013 HIV estimates.

Other methods for generating subnational HIV estimates

From DHS

HIV testing has been conducted by DHS since 2001, on the basis of which nationally representative estimates of HIV prevalence are produced. Estimates of HIV prevalence at the first administrative level are also produced. DHS is typically designed to be representative at the national and first administrative levels, but not at the subnational level more specific than the first administrative level. Prevalence estimates from DHS for countries that have included HIV testing in their surveys are available from the DHS website (https://dhsprogram.com/) through StatCompiler or through country reports or datasets.

Spectrum/Estimation and Projection Package (EPP)

Estimates for countries and first administrative level are generated using Spectrum/Estimation and Projection Package (EPP) based on the data available. Data sources include surveys of pregnant women attending antenatal clinics, population-based surveys, sentinel surveillance among key populations at higher risk, case reporting, programme data on antiretroviral therapy and prevention of mother-to-child transmission programmes and demographic data. The results from these models include a wide array of variables related to HIV including HIV prevalence and number of people living with HIV.

Annually, UNAIDS and its partners support country-level teams in producing national estimates using Spectrum. Every two years, UNAIDS and its partners conduct regional workshops to train national personnel on the tools and methodologies used to produce national estimates. Country-level teams are then responsible for calculating HIV estimates and projections. Regional estimates are produced separately for each region based on data only from that province *(4)*.
In several countries where data are available, including India, South Africa, Nigeria, Mozambique and Kenya, estimates have been produced at the regional level using Spectrum.

In Kenya for example, estimates were first produced at the provincial level[3] applying Spectrum/EPP by including province-level inputs. In the next step, the provincial-level estimates were disaggregated to the county level. Population projections for each province were based on the total fertility rates and mortality indicators from the Kenya DHS and adjusted to match the estimates from the national census. Population estimates for counties were taken from the National Bureau of Statistics. For each county, the prevalence was determined by examining surveillance and survey cluster data from 2003 to 2012. As stated in the report:

The prevalence estimate for 2013 for each county was multiplied by the population aged 15–49 in the county to estimate the number of [HIV-positive] adults. The number of [HIV-positive] adults in each county was adjusted so that the total across all counties in a province would equal the provincial total. Values for other indicators were first distributed by county according to the number of [HIV-positive] adults and then adjusted to match the provincial totals *(5)*.

3. Note that while the DHS/AIS were designed to inform at the level of the province, the provincial administrative level is no longer in existence in Kenya.

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2. Burgert, Clara R., Josh Colston, Thea Roy, and Blake Zachary. 2013. Geographic displacement procedure and georeferenced data release policy for the Demographic and Health Surveys. DHS Spatial Analysis Reports No. 7. Calverton, Maryland, USA: ICF International.

