UNAIDS Geospatial HIVE-Map Model Meeting - July 2017 10-12th July 2017, The Capital 20 West, Johannesburg, South Africa

Participants

- Presenters and Facilitators: Samir Bhatt (Imperial College London), Pete Gething (Oxford University), Jeff Eaton (Imperial College London), Steve Gutreuter (US Centers for Disease Control and Prevention CDC), Sabrina Lamour (Imperial College London), Mary Mahy (UNAIDS Headquarters), Amala Reddy (UNAIDS SA), Tim Fowler (US Census Bureau)
- Malawi Team: George Bello (Ministry of Health MoH), Evelyne Kim (CDC), Andrew Mganga (MOH), Masauso Nzima (UNAIDS– Malawi), Danielle Payne (CDC), Lonjezo Sithole (National AIDS Commission)
- South Africa Team: Sarah Girdwood (Health Economics and Epidemiology in South Africa HE²RO), Lise Jamieson (HE²RO), Leigh Johnson (University of Cape Town), Takura Kupamupindi (ICAP Columbia University), Patrick Nadol (CDC), Brooke Nichols (HE²RO)
- Zambia Team: Kumbutso Dzekedzeke (ICAP), Peter Funsani (MoH), Heston Phillips (UNAIDS– Zambia), Mwiche Siame (MoH)
- Zimbabwe Team: Boaz Chelegut (UNAIDS), Janet Dzangare (National AIDS Council of Zimbabwe-NAC), Mutsa Mhangara (USAID), Brilliant Nkomo (MOH), Amaka Nwankwo-Igomu (CDC), Isaac Taramusi (NAC)
- Apologies: Patrick Amanzi (Zambia MoH), Soka Nyirenda (Zambia MoH), Romy Overmeyer (South Africa NDoH), Athena Pantazis (US Census Bureau), Petro Ruosso (SANA)

Objectives

The aim of this meeting was to further develop the geospatial HIVE model for countries and discuss the key results from this model, that can improve the granular understanding of the HIV epidemic. Specific objectives of the meeting were to review the following items:

- Current data sources and forthcoming surveys for subnational modelling
- Interim subnational results and of the HIVE-map model for Malawi, South Africa, Zambia and Zimbabwe
- Use, interpretation and dissemination of HIVE-map results
- Future method development and application of the HIVE-map model for countries

Associated Material

All slides presented at the meeting (including preliminary results, comparisons between HIVE results and alternative modelling methods, country team presentations, and timelines for model review, and approvals and development) are located in a shared folder, accessible to meeting participants only. Please contact <u>estimates@unaids.org</u> for further information.

Summary

Following welcoming remarks from Amala Reddy, regional UNAIDS strategic information adviser, Mary Mahy provided a brief introduction explaining the relationship between previous sub-national estimates, the HIVE model and the Spectrum results. She emphasized that UNAIDS is supporting countries to move to the HIVE model results for their national strategic plans and for US Government country operation plans in 2018.

Pete Gething and Samir Bhatt presented an overview of geospatial modelling with the HIVE-Map. The HIVE-Map model uses data from surveys and routine HIV service delivery data, geographic coordinates and additional demographic and geographic data sources that appear correlate with the HIV epidemic, to generate a range of key HIV indicators at varying degrees of subnational levels (for ages 15 years and above), which can be used for effective HIV monitoring and strategic targeting of intervention programmes. Currently, the following indicators were available as outputs from the HIVE-Map:

- HIV prevalence at the district level and 5x5 km resolution (by age and sex)
- Number of people living with HIV (PLHIV) at the district level (by age and sex)
- Coverage of antiretroviral therapy (ART) at the district level (by age and sex)
- Number of new infections by relative transmission risk at the district level (by age and sex)

The preliminary country results from the HIVE-Map Model were presented, which were positively received by participants. Several members expressed that the HIVE results appeared to confirm similar results from alternative data sources, i.e. prevalence estimates from surveys or other modelling methods, which they stated helped "build confidence" in the model that would favour wider use.

