Method Development for the UNAIDS Estimates: May 2017

Report and Recommendations from the Spring Meeting of UNAIDS Reference Group on Estimates, Modelling and Projections

Geneva, Switzerland, 16-17 May 2017

REPORT & RECOMMENDATIONS

The meeting of the UNAIDS Reference Group on Estimates, Modelling and Projections was organised for UNAIDS by the secretariat of the Reference Group (www.epidem.org) based at Imperial College London. Participants of the meeting are listed at the end of this document.

Introduction

The UNAIDS Reference Group on Estimates, Modelling and Projections exists to provide impartial scientific advice to the Joint United Nations Programme on HIV/AIDS (UNAIDS) 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 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 at Imperial College London. The work of the Reference Group occurs in coordination with other groups including the European Centre for Disease for Disease Prevention and Control (ECDC), the Measurement and Surveillance of HIV Epidemics (MESH) Consortium, the United States Center for Disease Control and Prevention (US CDC), the Institute for Health Metrics and Evaluation (IHME), and the ALPHA Network, among others.

Aim of the meeting

The general purpose of the Reference Group meetings is to support the further development and refinement of the current methods used to generate UNAIDS Global Estimates of HIV (i.e. Spectrum modelling software packages, used by countries to generate estimates), as well as address other research and development issues that are relevant to the Reference Group. For this meeting, the objectives were as follows:

1. To provide technical recommendations for updates for Spectrum 2018, following feedback from UNAIDS 2017 Estimates
2. To review and discuss method development surrounding the Reference Group core theme areas, namely:
    - Continuous Update and Improvement
    - Age-structured models
    - Use of case-report and mortality data
    - Use of program service data
    - Spatially-specific estimates
    - Catalyse focused research and data collection

Outline

The UNAIDS Reference Group Spring Meeting 2017 was held at the UNAIDS Headquarters in Geneva, Switzerland, on the 16th and 17th May 2017. The meeting featured presentations combined with group discussion to generate consensus recommendations. The program was divided into the following sessions:

    I. Country Estimates and Software Updates
    II. Software Updates and Incidence Estimation using EPP
    III. Use of Program Data
    IV. Use of Population Survey Data
    V. Estimating the Need for Prevention of Mother-to-Child Transmission (PMTCT) Intervention
    VI. Spatial-specific Estimates
    VII. Estimating Trends in Incidence in Young People

This report includes summaries of the presentations and discussions for each session. Links to the presentations are available to UNAIDS Reference Group members on the May 2017 Meeting page, on the Reference Group website (for non-members, please contact the project manager). The final recommendations and action items can be found towards the end of this report, which have been categorised according to the core theme areas, mentioned above.

The recommendations drafted at Reference Group meetings give UNAIDS guidance on how best to calculate estimates of the HIV epidemic on populations, provide an opportunity to review current approaches, as well as help to identify which data are needed to inform those estimates. Earlier reports are published on the Reference Group website (www.epidem.org), which include further information on the different modelling tools described in this report. Such transparent processes aim to allow the statistics and reports published by UNAIDS and partners to be informed by impartial, scientific peer review.

The list of participants and meeting agenda are included in Appendix I and Appendix II, respectively.

Session I. Country Estimates and Software Updates (AEM and CSAVR)

Mary Mahy presented an overview of the 2017 UNAIDS estimates on a global scale and for generalised epidemics. The overall impact, challenges and uptake of the newly added features in the current Spectrum and Estimation and Projection Package (EPP) software (further outlined below) by different countries were highlighted. Keith Sabin subsequently provided feedback for use of the AIDS Epidemic Model (AEM) in Asia. He stated this year's estimates were generally well received by countries, though explained that certain challenges remain to be addressed, including the modelling of nosocomial infections amongst children and of returning migrant populations, that had been deported due to HIV infection. He also raised the issues of discrepancies in antiretroviral therapy (ART) distribution based on CD4 cell count criteria, which significant impact on associated mortality results. The Reference Group agreed that these challenges should be addressed and suggested that data from the IeDEA (International Epidemiology Databases to Evaluate AIDS) network, IHME (Institute for Health Metrics and Evaluation), the literature, etc. may prove useful in re-evaluating mortality rates relative to CD4 cell counts.

