Technical updates for UNAIDS-supported estimation tools

Report and recommendations from a meeting of the UNAIDS Reference Group on Estimates, Modelling, and Projections
5-8th October 2021

REPORT & RECOMMENDATIONS

Abbreviations

ADR	AIDS Data Repository
ANC	Antenatal clinic
ART	Antiretroviral therapy
CDC	US Centers for Disease Control and Prevention
CLHIV	Children living with HIV
EPP	Estimation and Projection Package
IeDEA	International Epidemiology Databases to Evaluate AIDS
PEPFAR	US President's Emergency Plan for AIDS Relief
PHIA	Population-based HIV Impact Assessment
PLHIV	People living with HIV
(P)MTCT	(Prevention of) Mother to Child Transmission
UNAIDS	Joint United Nations Programme on HIV/AIDS
WHO	World Health Organization

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), managed at Imperial College London, the University of Cape Town, and Stanford University. Participants of the meeting are listed at the end of this document.

Oli Stevens, October 2021

Background

UNAIDS Reference Group on Estimates, Modelling, and Projections
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, 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 HIV estimates, which are the source for UNAIDS Global HIV epidemic estimates. The group is coordinated by a secretariat hosted at Imperial College London, the University of Cape Town, and Stanford University.

Meeting Overview
The UNAIDS Reference Group held its virtual thematic meeting on *Technical updates for UNAIDS-supported estimation tools* from 5-8th October 2021. The meeting featured presentations and group discussion to generate consensus recommendations. The programme was divided into the following sessions:

1. Spectrum updates and on -ART mortality
2. Calibrating to ART coverage data in EPP
3. COVID-19 and HIV
4. Naomi, ADR, and the Estimates Navigator
5. Key populations in SSA
6. CSAVR and concentrated epidemics

This report presents a summary of the meeting presentations and discussions. The presentations are available to meeting participants at www.epidem.org (others, please contact the Secretariat via epidem@imperial.ac.uk). The final recommendations can be found at the end of this report.

The recommendations drafted at these meetings provide UNAIDS with guidance on generating HIV estimates, review current approaches, and identify required data to further improve HIV estimates. Previous meeting reports are available at www.epidem.org. This transparent process aims 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.

Meeting introduction

Mary Mahy provided an overview of the 2022 estimates process. Key process updates for the upcoming estimates round are:

- Mid-year data quality reviews with countries in advance of the estimates process,
- Implementation of a new 'Estimates Navigator' tool to guide countries through the multiple tools and process in developing the estimates (see session X), and
- A renewed interface for HIVtools.unaids.org.

There will be a focus on collating key population data and reviewing viral load suppression data in sub-Saharan Africa.

Session 1: On-ART mortality and Spectrum updates

Spectrum presently stratifies the ART population by CD4 count at initiation and duration on treatment (0- 6, 7-12, 12+ months). Previous analysis of IeDEA collaboration mortality data found that mortality continued to decline for each year on treatment after the 12+ month duration category [1]. Crude analysis of the recent Spectrum estimates implied that half of PLHIV on ART globally may have been on ART for more than 5 years. Validation analyses of Spectrum natural history and treatment mortality models with Thembisa estimates in South Africa that are calibrated to vital registration data indicate that Spectrum may be overestimating the number of deaths on ART [2]. This session sought to address whether:

- the number of Spectrum treatment duration categories should be increased to reflect declining on-ART mortality for longer durations on ART; and whether
- increasing the number of treatment duration categories improves alignment between Spectrum and Thembisa estimates in South Africa?

Rob Glaubius and John Stover presented two planned and proposed updates to the Spectrum interface:

1. A new validation plot has been added to visualise Spectrum of estimates of ART coverage against survey ART coverage estimates by age.
2. Spectrum currently caps estimates of ART coverage at 100% when the number on ART exceeds the number of estimated PLHIV. This will be removed to encourage countries to interrogate estimates of ART coverage that exceed 100%.

Three proposed changes to model structure, calculations, and computation changes were considered, based on previous Reference Group meeting discussions:

1) Removing the dependency between mortality rates at long treatment durations and baseline CD4 count.

Adding additional duration categories would increase the time taken to run AIM uncertainty analysis by around 20%. If mortality rates at long treatment durations

were assumed to be independent of baseline CD4, this slowdown would be mitigated. However, it would require non-trivial code changes, consideration of CD4 count at ART interruption and differential dropout rates by ART duration.

2) Using fewer timesteps per year for adult HIV calculations.

Spectrum uses 10 timesteps per year for disease progression, HIV mortality, and ART update/interruption. Using fewer timesteps would decrease computation time but may result in changes to the estimates. Results from tests using 2, 4, 6, 8, and 10 timesteps per year indicate that changes to the estimates are small at 4-8 steps/year in AIM and EPP-ASM, and though computation time can decrease by up to 50%, these benefits are not consistently realised across countries. Differences in non-ASM EPP can be significant.