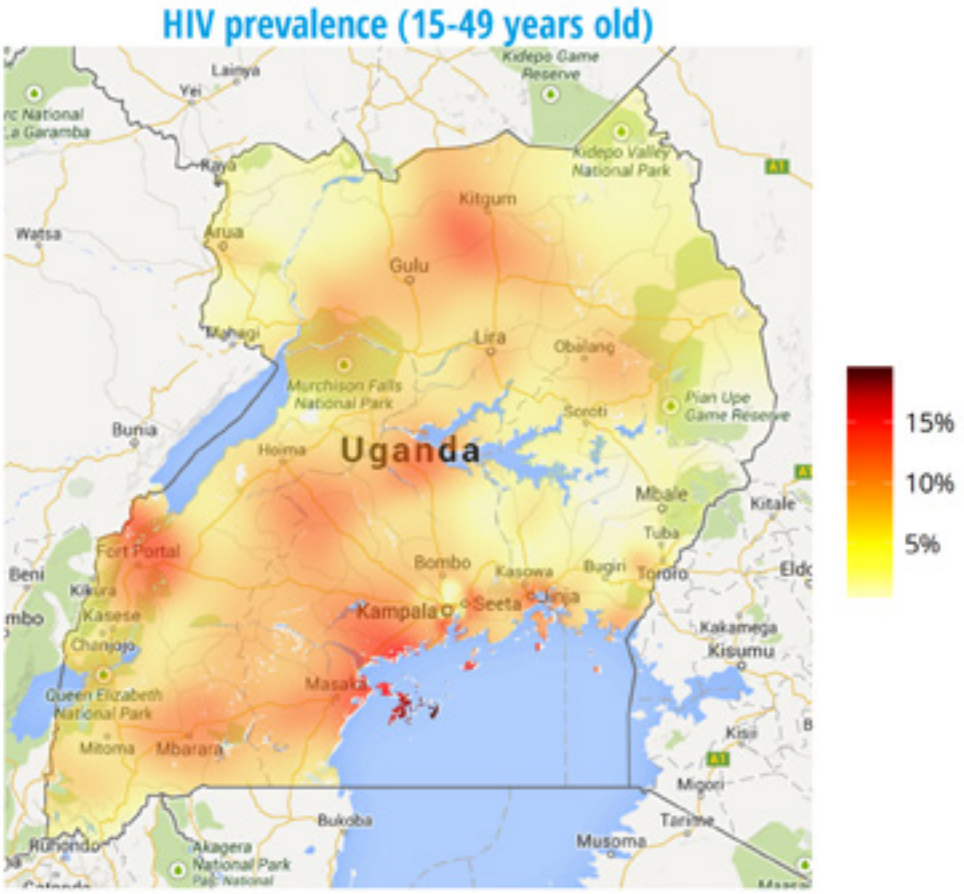
3. Methodology – understanding the HIV estimates. Geneva: Joint United Nations Programme on HIV/AIDS; 2013 (http://www.unaids.org/en/media/unaids/contentassets/documents/epidemiology/2013/gr2013/20131118_Methodology.pdf, accessed 7 July 2014).

4. Stover J, Brown T, Marston M. Updates to the Spectrum/Estimation and Projection Package (EPP) model to estimate HIV trends for adults and children. Sexually Transmitted Infections. 2012;88(Suppl 2):i11–.i16. doi:10.1136/sextrans-2012-050640.