Lastly, Kim Marsh gave feedback from the countries in Latin America, the Caribbean and Middle East and North Africa, many of which used the Spectrum CSAVR (case surveillance and vital registration) incidence fitting tool. Kim presented recent CSAVR updates (e.g. the addition of a single logistic regression curve for incidence curve fitting in growing epidemics), and the progress and remaining challenges in incidence estimates, including the current limitations of the inputting the lag year between HIV infection and diagnosis. The Reference Group supported the view that this process should be automated in Spectrum.

Session II. Software Updates (Spectrum and EPP) and Incidence Estimation using EPP

Multiple features have been implemented in the current software version, used for the 2017 country estimates (please refer to the November 2016 meeting report for more details). For Spectrum, these have included the fitting of the age-structured incidence rate ratio (IRR) adjustments, which have helped improve fits to prevalence by age (particularly for young women), and Spectrum's overestimation of coverage for prevention of mother-to-child transmission of HIV (PMTCT) programs. Other updates include the HIV modelling tool from the European Centre for Disease Prevention and Control (ECDC) as an additional input for measuring incidence, a tool to extract data from District Health Information Software (DHIS2) into Spectrum, and another package that extracts all the indicators from Spectrum required for Global AIDS Monitoring (GAM). John Stover also presented plans for upcoming CSVAR developments, due to be implemented in the coming months.

For EPP, newly added features included implementation of the age-sex model (ASM) for generalised epidemics, incorporation of routine antenatal program data (ANC-RT) and of cohort-based incidence assay measures, addition of variance inflation, and the hierarchical model. Tim Brown described some of the technical issues that are currently being worked on, and described plans for method development, including work to support web-based Spectrum/EPP application, the next phase of the ASM model (see session V) and software maintenance.

Jeff Eaton gave an overview of EPP model assumptions and the restrictive flexibility of r(t) for the R-spline and R-trend curves, due to several factors, e.g. limited number of cubic splines and the use of equilibrium prior (particularly for future trends). Jeff and Tim Brown presented preliminary results for exploratory studies without equilibrium prior and the use of increased number of splines. The Reference Group recommended that a working group is to be established, to further investigate r(t) improvements, including methods to replace the use of equilibrium prior, and approaches to increase model's responsiveness to recent data. It was also agreed that further investigations should be pursued for EPP to include inputs from other incidence tools, e.g. CSAVR.

Session III. Use of Program Data

Eby Pascal outlined the UNAIDS guidance for use of ANC-RT data, given to countries for the 2017 estimates, though acknowledged that further support was required to improve the evaluation of ANC-RT data quality by countries. Kennedy Mutai provided his perspective on the use of ANC-RT data in Kenya's latest estimates and highlighted the challenges of evaluating data inconsistencies e.g. handling incomplete data and potential biases associated with missing data. Jeff Eaton explained the current limitations in using ANC-RT data, particularly those with variable data quality and low number of data points. He presented an approach to improve assessment of data quality though use of coverage diagnostic plots, which he proposed could be automatically generated in EPP/Spectrum. Such diagnostics would require additional indicator inputs (total number of the visits to their first antenatal clinic - ANC1, number of ANC1 tested, number of known HIV+, number of tested HIV+, number already on ART). The Reference Group supported that these indicators and diagnostic plots should added to EPP/Spectrum. UNAIDS also proposed that the 2017 country data files should be reviewed for potential data quality discrepancies.

Session IV. Use of Population Survey Data

Joy Fishel introduced the procedures for survey design and HIV testing used by the Demographic Health Survey (DHS) programs, which included sample design, weighting methods, and representative response rates to the surveys. DHS testing algorithms have recently changed, which now additionally include a third confirmatory test to improve specificity for HIV diagnosis, yet this poses implications on comparability with older DHS data. Joy explained that a Bayesian latent class analysis is currently being undertaken (by Mathieu Maheu-Giroux), to estimate parameters for the sensitivity and specificity of the two EIAs in surveys without a confirmatory assay to calculate an adjusted HIV prevalence. The Reference Group supports this work and anticipate the results of this work for the next Reference Group Fall meeting.

Jessica Justman presented the survey designs of Population-based HIV Impact Assessments (PHIA's) that are currently underway. Jessica showed preliminary comparisons between DHS and PHIA prevalence results, which were comparable. In the case for Zimbabwe, presented by Isaac Taramisu, HIV prevalence and incidence from PHIA's were generally lower than DHS results.