Provisional recommendation: Retain 10 timesteps/year

3) Intercalating new HIV infections each time step instead of once per year.

AIM adds new HIV infections in adults at the end of each year, whilst EPP-ASM calculates new infections at each timestep. Previous analyses showed that calculating new infection by timestep in AIM caused large differences in new HIV infections (10%-25%) for countries using EPP. Refinements to the approach to the 'EPP prevalence adjustment' in Spectrum, which ensures that the prevalence in Spectrum matches that returned by EPP, has decreased these differences to +/- 3% for new HIV infections, AIDS deaths, and PLHIV.

The benefit for intercalating new infections at each timestep would improve estimates of knowledge of status in Shiny90 by removing the artificial assumption that the individuals are not diagnosed and initiate treatment in the first year after becoming infected.

4) Incidence/prevalence adjustment

Spectrum uses an incidence/prevalence adjustment to resolve small discrepancies in HIV incidence between EPP and AIM. In 2013, the size of the adjustment was fixed at the 2010 value to remove artefacts in the HIV incidence trend caused by changing ART eligibility criteria. Allowing the incidence/prevalence adjustment to change over time increases global new infections by 0.7% in 2020 with individual countries differing by +/- 10%. Removing the adjustment entirely can result in large changes to adult HIV prevalence – between -12 and +24% indicating that the adjustment should be retained.

Provisional recommendation: Retain incidence/prevalence adjustment and let it vary over time beyond 2010.

Key points from discussion

- A second ART coverage validation timeseries plot should be added in addition to the visualisation by age group (Jeff Eaton)

- In European cohort data there is a persistent increase in mortality for those who initiated ART at low CD4 counts despite being on treatment for long durations (Nikos Pantazis)

Leigh Johnson presented updates to IeDEA analysis of adult on-ART mortality rates. Updates included producing estimates by single year of age using a cubic polynomial and splitting the 12+ duration category into 12-23, 24-47 and 48+ month categories. In both African and Asian and American cohorts estimates using continuous age patterns were consistent with model results using compartmental age groups. Considering additional treatment duration categories, mortality rates for those 48+ months on treatment were 40% lower in African cohorts and 25% lower in Asian and American cohorts compared to mortality in the 12-23 month compartment. Numbers of observed deaths at longer ART durations in the IeDEA data set were low, and it is difficult to say with confidence at what duration mortality rates stabilise, but data from the Asian and American cohorts suggest little difference in mortality comparing 36-47 and 48+ months.

Jeff Eaton presented the effect of decreasing on-ART mortality beyond 12 months and Spectrum alignment with South Africa vital registration data. South Africa is the only SSA country with high quality vital registration data to which Thembisa is calibrated. Spectrum estimates higher AIDS deaths than Thembisa and vital registration data in recent years, driven by discrepancies in on-ART mortality in ages 35-54. Three changes to the mortality inputs in EPP-ASM were made, derived from parameter estimates in Johnson et al., 2019:

- The time trend was attenuated by 60%
- New compartments were created for 24-35 and 36+ months with 80% and 60% of the mortality experienced by those in the 12-23 month compartment respectively.
- The baseline mortality of the 12-23 month compartment was increased by 25%

Across 81 EPP regions changes were negligible for estimates of PLHIV or new infections, with a small reduction in AIDS deaths (median 2%). This was unlikely to account for the difference between Spectrum and Thembisa in South Africa. Thembisa estimates an IeDEA bias parameter that reduces mortality at longer ART durations by 25% to enable the vital registration data to be reconciled with IeDEA mortality estimates. When incorporating the bias parameter in Spectrum alongside South Africa-specific IeDEA mortality estimates, Spectrum produces similar estimates of on-ART mortality as Thembisa.

Key points in discussion

Duration compartments:

- Adding more duration compartments does not reconcile observed difference in South Africa and changes are not worth development time (Jeff Eaton, Leigh Johnson)
- Review whether additional paediatric treatment compartments are required at 2022 Paediatric Reference Group meeting

- **Recommendation: No change**

Number of timesteps in Spectrum:

- The number of timesteps could be specified by the user in EPP-ASM's advanced options (Jeff Eaton), but allowing structural differences between countries introduces inconsistencies and the benefits are not that large (Rob Glaubius, Tim Brown, John Stover)
- The number of timesteps should not be reduced for non-ASM EPP (Tim Brown)
- **Recommendation: No change**

Intercalation of new infections:

- **Recommendation: Intercalate new infections at each timestep**
- This requires coordinated updating of Spectrum/AIM, Shiny90, and CSAVR code. No revisions to EPP-ASM or EPP code are required.