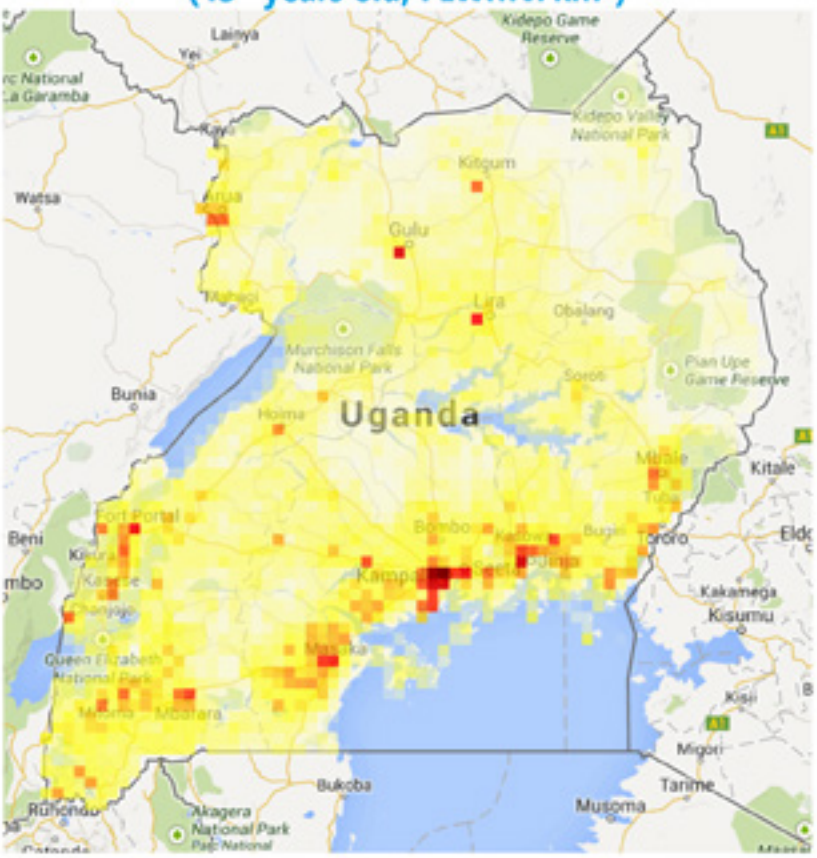
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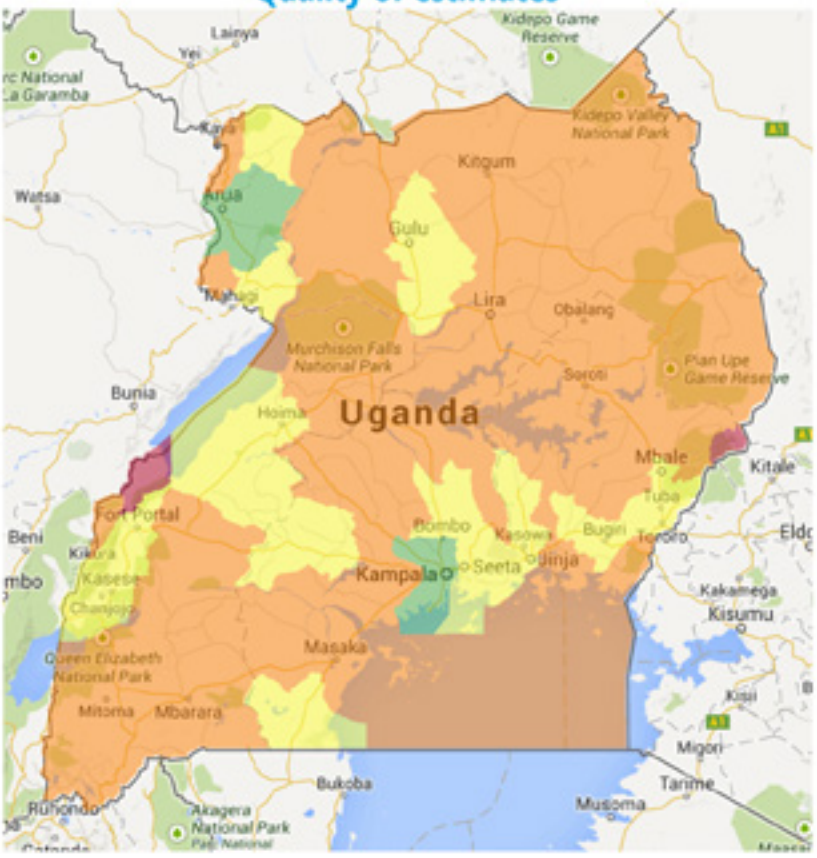
HIV estimates at district level