The Reference Group acknowledged the multiple differences in the methods and analyses between the PHIA and DHS programs (e.g. in weighting schemes, survey roster composition, testing algorithms, quality assurance testing, etc.), and supported the view that these variances should be retained in the modelling process. Discussions followed on how to best treat data from these two survey programs in Spectrum/EPP, whereby the reweighting of PHIA data to match DHS weighting methods was not recommended for country estimates. It was agreed that three approaches should be investigated, namely:

- To handle PHIA and DHS data as separate data categories
- To have PHIA and (earlier) DHS data in the same data input category (as both are household data). Variance for each may be inflated based on differences apparent in the PHIA and DHS surveys that took place concurrently in the same location
- To investigate the individual characteristics of people interviewed in each survey to predict participation in either PHIA or DHS, or non-participation, and evaluate potential response bias (Emma Slaymaker)

Session V. Estimating the need for PMTCT Intervention

Mary Mahy and John Stover explained that the estimates from the current version of Spectrum now better match prevalence in pregnant women and in children from survey data. However, Spectrum continues to estimate implausibly high coverage for prevention of mother-to-child transmission of HIV (PMTCT) programs for some countries, despite recent improvements through adjustments in age- and sex-specific incidence rate ratios. They explained that the overestimation of PMTCT coverage can be partially rectified through removal of HIV-associated reductions in fertility, by setting fertility rate of HIV+ pregnant women equal to those of

non-infected women (i.e. FRR set to 1), yet this phenomenon seems contrary to the current understanding of the epidemic.

Indeed, Milly Marston presented further evidence for subfertility in HIV+ women being linked with changes in their sexual behaviour. These were, in turn, associated with a variety of factors, including marked differences between urban and rural residencies, and across regions, and variations in PMTCT coverage and ART retention.

Jeff Eaton present latest developments in the age-sex model (ASM), and included modelling at a subnational level, and proposals to replace the bias parameter currently used for ANC-RT prevalence in EPP to with a parameter to scale age-specific fertility rate ratio (FRR) in Spectrum. He also presented preliminary results for incorporating age-specific mortality trends, compared with UNAIDS 2016 estimates, yet outlined that the latest method developments in ASM may further add computational burden to the current software.

Following discussions, it was recommended that the effect of subfertility would be removed across all countries for the 2017 estimates, for consistency purposes and that Avenir Health would develop methods to adjust scaling FRRs to improve matches with HIV prevalence in pregnant women and ANC-RT data. Additionally, it was recommended that further investigations on the usefulness and feasibility of novel adjustment procedures to address HIV subfertility should be undertaken, such as scaling FRR in fitting process. Furthermore, it was agreed that Jeff Eaton would a demonstrate a comprehensive investigation across multiple countries, showing the benefits and feasibility of the ASM approach, at the next Reference Group meeting, including the incorporation of age/sex-specific adult mortality (ASM phase II).

Session VI. Spatially-specific Estimates of HIV

Sam Bhatt described the progress that has been made with the geospatial model (i.e. the HIVE model) with regards to method development and use-cases. Recent updates have included the convergence of the facility and survey geospatial models, further investigations in the catchment model, additional country results, and the proposal of 'results packs' for countries. The current proposal consisted of a 9-page document, comprised of a short briefing of the geospatial model and a series of maps and tables on key indicators for HIV estimates by district. Suggestions to improve the document were given, including the addition of a disclosure of model assumptions, and discussions on selecting the most relevant indicators for countries e.g. HIV prevalence versus number of people living with HIV (PLHIV).

Ray Shiraishi gave an overview of the Small Area Estimates (SAE) model, used by CDC, which is based on HH data only. John Stover's subsequently gave an overview on Spectrum's spatial disaggregation process of provincial estimates to district level, which makes use of several indicators, including prevalence levels from the geospatial model, SAE and prevR. Kennedy Mutai and Isaac Taramisu presented comparisons of estimates generated from the various subnational modelling methods for Kenya and Zimbabwe, respectively, indicating considerable heterogeneity across methods. They also expressed the desire for HIV estimates below the district-level, to better aid program management in countries, e.g. for ART distribution.

The Reference Group recommended that continued engagement with countries and program managers is required by modelling teams, to help identify outputs most useful to countries. Further comparisons between the different subnational modelling strategies should also be undertaken to improve model development and help reach a consensus. It was also recommended that the subnational estimates working group would continue to address technical aspects required for the geospatial model development and focus on the defined use cases (e.g. incidence rank order, ART coverage, program allocation, etc.). The Reference Group recognised that a long-term plan for deployment, use and continued development of these methods is still in progress.

