Technical Updates and Method Development for the UNAIDS Estimates, 2018

Report and Recommendations from the meeting held by the UNAIDS Reference Group on Estimates, Modelling and Projections

Atlanta, Georgia, USA, 1st June 2018

REPORT & RECOMMENDATIONS

UNAIDS
UNHCR UNODC
UNICEF ILO
WFP UNESCO
UNDP WHO
UNFPA WORLD BANK
JOINT UNITED NATIONS PROGRAMME ON HIV/AIDS

Abbreviations

AEM	AIDS Epidemic Model
AIDS	acquired immunodeficiency syndrome
ANC	antenatal care data
ANC-RT	routine antenatal care data
ANC-SS	antenatal care data from sentinel surveillance sites
ART	antiretroviral therapy
ASM	Age- and Sex-specific Model (for HIV incidence)
CDC	(U.S.) Centers for Disease Control
CSAVR	Case Surveillance and Vital Registration tool
DHS	Demographic Health Survey
DQA	Data Quality Assessments
EPP	Estimation and Projection Package
FRR	fertility rate ratio
GBD	Global Burden of Disease study (by IHME)
HIV	human immunodeficiency virus
IHME	Institute for Health Metrics and Evaluation
LAC	Latin-America and Caribbean
MTCT	mother-to-child transmission (of HIV)
PEPFAR	(U.S.) President's Emergency Plan for AIDS Relief
PHIA	Population-based HIV Impact Assessment
PLHIV	number of people living with HIV
PMTCT	prevention of mother-to-child transmission (of HIV)
RW	random walk
TBC	To be confirmed
UNAIDS	Joint United Nations Programme on HIV/AIDS
VL	viral load
VMMC	voluntary medical male circumcision
WCENA	Western and Central Europe and North America
WHO	World Health Organization

Background

UNAIDS Reference Group

The Joint United Nations Programme on HIV/AIDS (UNAIDS) relies on impartial scientific advice from international experts in relevant subject areas to provide guidance on how to best calculate estimates and projections of the prevalence, incidence, and impact of HIV/AIDS globally. The UNAIDS Reference Group on Estimates, Modelling and Projections acts as an 'open cohort' of epidemiologists, demographers, statisticians, modellers, and public health experts to provide scientific guidance to UNAIDS and partner organisations on the development and use of the tools used by countries to generate annual national HIV estimates. The group is coordinated by a secretariat managed at Imperial College London and the University of Cape Town.

Work at UNAIDS Reference Group has been organised broadly into two tracks:

- 'Technical update' work streams: These work streams are oriented to conducting research and providing technical feedback and guidance on specific updates for the suite of tools used for annual UNAIDS estimates, which include Spectrum, Estimation and Projection Package (EPP), Case Surveillance And Vital Registration tool (CSAVR), etc.
- 'Thematic' meetings: These meetings are focused on convening new research to catalyze innovation on specific aspects of HIV estimates that require substantial conceptual or methodological development

Meeting Objectives

The purpose of this meeting was to provide technical recommendations for updates for Spectrum and accompanying estimation tools in 2018, which are used by countries to generate their 2019 national HIV estimates. Specific objectives included reviewing planned updates for the Spectrum software and embedded incidence tools EPP and CSAVR, and planning upcoming software implementations – some of which has been recommended at the Reference Group's preceding meeting on "New data, tools, and methods for estimating HIV incidence patterns and trends" (30-31 May 2018, Atlanta).

Outline

The UNAIDS Reference Group held its meeting on "Technical Updates and Method Development for the UNAIDS Estimates 2018" at the Georgia Tech Hotel and Conference Center in Atlanta, USA, on 1 June 2018. The meeting featured presentations combined with group discussion, to generate consensus recommendations. The programme was divided into the following sessions across the day:

1. Review of 2018 UNAIDS Estimates
2. Spectrum Updates
3. EPP and CSAVR Recommendations and Implementation
4. Estimating ART coverage and HIV care-cascade indicators

This report presents a summary of the presentations and discussions of the meeting. Copies of the presentations are available for UNAIDS Reference Group members on the Reference Group website (for non-members, please contact the Secretariat). The final recommendations and action items can be found towards the end of this report, followed by the timelines of proposed software implementations. The recommendations drafted at the Reference Group meetings give UNAIDS guidance on how best to calculate estimates of the HIV epidemic in 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 UNAIDS Reference Group website (www.epidem.org), which include additional 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.