It was emphasised that the "numbers of new infections by relative risk" generated by the HIVE-model were modelled estimates that sought to geographically distribute within each country the number of new infections as estimated by Spectrum/EPP (or the Thembisa model for South Africa), with the distribution driven by the relative risk of transmission based on ART coverage and PLHIV. Thus, geospatial estimates of new infections derived in the way make the simplifying assumption that geographical variation in incidence is driven by the existing distribution of virally unsuppressed infected individuals. This approach does not capture the effect of other drivers of change in incidence, such as behavioural or wider intervention factors. The consensus was that countries would still find it useful to have this number, but that the estimates should be carefully described in the results documents so all appropriate interpretation and caveats are clearly presented.

Steve Gutreuter gave an overview of the Small Area Estimates (SAE) method, which is based on survey data from specific years. He showed preliminary comparisons between SAE and HIVE results for multiple countries (including SAE estimates based on the recent PHIA results for two countries, versus HIVE-Map results that had not incorporated the PHIA yet). He demonstrated that for the majority of districts, results were highly comparable between the methods and that the confidence intervals were generally narrower for the HIVE-Map results. It was recognised that the wide heterogeneity often observed in ART coverage data has implications on estimates from the HIVE-MAP model and other modelling tools. It was suggested that this heterogeneity may obscure underlying correlations between ART coverage and viral load suppression, and increased efforts need to be made to improve data collection for numbers on ART.

Further presentations and discussions followed on the data sources used for this round of HIVE results, including on routine data and survey data that were included in the model. It was noted that the presented results were still based on 2016 Spectrum country files. Results would thus be updated with the 2017 provincial files (or national files if no provincial files are available) for the next round of HIVE results. Countries provided updates on upcoming surveys and timings for expected results (see country presentations). It was acknowledged that certain tuberculosis surveys that are underway in some countries also contain information on HIV indicators and should be considered as data source. Other data clarifications, missing data and data discrepancies were also followed up with the country teams individually, in order to maximally utilise the most current data available for each country for the estimates. The release and use of the PHIA results were also discussed. All partners agreed to continue discussions around how these data may be made available for the HIVE model as early as possible.

The importance and impact of subnational modelling was highlighted, where countries presented a wide range of uses for subnational model estimates (see presentations). Estimates were being used for resource allocation, planning for government policy and programmes, identifying/prioritising specific areas for interventions, preparation and target setting for Country Operational Plans (COP16, COP17, etc.) with PEPFAR, funding applications (e.g. Global Fund) and for advocacy to policy-makers.

The meeting ended with group discussions on ways to improve model use and implementation, dissemination of results, and on identifying policy questions which subnational modelling could help answer. A summary of the suggestions, as well as proposed timelines for the HIVE-Map estimation process, have been summarised below.

Suggestions for longer-term HIVE-Map Model Development

- Incorporation of migration fluxes between districts (and potentially also bordering countries in some cases), where such data are available
- Incorporation of socio-economic indicators
- Incorporation of behavioural components (e.g. male circumcision and condom use)
- Model could include an indicator for viral load suppression, to be presented alongside ART coverage results
- In addition to indicators by district, results for major metropolitan areas (e.g. capital cities) could also be presented
- The model should aim to additionally include paediatric estimates

Changes to Country Profile PDF Summaries

- Introductory page
 - Addition of a map with general geographic information of the country to the first page (e.g. terrain, major cities, major roadworks)
 - Age boundaries to be revised for the indicators listed in Box 1 (prevalence for 15-49 years only, i.e. indicators on PLHIV and ART coverage for age 15+, taken directly from Spectrum files)
 - Numbers of PLHIV, on ART and new infections to be rounded up (using standard UNAIDS method for approximation)
- Figures
 - For ART Coverage, colour scale should be reversed, so that red highlights with greatest need (i.e. lowest coverage) and green is where coverage is the highest
 - Maps to be labelled with districts names (e.g. each district labelled with number and then listed in map legend)
 - Boundaries for provinces to be thickened on the maps, to help identify which province each district belongs to
 - Include time element in report
 - Potential additional figure: a page showing just one large map of HIV prevalence (5x5 km resolution) overlaid with various additional information, e.g. geographical terrain (including major water bodies), road networks, antenatal clinics (ANC) and other health facilities, major cities, and district names
- Key Indicators
 - Improved explanation (and/or renaming) of the "new infections by relative risk" indicator (see Recommendations section for latest update on this metric)