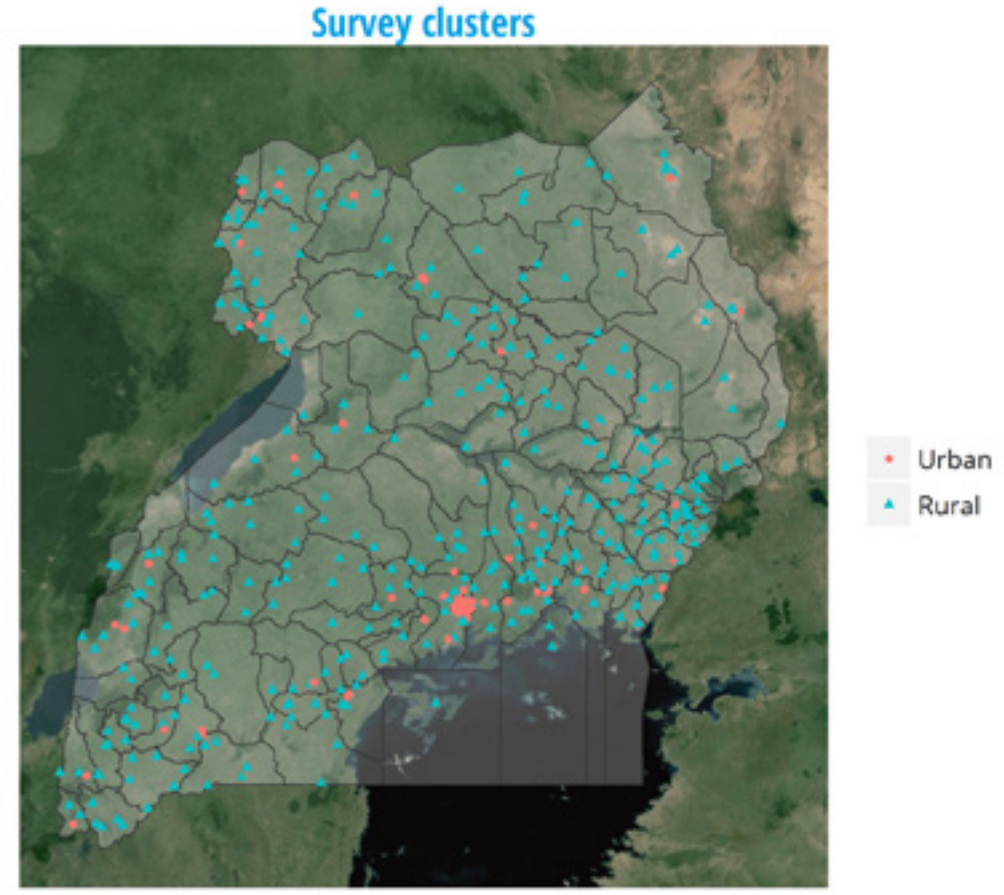


People living with HIV density (15+ years old, PLWHIV/km²)



Quality of estimates





Quality of estimates

- *Good:* estimates are based on observations from the same district.
- *Moderately good:* estimates are mainly based on observations from the same district.
- *Uncertain:* estimates are mainly based on observations from neighboring districts.
- *Very uncertain:* estimates are based only on observations from neighboring districts.

Quality of HIV estimates at district level depends on the sampling size of the 2011 Uganda AIS survey, where a total of 19 568 individuals (15-49 years old) were tested successfully for HIV in 470 survey clusters with geolocation.

Estimates per district

Region / District	HIV prevalence (15-49 years old)	People living with HIV (15-49 years old)	People living with HIV (15+ years old)	Quality of estimates
Central 1				
Bukomansimbi	10,70%	9 500	10 000	uncertain
Butambala	12,30%	6 800	7 500	uncertain
Gomba	11,70%	9 900	11 000	uncertain
Kalangala	17,80%	3 900	4 300	uncertain
Kalungu	11,80%	12 000	13 000	uncertain
Lwengo	11,00%	17 000	19 000	uncertain
Lyantonde	9,70%	4 100	4 500	uncertain
Masaka	12,00%	17 000	19 000	uncertain
Mpigi	12,30%	15 000	16 000	uncertain
Rakai	9,30%	24 000	26 000	moderately good
Ssembabule	9,70%	11 000	12 000	uncertain
Wakiso	8,10%	47 000	52 000	good
Central 2				
Buikwe	9,50%	20 000	22 000	moderately good
Buvuma	11,50%	3 100	3 400	uncertain
Kayunga	5,40%	10 000	11 000	uncertain
Kyankwanzi	10,40%	15 000	17 000	uncertain
Luwero	7,70%	17 000	18 000	moderately good
Mityana	10,60%	18 000	20 000	uncertain
Mubende	9,90%	27 000	29 000	moderately good
Mukono	9,10%	25 000	27 000	moderately good
Nakaseke	8,30%	7 300	8 000	uncertain
Nakasongola	9,90%	8 000	8 800	uncertain
East Central				
Bugiri	5,10%	8 600	9 500	moderately good
Buyende	5,50%	6 700	7 400	uncertain
Iganga	5,40%	12 000	13 000	moderately good
Jinja	8,20%	20 000	22 000	moderately good
Kaliro	4,00%	3 900	4 300	uncertain
Kamuli	4,90%	11 000	12 000	moderately good
Luuka	4,50%	5 300	5 900	uncertain
Mayuge	7,90%	16 000	18 000	uncertain
Namayingo	9,10%	8 300	9 200	uncertain
Namutumba	3,40%	3 600	4 000	uncertain