Review of 2018 UNAIDS Estimates (Session 1)

Preliminary UNAIDS HIV estimates for 2018 were presented by Mary Mahy. Global adult estimates, such as AIDS deaths, new infections and the number of people living with HIV (PLHIV), were similar with 2017 results. Greater variation was observed in paediatric estimates. Software updates that had been implemented for the 2018 estimates were summarised and included updated population data (WPP 2017), updates to the age-sex-specific model (ASM) in EPP, additional spline function in CSAVR, amongst others. 2018 results for generalised epidemics showed concordance between the estimates and results from recent population-based HIV impact assessments (PHIA's).

Assessment of data quality from routine antenatal care (ANC-RT) has been an ongoing process, though UNAIDS have reported limited use of the ANC data validation page that has recently been implemented in EPP. Following discussions, the Reference Group recommended changing certain aspects of the software interface to encourage users to review their data inputs, e.g. simplifying and moving the ANC validation page from EPP to Spectrum, and adding visualisations of sources of mother-to-child-transmission of HIV (MTCT) and number of new paediatric infections.

Spectrum estimates of mortality were presented by Kim Marsh, who assessed the effect of current approaches in changing ART allocation by CD4 risk group to improve the apparent overestimation of HIV-related mortality in Spectrum, particularly for countries within Western and Central Europe and North America (WCENA) and Latin America and the Caribbean(LAC) regions. Discussions followed on the allocation of the causes of death and the extent to whether all HIV-related deaths were indeed recorded as AIDS-deaths. The Reference Group agreed that further investigation into HIV-related deaths and ART allocation were required and that this issue would be addressed in more detail at the next Reference Group meeting (September 2018), in consultation with IHME.

Challenges in data quality and availability for key population risk groups in concentrated epidemics were presented by Keith Sabin. Alternative to EPP and CSAVR, several countries in Asia Pacific and Central Europe use the AIDS Epidemic Model (AEM) as their incidence estimation tool. AEM requires data inputs by risk groups, disaggregated by gender that many of the countries lack, and have instead heavily relied on default inputs based on data from Thailand, which may not be representative to their setting. The Reference Group thus encouraged further exploration into the implications of using Thai results for other settings, and recommended a review of the 2019 AEM country estimates by the group prior to publication (data files may need to be requested first through UNAIDS Asian Regional Support Teams).

Spectrum Updates (Sessions 2 & 3)

Planned updates for the Spectrum software were presented by John Stover, which included the addition of visualisation pages for sources of mother-to-child-transmission (MTCT), updating the method of PMTCT allocation for subnational inputs, and proposals to change current methods for allocation of ART to newly diagnosed patients by age and CD4, (to adjust the distribution to match expected mortality). Results presented at the 2018 CROI meeting suggesting higher per-act risk of HIV acquisition among pregnant and post-partum women were discussed by the group. It was agreed that a further data collection and exploration studies should be conducted prior to making any Spectrum parameters adjustments. The Reference Group also recommended further validation of certain model assumptions, e.g. the use of updated fertility rate ratios (FRR's) for generalised epidemic settings and triangulating current assumptions on the number of patients disengaged from care (loss-to-follow-up/drop-outs) with other data sources (e.g. from PHIA's). Further investigation to determine fertility patterns amongst HIV-positive and HIV-negative women for concentrated epidemics was supported.

Avenir Health demonstrated the multiple features of the online version for Spectrum, which is due to be released by the end of 2018, in time for the 2019 estimates. Discussions followed on data protection and having different levels of user access rights. The group agreed that Spectrum-on-the-web should include a function to be able to export and email a summary of the results, to allow results to be disseminated to other members without having to share access to the Spectrum file itself.

Handling migration posed another major challenge to modellers, which had also been discussed in the preceding Reference Group meeting on incidence (see link below). Jeff Eaton presented the current issues in demographic inputs in subnational files, which do not capture migration well, resulting in discrepancies in PLHIV estimates. The Reference Group recommended that Spectrum should aim to match annually to an input population distribution, rather than input subnational migration flows, and that additional visualization of the size of adjustment would help review the demographic inputs.