Session VII. Estimating Trends in Incidence in Young People

Tim Hallett and Mary Mahy described the challenges in measuring incidence particularly in young people, including in adolescent girls and young women (AGYW). The Reference Group acknowledged that several

approaches are being deployed to estimate HIV incidence, which make use routine program and surveillance data. Multiple of the studies that are underway are also intended to contribute to the evaluation of the DREAMS, an initiative set up by PEPFAR/USAID to reduce HIV incidence by 40% among AGYW in the 10 DREAMS countries by end-2017. These data themselves are challenged by the time period for an effect to develop and to be observed in measures of HIV prevalence, and the biases that arise from reductions in HIV risk, also affecting the composition of the sample observed at antenatal clinic.

Ray Shiraishi presented the current activities by the Centers for Disease Control and Prevention (CDC) in measuring incidence in AGYW, including three approaches that have been underway, following a consultation on measuring HIV Incidence among Key Populations in Resource-Limited Settings: the HIV testing history (Fellows et al, 2015), the CD4 depletion model (Song et al, 2017; Szwarcwald et al 2016), and Osmond's Method (van Griensven 2010; Kurth et al, 2015). He also gave a brief overview of the DREAMS initiative and survey designs, data management and analyses, and project timelines. Sam Bhatt followed by presenting the potential application for the geospatial model for DREAMS evaluation, and demonstrated results for incidence rate changes between DREAMS and non-DREAMS districts.

The Reference Group recognised that different approaches, that are to be used to estimate HIV incidence, are based on combinations of individual-level data on prevalent HIV infection and HIV testing history, each with various methodical challenges (e.g. reporting and recall biases, and the precision of a likely estimate). It was also acknowledged that the presented application of the geospatial model does not give an estimate of the measures in the magnitude of incidence changes in DREAMS sites. Nevertheless, the model may indicate if there is a tendency for DREAMS sites to exhibit greater reductions in prevalence. It thus may prove useful combining the geospatial results with data on actual uptake of services, to determine if there is a relationship between them, implying that DREAMS interventions have had an effect.

Key Recommendations

Recommendation/Action Item	Tasked Person(s)	Proposed timeline
1. Continuous Update and Improvement		
Spectrum CD4 Cell Count Distribution: The collection and incorporation of data on the CD4 cell count distribution of those initiating ART for alternative allocation designs to be encouraged, which would also aid reviewing historical results	UNAIDS	By next Ref group meeting (Nov 2017)
Spectrum Output Customisation: Facility for non-standard age disaggregation to be added in Spectrum for prevalence output	Avenir Health	Nov 2017
CSAVR Method Development: More flexible functional forms of case-reporting tool (e.g. spline) to be investigated	Avenir Health	Nov 2017
CSAVR Method Development: Approaches for Spectrum to automatically estimate lag year (from infection to diagnosis) from the entered mean CD4 cell count at diagnosis, for each respective population group to be pursued	Avenir Health	Nov 2017
Estimation and Projection Package (EPP) Incidence Curve Fitting: Simulation studies to explore options for removing the 'equilibrium prior' and alternative forms of r(t) to be conducted. This would include the gathering and analyses of empirical data that could evaluate r(t) to help guide suitable assumptions	Jeff Eaton, Le Bao	Nov 2017
Incidence Assays: Options for EPP to include incidence assays as a point estimate and range that reflect sampling and parametric uncertainty to be pursued	East-West Centre, Jeff Eaton	Nov 2017
Incidence Estimation in EPP: Approaches for EPP to use case-report data and CSAVR as different data sources (including prevalence levels to be pursued. The ultimate aim would be a complete convergence of multiple incidence tools	All	Long-term (2018+)
Use of Household (HH) Survey Data Misclassification Errors of EIA's: Bayesian latent class analyses approach for correcting past Demographic Health Surveys (DHS)'s for limitations in earlier testing algorithms to be pursued. Recommendations to adjust historical DHS estimates where possible shall be considered, depending on results	Joy Fishel, Mathieu Maheu-Giroux	Nov 2017
Incorporation of DHS and PHIA Data: Re-weighting of PHIA data for non-response to align with DHS is not recommended for country estimates. Instead, the following approaches should be further investigated: • Treating PHIA and DHS data as separate data categories • Treating PHIA and (earlier) DHS data as belonging to the same category (e.g. as household data). Variance for each may be	East-West Centre, Avenir	Nov 2017