Region / District	HIV prevalence (15-49 years old)	People living with HIV (15-49 years old)	People living with HIV (15+ years old)	Quality of estimates
Kampala				
Kampala	7,70%	58 000	64 000	good
Mid Eastern				
Budaka	2,80%	2 500	2 700	uncertain
Bududa	4,20%	3 200	3 600	uncertain
Bukwo	1,30%	400	440	very uncertain
Bulambuli	4,30%	2 700	3 000	uncertain
Busia	7,00%	11 000	12 000	uncertain
Butaleja	3,40%	3 400	3 800	uncertain
Kapchorwa	4,00%	1 900	2 100	uncertain
Kibuku	2,20%	1 800	2 000	uncertain
Kween	2,60%	1 100	1 200	uncertain
Manafwa	3,70%	6 100	6 800	moderately good
Mbale	4,00%	8 400	9 300	moderately good
Pallisa	1,90%	3 100	3 400	uncertain
Sironko	4,30%	5 200	5 700	uncertain
Tororo	5,80%	14 000	15 000	moderately good
Mid Northern				
Agago	8,60%	10 000	11 000	uncertain
Alebtong	6,80%	7 000	7 700	uncertain
Amolatar	7,20%	4 400	4 900	uncertain
Amuru	7,30%	6 300	6 900	uncertain
Apac	7,20%	11 000	13 000	uncertain
Dokolo	5,90%	4 800	5 300	uncertain
Gulu	9,50%	18 000	20 000	moderately good
Kitgum	8,60%	9 300	10 000	uncertain
Kole	7,40%	7 800	8 600	uncertain
Lamwo	8,70%	6 500	7 200	uncertain
Lira	8,30%	15 000	17 000	uncertain
Nwoya	9,20%	2 400	2 700	uncertain
Otuke	7,40%	3 300	3 700	uncertain
Oyam	7,10%	12 000	14 000	moderately good
Pader	10,70%	9 500	11 000	uncertain

Region / District	HIV prevalence (15-49 years old)	People living with HIV (15-49 years old)	People living with HIV (15+ years old)	Quality of estimates
Mid Western				
Buliisa	6,50%	2 600	2 900	uncertain
Bundibugyo	8,50%	8 300	9 100	uncertain
Hoima	7,60%	17 000	18 000	moderately good
Kabarole	11,60%	26 000	29 000	moderately good
Kamwenge	7,30%	12 000	13 000	uncertain
Kasese	6,90%	23 000	25 000	moderately good
Kibaale	7,70%	20 000	22 000	moderately good
Kiryandongo	7,30%	7 500	8 300	uncertain
Kyegegwa	8,50%	6 000	6 600	uncertain
Kyenjojo	10,00%	17 000	19 000	uncertain
Masindi	6,90%	10 000	11 000	uncertain
Ntoroko	10,90%	3 500	3 900	very uncertain
North East				
Abim	7,00%	1 500	1 700	uncertain
Amudat	1,80%	710	780	uncertain
Amuria	8,40%	9 200	10 000	uncertain
Bukedea	3,50%	2 700	3 000	uncertain
Kaabong	4,30%	6 700	7 400	uncertain
Kaberamaido	5,50%	4 600	5 000	uncertain
Katakwi	7,40%	5 600	6 200	uncertain
Kotido	5,30%	3 200	3 600	uncertain
Kumi	3,00%	3 100	3 400	uncertain
Moroto	5,60%	2 700	3 000	uncertain
Nakapiripirit	2,80%	1 600	1 800	uncertain
Napak	6,40%	4 600	5 000	uncertain
Ngora	3,80%	2 400	2 700	uncertain
Serere	4,80%	5 400	5 900	uncertain
Soroti	6,20%	7 600	8 400	uncertain