Incidence Tool Updates - EPP & CSAVR (Sessions 2 & 3)

CSAVR Updates

Current 2018 developments to Spectrum's incidence tool for case surveillance and vital registration data (CSAVR) were presented by Guy Mahiane. These included options for users to change the start date of the epidemic and to adjust their diagnoses rates to better capture time-dependent changes in the epidemic. Proposals for mid-/long-term CSAVR enhancements included the incorporation of prevalence data, harmonization with the EPP-ASM model, and the incorporation of key populations into CSAVR, to accommodate care surveillance data from specific risks groups. Different approaches to incorporate key populations were discussed, for example whether data inputs and outputs should be disaggregated by risk group and/or by age. The Reference Group supported the updates plans for further exploration into the age-disaggregation and addition of key populations in CSAVR. Additionally, the group encouraged further investigation into the influence of alternative parameteric assumptions and constraints on incidence estimates and trends and model comparison and validation using simulated datasets.

EPP Updates and Incidence Model Selection

The recommendations generated from the preceding UNAIDS Reference Group meeting on "New data, tools, and methods for estimating HIV incidence patterns and trends" (30-31 May 2018, Atlanta) were summarised, followed by discussions on the development and associated implementation schedules for the updates in the incidence estimation tools. A final timeline for the various software developments can be found in the Key Recommendations and Timelines section of this report.

Software updates that were agreed for September 2018 implementation included the roll-out of the logistic random walk (logistic-RW) incidence model in EPP (subject to further development and model comparison results), incorporation of voluntary medical male circumcision (VMMC), and revisiting current ART coverage allocation (to be disaggregated e.g. by risk group and/or age). Investigations for the latter should include the assessment of the impact of ART coverage parameter on transmission rates and incidence estimates. Tim Brown reported on progress of EPP-on-the-web which was planned to be implemented in time with the online Spectrum version in 2018. Le Bao presented Ben Sheng's analyses for adjustments to the calibration parameter to account for potential bias when transitioning from ANC data collected from sentinel surveillance sites (ANC-SS) to data routinely collected from ANC facilities (ANC-RT). These were endorsed for EPP implementation in 2018. Further development of Bao's analyses on site influence on HIV prevalence estimates (including exploratory studies on time variance of calibration parameters) and potential extension of site influence to other areas within EPP were also recommended.

The group agreed that the incorporation of age-structure into EPP (EPP-ASM) for concentrated epidemic settings required further investigation and is planned for 2019. Until then, the adult-to-pregnancy ratio adjustment should be continued in EPP for non-ASM users and should continue to be updated. Discussions followed about determining the most appropriate metrics for model comparisons and whether different indicators for accuracy of model fit or predictive fit were sufficient in recommending users to switch models for their country estimates. It was agreed that review and evaluation of model comparisons should be conducted within the Reference Group rather than the model end user, and that these metrics were thus not required to be listed within the software. Furthermore, the group discussed the guidance that should be given to countries on use of the older legacy models in comparison with the newer versions. The Reference Group endorsed the use of the most up-to-date models for estimation to best capture each country's epidemic, and recommended that EPP-ASM for generalised epidemics should be set as the default option in

EPP. The group recognised that countries may wish to continue to use older models and these should remain available in the software for use for a transitionary time period (yet to be agreed).

Software Testing Workshop

The Reference Group agreed that a beta-software testing workshop would be set up in September 2018 with UNAIDS, for the evaluation of software updates and comparison of the different incidence models (e.g. logistic-RW results, effect of revised parameters on FRR's and ART coverage adjustments, etc.) by modellers and selected country teams (such as those with PHIA data, e.g. Malawi and Haiti - the latter also has strong case surveillance data). The workshop would provide an opportunity for feedback to improve method development prior to software release, as well as encourage the uptake of updates by countries.

Estimating ART coverage and HIV care-cascade indicators (Session 4)

The current methods employed by UNAIDS to estimate '90-90-90' HIV care cascade indicators (see UNAIDS 2017 report on "90–90–90 - An ambitious treatment target to help end the AIDS epidemic") were presented by Kim Marsh. Challenges particularly in estimating the first '90', i.e. the percentage of people aware of their HIV status were highlighted. Data on HIV testing history and status awareness is largely obtained from population surveys (e.g. demographic and health surveys/DHS), yet these are typically done only every few years making it challenging to generate reliable estimates in between the survey years. Stigma towards HIV-infected individuals continues to pose a problem in many countries, resulting to under-reporting of diagnosis and thus unrealistic estimates for the first '90'. Approaches undertaken by Malawi and Botswana to collect data to improve their estimates for the care cascade indicators were presented, though issues with data quality have remained challenging (e.g. handling incomplete data sets and data duplication due to lack of unique individual identifiers).