inflated based on differences apparent in the PHIA and DHS surveys that took place concurrently in in the same location • Investigate individual drivers of differences in response rate to PHIA and DHS surveys	Health, Le Bao, Jeff Eaton Emma Slaymaker	
Overall Model Fitting in EPP/Spectrum: Acknowledge that models/estimates must allow for sporadic fluctuations (due to e.g. nosocomial transmission outbreaks, migration, etc.) in specific population groups, e.g. by direct input into the model	Avenir Health, East-West Centre	Nov 2017
Model Development: All developers to consider means by which code can be checked for accuracy, e.g. via units tests	All modellers	Nov 2017
Model Inputs: Consider utility of reviewing data (e.g. ANC-RT) being input to remove outliers and "condition" prior to entry to model	Not yet assigned	Nov 2017
2. Age-structured models		
HIV-related Fertility Rate Reduction Subfertility Adjustment (Interim 1, May 2017): UNAIDS to remove subfertility effect across all countries for current round of estimates, for consistency purposes	UNAIDS	May 2017
Subfertility Adjustment (Interim 2, July 2017): Spectrum to investigate scaling of FRR's to match prevalence in pregnant women from ANC-RT data scaling (TBD on UNAIDS reporting schedule)	Avenir Health	July 2017 (TBD)
Subfertility Exploration Studies: Investigations on the usefulness and feasibility of novel adjustment procedures to address HIV subfertility to be pursued, e.g. scaling FRR in fitting process	Avenir Health, Milly Marston, Jeff Eaton	Nov 2017
Age-Sex-Model Development A comprehensive investigation showing the benefits and feasibility of the age/sex-specific model approach to be presented at the next Reference Group meeting, including incorporation of age/sex-specific adult mortality	Jeff Eaton	Nov 2017
Age-structures in EPP/Spectrum Immediate communication between EPP and Spectrum on age-structured data to be initiated and include analyses into remaining discrepancies between prevalence (by age)	Avenir Health, East-West Centre, Jeff Eaton	Nov 2017
3. Use of case-report and mortality data		
Use of Mortality Data Mortality on ART: Mortality rates of all people on ART across regions to be investigated (using data from IeDEA, Alpha network, literature reviews, etc.)	Alpha Network	Nov 2017
AIDS Mortality: Inclusion/exclusion criteria for AIDS mortality data used in the model to be reviewed	Not yet assigned	Nov 2017

4. Use of programme service data		
Incorporation of ANC-RT Data in EPP: Additional inputs for routine ANC data (ANC1, number of known HIV positives, number of people tested/ANC visits, number of tested positives, etc.) to be implemented, to generate coverage diagnostic plots in EPP and aid ANC-RT data quality evaluation	East-West Centre, Avenir Health	Nov 2017

5. Spatially-specific estimates		
Geospatial (HIVE) Model Subnational Estimates Working Group: Current working group to continue and focus on defined use case (incidence rank order, ART coverage, program allocation, etc.) and method development	Working Group (Sam Bhatt, Mary Mahy, Ray Shiraishi, Tim Hallett, Sabrina Lamour, etc.)	Ongoing (monthly meetings)
Geospatial Model Roll-out: Geospatial model to be written up, including alignment around caveats and issues of interpretation for the country results packs that being developed for September. Results are to be shared with countries and further direct engagement with countries and program managers is encouraged, to aid development of use-cases and dissemination	Sam Bhatt, Pete Gething	Sep 2017
Subnational Model Comparisons: Further comparisons between subnational modelling methods (e.g. SAE vs. geospatial) to be undertaken for multiple countries	Sam Bhatt, Ray Shiraishi, Avenir Health	Nov 2017

6. Catalyse focused research and data collection		
Country Estimates: Listing of estimation methods and assumptions used in each country to be curated	UNAIDS, Avenir Health	Nov 2017