Region / District	HIV prevalence (15-49 years old)	People living with HIV (15-49 years old)	People living with HIV (15+ years old)	Quality of estimates
South Western				
Buhweju	8,20%	4 300	4 800	uncertain
Bushenyi	8,50%	11 000	12 000	uncertain
Ibanda	6,80%	8 500	9 400	uncertain
Isingiro	8,90%	18 000	20 000	uncertain
Kabale	5,40%	15 000	17 000	uncertain
Kanungu	7,80%	9 500	11 000	uncertain
Kiruhura	8,70%	12 000	13 000	uncertain
Kisoro	5,70%	7 100	7 800	uncertain
Mbarara	10,60%	24 000	27 000	uncertain
Mitooma	7,00%	7 100	7 800	uncertain
Ntungamo	6,90%	17 000	19 000	uncertain
Rubirizi	7,70%	5 000	5 500	uncertain
Rukungiri	7,10%	12 000	14 000	uncertain
Sheema	9,80%	11 000	12 000	uncertain
West Nile				
Adjumani	4,50%	5 800	6 400	uncertain
Arua	5,60%	20 000	22 000	good
Koboko	4,30%	3 500	3 900	uncertain
Maracha	4,40%	4 100	4 600	uncertain
Moyo	4,30%	5 300	5 800	uncertain
Nebbi	5,70%	9 600	11 000	moderately good
Yumbe	3,10%	5 000	5 500	moderately good
Zombo	4,10%	4 400	4 800	uncertain
ALL	**7,20%**	**1 100 000**	**1 200 000**	

Uncertainty bounds

Region / District	HIV prevalence (15-49 years old)		People living with HIV (15-49 years old)		Quality of estimates
	Low	High	Low	High	
Central 1					
Bukomansimbi	4,70%	21,50%	4 200	19 000	uncertain
Butambala	4,20%	28,90%	2 300	16 000	uncertain
Gomba	6,20%	20,40%	5 200	17 000	uncertain
Kalangala	9,90%	29,50%	2 200	6 500	uncertain
Kalungu	5,90%	21,70%	6 000	22 000	uncertain
Lwengo	6,50%	17,80%	10 000	27 000	uncertain
Lyantonde	3,70%	21,70%	1 600	9 100	uncertain
Masaka	7,20%	19,30%	10 000	28 000	uncertain
Mpigi	7,20%	19,80%	8 600	24 000	uncertain
Rakai	5,40%	15,20%	14 000	39 000	moderately good
Ssembabule	5,60%	16,00%	6 400	18 000	uncertain
Wakiso	6,40%	10,20%	37 000	59 000	good
Central 2					
Buikwe	6,40%	13,70%	13 000	29 000	moderately good
Buvuma	7,00%	18,20%	1 900	4 900	uncertain
Kayunga	3,00%	9,20%	5 600	17 000	uncertain
Kyankwanzi	6,50%	16,10%	9 500	23 000	uncertain
Luwero	4,70%	12,30%	10 000	27 000	moderately good
Mityana	6,30%	17,00%	11 000	29 000	uncertain
Mubende	6,70%	14,40%	18 000	39 000	moderately good
Mukono	6,60%	12,40%	18 000	33 000	moderately good
Nakaseke	4,30%	15,20%	3 700	13 000	uncertain
Nakasongola	4,60%	19,10%	3 700	15 000	uncertain
East Central					
Bugiri	2,80%	8,90%	4 800	15 000	moderately good
Buyende	2,40%	11,70%	2 900	14 000	uncertain
Iganga	3,00%	9,30%	6 900	21 000	moderately good
Jinja	5,30%	12,40%	13 000	31 000	moderately good
Kaliro	1,20%	10,90%	1 200	11 000	uncertain
Kamuli	2,90%	7,90%	6 700	18 000	moderately good
Luuka	2,10%	9,20%	2 400	11 000	uncertain
Mayuge	5,10%	11,90%	10 000	25 000	uncertain
Namayingo	4,50%	16,90%	4 100	16 000	uncertain
Namutumba	1,10%	9,20%	1 100	9 800	uncertain