The latest care cascade results from the recent PHIA's were shown by Drew Voetsch, demonstrating that progress by countries was slowest on the first 90, but much improved on the second and third 90's, i.e. update of ART and viral load (VL) suppression, respectively. Testing for VL and antiretroviral drugs (ARV's) within individuals blood were conducted as part of the PHIA's, which revealed the strong biases and under-reporting when relying on self-reporting of HIV status awareness in the surveys (up to 20% in some countries reported not being aware of their HIV status yet were found to be virally suppressed and/or on ARV medication). Consequently, PHIA results were adjusted accordingly to correct for the misreporting of HIV awareness.

In recognition of current issues with routine programmatic data quality, a collaborative initiative has recently been set up between PEPFAR-agencies, the Global Fund, and a number of countries to conduct data auality assessments (DQA's) to increase the quality on data collection and reporting through standardized and routine monitoring of data quality and thus improve estimates for incidence and numbers on ART. The methods and plans for rolling out the DQA's were presented by John Arbele-Grasse. The Reference Group recognised the substantial efforts by countries to improve their data and highly anticipate the DQA results.

In the final part of this session, different model-based approaches for estimating 90-90-90 were presented, namely for Thembia model (by Leigh Johnson), Cote d'Ivoire model (by Mathieu Maheu-Giroux) and the Optima model (by Robyn Stuart), to explore opportunities to improve current methods in Spectrum. Throughout the session, there was a strong interest by UNAIDS, CDC and partners in obtaining 90-90-90 outputs that were disaggregated by age and sex. Maheu-Giroux's model is currently set up to model the number of PLHIV aware of their status, stratified by sex and into two age-groups (15-24 years and 25-49 years), using incidence and ART coverage estimates produced by Spectrum/EPP. The Reference Group agreed that increased efforts should be made to shift the dependence on generating 90-90-90 indicators from UNAIDS to the countries themselves, and recommended the development of bespoke statistical tool to generate 90-90-90 estimates by age and sex (e.g. an extension of Maheu-Giroux's model).

Key Recommendations and Timelines

Recommendation/Action Item	Lead Person(s)	Proposed timeline
Review of 2018 UNAIDS Estimates		

HIV-related mortality and AIDS deaths:
• Review the interpretation of vital registration data in WCENA, LAC, and Asia/Pacific region, potential misclassifications of HIV-related deaths or other sources of excess mortality not recorded as 'AIDS' deaths in vital registration data
   o Secretariat to co-ordinate meetings and agenda for Working Group Jun-September
   o Findings to be presented at next Reference Group meeting
	Secretariat, Kim Marsh, Tara Mangal, PAHO, WHO, IHME, Avenir Health, TBC	Sep 2018

• The Reference Group recommends the continued data collection of CD4 count at diagnoses by surveillance implementers for reliable mortality and incidence estimation	National HIV programmes, PEPFAR, Global Fund	Ongoing
Evaluation of AEM (AIDS Epidemic Model) Estimates: • Request country AEM files to be reviewed by the Reference Group	Keith Sabin, Asian RST	Aug 2018
• Review assumptions for trend inference from HSS data in AEM o Consider random effects model likelihood used in EPP and/or Bao hierarchical model	East-West Center, Secretariat, Le Bao	2019

• Review AEM parameter value assumptions extrapolated from other settings. Many are based on Thai data.
   o Assess influence on estimates
   o Explore opportunities to include additional local data sources
	East-West Center, Keith Sabin, JHU	2019

• Review evidence about robustness of current paediatric estimates in Asia	TBC*	2018
Spectrum Updates		

Validation of model assumptions:
• Validation of updated fertility rate ratio parameters (FRR's) via comparisons of:
   o ANC-RT prevalence
   o Prior ART coverage among pregnant women
   o Historical numbers of children with HIV
	Jeff Eaton, UNAIDS, Avenir Heath	Sep 2018 (Peds Mtg)