Appendix I. List of Participants

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Appendix II. Agenda

Day 1: Tuesday, 16th May 2017

Time	Duration (mins)	Topic	Presenter(s)/ Lead Discussant
Session I: Country Estimates and Software Updates (chaired by Peter Ghys) Objectives • Feedback from UNAIDS Estimates for 2017 to improve 2018 estimates • Discuss latest software updates (AEM, CSAVR)			
09:00	15	Welcome	Luiz Loures
09:15	15	Meeting overview	Peter Ghys, Tim Hallett
09:30	60	Progress since last Reference Group meeting, feedback from country estimation workshops, and approaches to improve models/assumptions	Mary Mahy, Keith Sabin, Kim Marsh
10:30	30	Coffee break	
Session II: Software Updates and Incidence Estimation using EPP (chaired by Jeff Eaton) Objectives • Discuss latest software updates (Spectrum, EPP) • Review and compare current statistical tools and issues for modelling incidence curves • Agree characteristics and assumptions for incidence estimates • Determine next steps towards guidance on use of incidence tools			
11:00	25	Review of Spectrum updates & amendments following country workshops	John Stover
11:25	25	Review of EPP updates & amendments following country workshops	Tim Brown
11:50	10	Review of current incidence tools in EPP	Jeff Eaton
12:00	60	Discussion	All
13:00	60	Lunch break	
Session III: Use of Program Data (chaired by Mary Mahy) Objectives • Review current assumptions for incorporating routine ANC (ANC-RT) data into EPP • Discuss novel/alternative modelling approaches and agree on best practice for future • Improve guidance on how to appraise data quality and when to use routine data for estimates			
14:00	10	Usage of routine ANC data for country estimates	Eby Pascal
14:10	10	Country case study: Use of ANC-RT - Kenya	Kennedy Mutai
14:20	20	Use of ANC-RT in EPP	Jeff Eaton
14:40	5	Missing Data Issue in HIV Surveillance Data	Le Bao
14:45	15	Discussion	Jeff Eaton, All
15:00	30	Coffee break	
Session IV: Use of Population Survey Data (chaired by Simon Gregson) Objectives: • Review results of recent DHS and PHIA, discuss potential sources of difference, and agree next steps for increasing understanding • Methods for incorporating survey incidence estimates into subnational EPP estimation • Review EPP/Spectrum model assumptions affecting ability to fit prevalence and incidence • Guidance on interpretation of prevalence trends from previous DHS to recent DHS/PHIA			
15:30	15	Overview of testing and survey procedures and data analysis – DHS	Joy Fishel
15:45	15	Overview of testing and survey procedures and data analysis – PHIA	Jessica Justman
16:00	45	Discussion	Mary Mahy, All
16:45	15	Wrap-up of Day 1	Tim Hallett
17:00	–	End of Day 1	

Day 2: Wednesday, 17th May 2017

Time	Duration (mins)	Topic	Presenter(s)/ Lead Discussant
Session V: Estimating the Need for PMTCT Intervention (chaired by Tim Brown) Objectives ● Review current tools and discuss novel/alternative approaches to reduce overestimation for PMTCT coverage ● Agree on guidance on recommended procedures for countries to improve PMTCT coverage			
09:00	10	Challenges with estimating PMTCT coverage	Mary Mahy, John Stover
09:10	40	● Adjusting FRR based on subfertility ● Age-dependent sexual activity in HIV positive women	Milly Marston
09:50	40	Age-structure model update	Jeff Eaton
10:30	30	Coffee break	
Session VI: Spatial-specific Estimates (chaired by Peter Ghys) Objectives ● Review and agree on optimal use-cases for geospatial model ● Review current strategies and provide recommendations for spatial-specific estimates for 2018+			
11:00	50	Geospatial model developments, use-cases and next steps	Sam Bhatt
11:50	10	Small Area Estimation	Ray Shiraishi
12:00	10	Subnational estimates with Spectrum	John Stover
12:10	10	Country case study: Comparisons of different modelling approaches - Kenya	Kennedy Mutai
12:20	10	Country case study: Comparisons of different modelling approaches - Zimbabwe	Isaac Taramusi
12:30	30	Discussion on all approaches	All
13:00	60	Lunch break	
Session VII: Estimating Trends in Incidence in Young People (chaired by Tim Hallett) Objectives ● Review current tools and discuss issues with measuring incidence in young people ● Discuss and agree on best to use our current estimate methods and/or the geospatial model to measure incidence in specific age-sex groups			
14:00	20	Problem statement: HIV incidence amongst young people	Tim Hallett, Mary Mahy, Jeff Eaton
14:20	20	● CDC activities for measuring incidence in AGYW ● Incidence Assays in Pregnant Women	Ray Shiraishi
14:40	20	Discussion	All
15:00	30	Coffee break	
15:30	15	Geospatial model for DREAMS	Sam Bhatt
15:45	45	Discussion	Mary Mahy, All
16:30	30	Final discussions and recommendations	Tim Hallett
17:00	–	Meeting close	