Region / District	HIV prevalence (15-49 years old)		People living with HIV (15-49 years old)		Quality of estimates
	Low	High	Low	High	
Kampala					
Kampala	6,50%	9,00%	49 000	68 000	good
Mid Eastern					
Budaka	0,60%	9,50%	550	8 200	uncertain
Bududa	1,20%	12,00%	910	9 200	uncertain
Bukwo	0,00%	24,30%	0	7 600	very uncertain
Bulambuli	1,30%	11,90%	800	7 300	uncertain
Busia	3,40%	13,50%	5 200	21 000	uncertain
Butaleja	1,30%	8,00%	1 300	8 000	uncertain
Kapchorwa	0,50%	16,40%	260	7 800	uncertain
Kibuku	0,40%	8,40%	310	6 800	uncertain
Kween	0,10%	15,40%	60	6 600	uncertain
Manafwa	1,70%	7,60%	2 800	13 000	moderately good
Mbale	2,20%	6,90%	4 700	15 000	moderately good
Pallisa	0,60%	5,20%	980	8 500	uncertain
Sironko	1,70%	10,00%	2 000	12 000	uncertain
Tororo	3,60%	9,20%	8 700	22 000	moderately good
Mid Northern					
Agago	4,00%	16,90%	4 600	20 000	uncertain
Alebtong	3,00%	13,90%	3 100	14 000	uncertain
Amolatar	3,20%	15,00%	1 900	9 100	uncertain
Amuru	3,60%	13,70%	3 100	12 000	uncertain
Apac	4,30%	11,60%	6 800	18 000	uncertain
Dokolo	2,50%	12,70%	2 000	10 000	uncertain
Gulu	6,10%	14,40%	12 000	27 000	moderately good
Kitgum	3,30%	19,40%	3 600	21 000	uncertain
Kole	3,90%	13,30%	4 100	14 000	uncertain
Lamwo	3,50%	19,20%	2 600	14 000	uncertain
Lira	4,60%	14,30%	8 400	26 000	uncertain
Nwoya	5,40%	15,10%	1 400	3 900	uncertain
Otuke	2,70%	17,30%	1 200	7 700	uncertain
Oyam	4,20%	11,70%	7 200	20 000	moderately good
Pader	5,80%	18,60%	5 200	16 000	uncertain
Mid Western					

Region / District	HIV prevalence (15-49 years old)		People living with HIV (15-49 years old)		Quality of estimates
	Low	High	Low	High	
Buliisa	2,30%	15,80%	910	6 300	uncertain
Bundibugyo	3,40%	18,30%	3 300	18 000	uncertain
Hoima	4,80%	11,90%	10 000	26 000	moderately good
Kabarole	8,00%	16,40%	18 000	37 000	moderately good
Kamwenge	4,00%	12,60%	6 700	21 000	uncertain
Kasese	4,60%	10,30%	15 000	34 000	moderately good
Kibaale	4,90%	11,70%	13 000	30 000	moderately good
Kiryandongo	3,50%	14,20%	3 600	14 000	uncertain
Kyegegwa	4,10%	16,40%	2 900	12 000	uncertain
Kyenjojo	6,20%	15,70%	10 000	27 000	uncertain
Masindi	3,50%	12,60%	5 300	19 000	uncertain
Ntoroko	4,40%	23,40%	1 400	7 600	very uncertain
North East					
Abim	2,00%	19,40%	430	4 200	uncertain
Amudat	0,00%	24,40%	0	9 900	uncertain
Amuria	4,90%	13,60%	5 500	15 000	uncertain
Bukedea	1,30%	8,30%	1 000	6 400	uncertain
Kaabong	1,00%	13,60%	1 600	21 000	uncertain
Kaberamaido	2,50%	11,00%	2 100	9 200	uncertain
Katakwi	3,90%	13,30%	2 900	10 000	uncertain
Kotido	1,30%	16,30%	770	10 000	uncertain
Kumi	1,20%	6,80%	1 200	7 200	uncertain
Moroto	1,00%	20,00%	480	9 800	uncertain
Nakapiripirit	0,50%	10,90%	270	6 300	uncertain
Napak	2,60%	13,90%	1 900	9 900	uncertain
Ngora	1,30%	9,40%	850	6 100	uncertain
Serere	2,30%	9,20%	2 600	10 000	uncertain
Soroti	3,30%	11,10%	4 000	14 000	uncertain
South Western					