• Comparison of recently ANC-SS surveys and ANC-RT data	CDC, Secretariat, UNAIDS	Sep 2018
• Triangulate assumptions on loss-to-follow-up/drop-outs for pregnant or breastfeeding HIV+ women with PHIA survey data o Review evidence for 'silent transfers' among pregnant & breastfeeding women	UNAIDS / WHO	Sep 2018 (Peds Mtg)

• ART allocation by CD4 and mortality parameters to be reviewed at September Reference Group meeting	Mortality working group	Sep 2018
• Add feature for allocation of ART to other Spectrum regions (similar to PMTCT allocation options)	Avenir Health	Sep 2018
Spectrum visualisations updates: • Move ANC-RT cascade data validation page into Spectrum instead of EPP with a simplified interface	Avenir Health, East-West Center	Sep 2018
• Add visualization of sources of transmission on overall mother-to-child-transmission to aid communication and comparison with survey data	Avenir Health	Sep 2018
• Display specific surveys and data points used in age 15-19 TFR adjustment and breastfeeding duration parameters	Avenir Health	Sep 2018
Spectrum-on-the-web: • Web interface to include feature to automatically compile, download and results from Spectrum cloud	Avenir Health	Sep 2018
• Interface to include a page to automate the disaggregation to lower levels using the worksheet method	Avenir Health	Sep 2018
Subnational demographic inputs: • Spectrum to match annually to an input population distribution (rather than input subnational migration flows) o Visualization to view size of adjustment, identifying any implausible results o Data sources for input subnational populations to be identified (likely US Census Bureau, World Pop)	Avenir Health	2018
• Review changes to prevalence/PLHIV estimates arising from fitting to age-specific DHS survey prevalence o Develop visualization and communication to countries about changes to prevalence/PLHIV arising from implicit age standardization	Jeff Eaton, UNAIDS, Avenir Health	Aug 2018
• Review comparison of Spectrum population and post-stratified PHIA survey population and resolve any discrepancies	Secretariat, CDC, UNAIDS, Avenir Health	Aug 2018
Model and software review and testing: • Conduct regional model beta testing workshop (e.g. in Kenya) to be conducted in September to test software updates, including impact of differing population structures and updated EPP-ASM and logistic-RW models (see Timelines)	UNAIDS	Sep 2019

Incidence Tool Updates: EPP and CSAVR		

EPP Updates:
• Recommend the age/sex stratified (EPP-ASM) model should be used as default in EPP for generalized epidemics
    o ANC adjustment should always be used for ANC data settings
    o Options to use other legacy models will remain available in software though use of most current models are encouraged
	UNAIDS, East-West Center	Aug 2019

• Implementation of logistic-random walk (logistic-RW) model and EPP-ASM updates aimed for September 2018 testing workshop	East-West Center	Sep 2018
• Inclusion of metrics for model selection is not required in software	East-West Center	Immediate
• Implementation of Sheng prior distribution for ANC-SS / ANC-RT bias	East-West Center, Le Bao, Ben Sheng	Sep 2018
• Methods to investigate site influence to be extended to accommodate use in EPP	Le Bao	2019
• Revised ANC testing cascade input to be 2010-current only. Review usage and opportunities to simplify tool.	East-West, UNAIDS, Avenir, Secretariat	Aug 2018

CSAVR Updates:
• CSAVR model updates for Spectrum 2019:
    o Optional estimation by risk group (key populations)
    o 'rlogistic' transmission rate fitting option
    o Provide option for directly specifying diagnosis rate or current approach to estimate diagnosis rate
    o Allow user specification of first year of diagnosis
	Avenir Health	Sep 2018

• Improved efficiency of CSAVR simulation using EPP-ASM algorithms or DLL	Avenir Health, East-West, Jeff Eaton	Sep 2018
• Review age/sex-patterns of new diagnoses and AIDS deaths in CSAVR settings	UNAIDS	Sep 2018
Estimation of HIV care-cascade indicators (90-90-90)		
• Recommend development of a statistical model for care cascade indicators in SSA for use by country estimates teams in 2019 estimates round. Implementation may exist as a tool external to Spectrum. o Ascertainment of routine HIV testing data and survey data (DHS, PHIA) for model development and testing	UNAIDS, CDC, Secretariat	June 2018
o Model development	Maheu-Giroux, Secretariat, CDC, Optima	July-Sep 2018

o Model development and review technical meeting
    o Tool review and recommendations
    o Tool refinement and implementation
	Secretariat
	Reference Group
	TBC*
		Aug 2018
		Sep 2018
		Nov 2018