- Tables
 - Reword "top 5/bottom 5" in Tables 1 & 2 as "districts with highest/lowest..."
 - Final tables (3 & 4) to include a column listing province, and district should be grouped within their respective provinces
 - Rearranging of final summary tables, as follows: i) PLHIV and Prevalence, ii) ART coverage (and VLS once available), and iii) Incidence (new infections) and Incidence Rate
 - Numbers of PLHIV, on ART and new infections to be rounded up (using standard UNAIDS approximation)
- Supplementary information
 - Present maps/tables of covariates used in model, highlighting those that were the most predictive for HIV indicators, for each country
 - Present maps/tables of behavioural indicators, e.g. condom use or male circumcision, to help understand the drivers of the epidemic
 - Include tables of all key indicators for different age boundaries, e.g. 15-49 years, 15+ years and potentially also 15-24 years

Use of Model and Results Dissemination

- Brochures and posters for quick sources of information and advocacy
- Complete breakdown of all result indicators by age, gender and year (e.g. in a report or in a spreadsheet file) for each district, for data querying.
 - This would also include a complete disclosure of all the covariates and data sources used in the model
- The desire for both online and offline platforms of the HIVE-MAP model was expressed by most country participants, e.g. similar to google maps which can be zoomed in/out and ideally with interactive functionalities (e.g. adjusting ART coverage levels and seeing projected changes in incidence).

Timelines for HIVE-Map Estimates

Short term

- July 30 Any outstanding data to modelers, final 2017 Spectrum files to modellers
 0 15 August PHIA data, otherwise we move ahead without
- 25 August Draft reports to countries
- 5 September Countries review and provide any final queries to modelers
- 15-26 September Request from UNAIDS to approve results from countries
- End September HIVE data available for impact reporting

Midterm

- Early December update Spectrum results
- January update HIVE
- February Use HIVE data for COP planning
- Ongoing Use HIVE data for national strategic plans

Long term

- Countries
 - Find methods for systematically and seamlessly extracting data from DHIS
 - Improve age and sex data from DHIS

- Modellers
 - Investigate incorporation of additional variables
 - Ongoing method development and improvement
 - Improve possibility of online access to software

Recommendations and Action Items

For Countries

- All countries to continue advocating data release of from their PHIA surveys for use in HIVEmap modelling (submit to HIVE team by 15th July 2017)
- All countries to deliver outstanding data requested by the modelling teams, and review results maps to provide their final approvals by end September 2017

For HIVE-Map Modelling Team

- Method Development
 - Sam Bhatt and Pete Gething will ask OGAC (Office of the U.S. Global AIDS Coordinator and Health Diplomacy) for country-approved shape files for consistency (July 2017) Update 18-Jul-17: OGAC shape files have been handed to HIVE modelling team
 - Incorporation of latest data, including 2017 Spectrum files and any other new data (by 30 July 2017 inclusion of PHIA results if submitted before 15 August 2017)
 - Long-term developments include investigating the incorporation of additional variables such as Viral Load Suppression, behavioural data, and continual model developments (including the possibility of online/offline access to software)

• Presentation and Dissemination of Results

• HIVE-Map team to agree on how to best explain and/or rename the incidence-related indicators (i.e. new infections by relative risk) and update accordingly in their results documents

Update 09-Aug-17: To avoid over-interpretation of these estimates, the HIVE-Map team and the UNAIDS Reference Group have recommended that the estimated metric be labelled as "Relative Incidence Risk", and be provided as a normalized metric on a relative scale between zero and one. This maintains the utility of the estimates in distinguishing geographical relative variation within countries and identifying changes through time, but makes it explicit that the estimates should not be interpreted as an absolute quantification of the number of new cases arising in each location.

- Presentation and interim results to be shared with meeting participants in a shared folder, accessible online to meeting all meeting participants. Update 17-Jul-17: All slides and preliminary results and country profile reports are accessible to meeting participants in shared Dropbox folder (see Associated Material)
- Sabrina Lamour to generate and share revised country profile pdf documents with updated results and incorporation the document changes listed previously (drafts to be sent to countries by August 2017)
- Final results will be published and available for impact reporting end September 2017 (method of results dissemination is currently under review)