Region / District	HIV prevalence (15-49 years old)		People living with HIV (15-49 years old)		Quality of estimates
	Low	High	Low	High	
Buhweju	3,30%	18,00%	1 700	9 500	uncertain
Bushenyi	4,20%	16,00%	5 500	21 000	uncertain
Ibanda	2,40%	16,50%	3 000	21 000	uncertain
Isingiro	5,00%	15,00%	10 000	30 000	uncertain
Kabale	2,50%	11,00%	7 000	31 000	uncertain
Kanungu	3,80%	15,00%	4 600	18 000	uncertain
Kiruhura	5,30%	13,90%	7 100	19 000	uncertain
Kisoro	1,40%	17,10%	1 800	21 000	uncertain
Mbarara	6,80%	16,10%	15 000	37 000	uncertain
Mitooma	2,60%	16,30%	2 600	17 000	uncertain
Ntungamo	3,80%	12,20%	9 200	29 000	uncertain
Rubirizi	3,20%	16,40%	2 100	11 000	uncertain
Rukungiri	3,70%	12,70%	6 600	22 000	uncertain
Sheema	4,90%	18,10%	5 600	21 000	uncertain
West Nile					
Adjumani	1,90%	9,50%	2 500	12 000	uncertain
Arua	3,90%	8,10%	14 000	29 000	good
Koboko	1,30%	11,60%	1 100	9 400	uncertain
Maracha	1,50%	11,10%	1 400	10 000	uncertain
Moyo	1,50%	10,50%	1 900	13 000	uncertain
Nebbi	3,10%	10,00%	5 300	17 000	moderately good
Yumbe	1,40%	6,60%	2 200	11 000	moderately good
Zombo	1,40%	10,00%	1 500	11 000	uncertain
ALL	**6,80%**	**7,60%**	**1 100 000**	**1 200 000**	

Guidance

Please refer to the methodology note on Developing subnational estimates of HIV prevalence and the number of people living with HIV available on http://www.unaids.org.

Data sources

- AIS Uganda 2011 (http://www.dhsprogram.com/)
- 2013 UNAIDS estimates computed with Spectrum/EPP (http://www.unaids.org/en/dataanalysis/datatools/spectrumepp2013/)
- LandScan 2012 for global population distribution (http://web.ornl.gov/sci/landscan/)
- GAUL for administrative boundaries (http://www.fao.org/geonetwork/srv/en/metadata.show?id=12691)
- Google Maps API for background layers (https://www.google.com/maps)

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This report has been written for UNAIDS by Joseph Larmarange (IRD / Ceped) in July 2014.

The Joint United Nations Programme on HIV/AIDS (UNAIDS) leads and inspires the world to achieve its shared vision of zero new HIV infections, zero discrimination and zero AIDS-related deaths. UNAIDS unites the efforts of 11 UN organizations—UNHCR, UNICEF, WFP, UNDP, UNFPA, UNODC, UN Women, ILO, UNESCO, WHO and the World Bank—and works closely with global and national partners to maximize results for the AIDS response. Learn more at unaids.org and connect with us on Facebook and Twitter.

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