*TBC: lead person(s) to be identified and confirmed by the Reference Group secretariat and partners

Proposed Timelines for Method Development and Implementation

Model development and review timeline:
- Logistic/RW transition model: June 2018
- Review convergence and efficiency: June 2018
- Proposal for changes to ART transmission and VMMC assumption: July 2018
- Technical working paper and full model results for review and feedback: August 2018

Software implementation steps and timeline:
- Implement Logistic-RW model in EPP software: June 2018
- Test providing age/sex-specific infections to Spectrum & develop new .SPT/SPU specification: June 2018
- Age-specific data inputs interface: July 2018
- Implement Log-RW & likelihood age-specific prevalence in EPP model and likelihood: August 2018
- Beta software for internal review: 1 Sept 2018
- Regional model beta testing workshop in Kenya: w/c 10 Sept 2018 (EPP)
- Review at Ref Group technical updates and/or Pediatric meeting: w/c 17 Sept 2018

Appendix I: List of Participants

#	Name	Affiliation
1	Robert Glaubius	Avenir Health, Glastonbury, CT, USA
2	Guy Mahiane	Avenir Health, Glastonbury, CT, USA
3	John Stover	Avenir Health, Glastonbury, CT, USA
4	Geoff Garnett	BMGF, Seattle, WA, USA
5	John Arbele-Grasse	CDC, Atlanta, GA, USA
6	Wolfgang Hladik	CDC, Atlanta, GA, USA
7	Laura Porter	CDC, Atlanta, GA, USA
8	Mike St. Louis	CDC, Atlanta, GA, USA
9	Liz Tangel Chehab	CDC, Atlanta, GA, USA
10	Ray Shiraishi	CDC, Atlanta, GA, USA
11	Drew Voetsch	CDC, Atlanta, GA, USA
12	Tim Brown	East-West Center, Honolulu, HI, USA
13	Jeff Eaton	Imperial College London, London, UK
14	Sabrina Lamour	Imperial College London, London, UK
15	Tara Mangal	Imperial College London, London, UK
16	Virginie Supervie	Inserm, Paris, France
17	Kate Grabowski	Johns Hopkins University, Baltimore, MD, USA
18	Mathieu Maheu-Giroux	McGill University, Toronto, Canada
19	Kennedy Mutai	NACC, Nairobi, Kenya
20	Irum Zaidi	OGAC, Washington DC, USA
21	Robyn Stuart	Optima, Copenhagen, Denmark
22	Le Bao	Penn State College, State College, PA, USA
23	Alex Welte	Stellenbosch University /SACEMA, Stellenbosch, South Africa
24	Peter Ghys	UNAIDS, Geneva, Switzerland
25	Mary Mahy	UNAIDS, Geneva, Switzerland
26	Kim Marsh	UNAIDS, Geneva, Switzerland
27	Keith Sabin	UNAIDS, Geneva, Switzerland
28	Leigh Johnson	University of Cape Town, South Africa
29	Richard Gray	UNSW Kirby Institute, Kensington, Australia
30	Michel Berusenberg	WHO, Geneva, Switzerland
31	Jesus Maria (Txema) Garcia-Calleja	WHO, Geneva, Switzerland

Appendix II: Agenda

UNAIDS Reference Group on Estimates, Modelling and Projections

Thematic Meeting 1: New data, tools, and methods for estimating HIV incidence patterns and trends

30-31 May 2018, Georgia Tech Hotel, Atlanta, USA

AGENDA

Day 1, Wednesday 30th May 2018

Time	Duration (mins)	Topic	Presenter(s)/ Lead Discussant
09:00	30	Meeting opening • Welcome and introductions • Overview of UNAIDS estimates • Meeting objectives and overview	Peter Ghys Mary Mahy Jeff Eaton
Session 1: Model structure and assumptions for recent HIV incidence trends in generalised epidemics (chaired by Josh Salomon) Objectives • Review current modelling approaches for recent incidence trends in generalised epidemic settings • Reach recommendations for model structures and assumptions for incidence estimation in EPP/Spectrum for generalised epidemics			
09:30	25	Estimates in context: Experience from Kenya	Kennedy Mutai
09:55	50	Current EPP and developments • Assumptions of current EPP models • Perceived limitations of current models • Model for transmission rate • Age-specific data • Model comparison • Discussion	Jeff Eaton All
10:45	30	Coffee break	
11:15	45	Assumptions for recent HIV incidence trends from other models for generalized epidemics • Thembisa model • Optima model • Goals Age-sex model • Discussion	Leigh Johnson Robyn Stuart Rob Glaubius All
12:00	30	Discussion and recommendations: • EPP model for 2019 estimates, including functional forms for transmission rate • Mechanistic assumptions about transmission dynamics and interventions in incidence estimates	Josh Salomon, All
12:30	60	Lunch break	
13:30	30	Discussion and summary of Session 1 recommendations	Josh Salomon, All
Session 2: Interpretation of data sources for incidence estimation in generalised epidemics (chaired by Mary Mahy) Objectives • Review interpretation of current data sources for generalised epidemic settings • Plan for incorporation of novel data sources for incidence estimation in generalised epidemic settings			
14:00	80	Using ANC data for assessing incidence trends • Current Spectrum/EPP assumptions about fertility, HIV & ART • Parameter estimates from DHS surveys	John Stover

Time	Duration (mins)	Topic	Presenter(s)/ Lead Discussant
		• Modelling changing antenatal biases over time • Adjusting for routine data quality and completeness • Discussion & recommendations	Jeff Eaton Leigh Johnson Mathieu Maheu-Giroux Mary Mahy, All
15:20	30	Coffee break	
15:50	115	Novel data sources and analytical approaches for generalised epidemics • Overview of surveillance outlook • CDC/PEPFAR incidence surveillance platforms • Recent testing history • Age-specific incidence • Correlates of incidence • Model simulation of novel surveillance approaches • Discussion: key evidence gaps and analytical developments	Andrea Kim/Wolfgang Hladik Katie Curran Ian Fellows Eduard Grebe Ray Shiraishi Katie Risher All
17:45	15	Day 1 wrap-up	Jeff Eaton
18:00	–	Meeting Close	

Day 2, Thursday 31st May 2018

Time	Duration (mins)	Topic	Presenter(s)/ Lead Discussant
Session 3: Model structure and assumptions for recent HIV incidence trends using case surveillance and vital registration data (chaired by Geoff Garnett) Objectives • Review modelling approaches and assumptions for estimating incidence trends from case-surveillance and vital registration data			
09:00	10	Introduction to Day 2	Jeff Eaton
09:10	80	Models for case surveillance settings • Overview of current tools in Spectrum and current usage • CSAVR model • ECDC model	Kim Marsh Guy Mahiane Chantal Quinten
10:30	30	Coffee break	
11:00	40	Models for case surveillance settings (cont'd) • Review and synthesis of incidence estimation models • GBD model for case-surveillance settings	Ian Fellows Austin Carter
Session 4: Incidence estimation using case surveillance and vital registration data: country case studies (chaired by Geoff Garnett / Leigh Johnson) Objectives • Understand data, assumptions and model structures underpinning recent incidence trends for bespoke country estimations models and compare results with Spectrum • Reach recommendations for data interpretation and model development in Spectrum for case-surveillance settings • Identify lessons and directions for expanding use of case surveillance and data to additional settings including SSA			
11:40	15	Overview and summary comparison: CSAVR, GBD, and bespoke country models	Austin Carter
11:55	35	Country case studies for incidence estimation • Canada	Ping Yan, All

12:30	60	Lunch break	
13:30	120	Country case studies for incidence estimation (cont'd) • USA • Netherlands • Australia • France	Rick Song / Irene Hall, All Ard van Sighem, All Richard Gray, All Virginie Supervie, All
15:30	30	Coffee break	
16:00	30	Country case studies for incidence estimation (cont'd) • UK	Daniela de Angelis, All
16:30	60	Discussion: • Recommendations arising from bespoke models for enhancing UNAIDS supported tools • Confidence in recent incidence trends in case surveillance settings • Should models incorporate mechanistic representation of transmission dynamics or intervention impacts? • Opportunities to harmonize models, assumptions, inference approaches across settings	Leigh Johnson, All
17:30	15	Final recommendations and meeting wrap-up	Jeff Eaton
17:45	–	Meeting close	