Incidence/prevalence adjustment:

- **Recommendation: Retain the adjustment and permit it to vary over time beyond 2010**

Continuous age pattern of mortality:

- EPP uses five-year age groups and some development will be required to transition to continuous age (Jeff Eaton).
- The cubic polynomial estimates high mortality at the young ages and there may be discontinuities with the paediatric model at around age 15. This may require smoothing (Josh Salomon, Leigh Johnson).
- **Recommendation: Implement a continuous age pattern for on-ART mortality for the 2022 estimates.**

Session 2: ART and EPP

Session 2 focused on challenges arising for inclusion and interpretation of ART data in Spectrum and EPP during the most recent HIV estimates. Mary Mahy presented age-stratified ART data entered into Spectrum. In several countries, ART coverage in women exceeded 100% in older age groups, and approached 100% in men. Further, several countries reported ART coverage in women aged 20-24 higher than in women aged 25-49 which is inconsistent with household survey data on ART coverage by age.

Tim Brown presented changes to the ART input editor for EPP. ART coverage from household surveys will be added to the data editor screen, and pre-populated alongside survey prevalence data. Sub-population ART apportionment in the absence of survey ART coverage data will remain unchanged from the current strategy of determining the distribution by the proportion of PLHIV in the subpopulation as calculated from survey HIV prevalence. If calibrating to survey ART coverage, numbers on ART could be apportioned based on survey ART coverage, or specified manually by the user. The latter risks inconsistencies with survey ART coverage.

Jeff Eaton presented an analysis jointly fitting EPP to 15-49 HIV prevalence and ART coverage in 12 countries consisting of 84 EPP regions. Incorporating survey ART coverage slightly adjusts estimates, in most cases a parallel increase or decrease in HIV prevalence or ART coverage, and in some cases slight change in recent trend. Joint fitting can worsen the calibration to survey prevalence, however this will more explicitly draw users' attention to cases where ART data are inconsistent with survey prevalence and population.

Leigh Johnson presented an analysis assessing bias in self-reported ART status in ANC clinic surveys from South Africa in 2017 and 2019. In both the 2017 and 2019 surveys, 34% of the HIV-positive women who were recorded as untreated at their first ANC visit had suppressed viral loads. This suggests errors in self-reporting, or that medical records are inaccessible/not checked. This is aligned with eight other South African studies that found around 30-40% of people who report not knowing their HIV status have detectable ARV metabolites.

Key points from discussion

- Validation of calculated ART coverage with survey data should be displayed in EPP not Spectrum (John Stover, Tim Brown)
- ART apportionment for years without data should be copied from the earliest available year of data (Jeff Eaton)
- **Recommendation:**
    - **Validation of ART coverage with survey data should be prioritised over calibration**
    - **Calibrating to ART coverage data in EPP should be offered to users but not made mandatory**

Session 3: Consequences of COVID-19 for HIV estimates

Luisa Frescura presented on the impact of COVID-19 on routine HIV services. Comparing 2020 to mid-2021:

- In 11 countries with available data, HIV testing services declined 20-80% and showed signs of subsequent recovery in Mozambique and Sierra Leone;
- The number of people on ART was stable or increased in the majority of 22 countries with data;
- The number of people initiating ART decreased 20-40%, and showed signs of recovery in around a third of countries
- The number of pregnant women tested for HIV or initiated on ART at ANC decreased by at least 10% in 6 of 7 reporting countries

Analysis was limited by the completeness of reported data and the large non-response due to the reporting burden of submitting monthly data.

John Stover presented an updated analysis assessing excess COVID-19 mortality in PLHIV [cite]. Meta-analysis from 22 countries that reported COVID-19 deaths stratified by HIV status found a significantly increased mortality rate (HR 1.29). However, 95% of PLHIV data were from South Africa. Upon excluding these data the hazard ratio was not significant and reduced to 1.16. A second meta-analysis estimates a 20% increase in the odds of COVID-19 mortality for PLHIV (OR 1.19, 95% CI 1.01-1.39). When applying an additional hazard of 25% for PLHIV to estimates of total excess mortality from COVID-19 to the top 30 countries, a maximum of 1% of PLHIV would be expected to die from COVID-19. Further, the countries experiencing the highest excess mortality are not in the highest HIV burden settings.

William Msemburi presented global estimates of excess COVID-19 mortality. Models were calibrated to COVID-19 vital registration data, and COVID-specific and socioeconomic covariates. COVID-19 death data stratified by age and sex were available for 60 countries. Countries were grouped by age pattern and experienced excess mortality into 8 clusters, enabling age and sex patterns of mortality to be extrapolated to countries that lacked data. Predicted deaths stratified by age and sex in South Africa aligned closely with observed deaths.

Key points from discussion

- Only small monthly fluctuations were seen in numbers on ART during the 2021 estimates round. Retaining the monthly ART editor gives users the option to enter monthly data if they wish (John Stover)
- An editor exists in DemProj to enter excess COVID-19 deaths. The excess COVID-19 estimates do not need to be integrated into Spectrum if WHO estimates are not finalised when Spectrum is released. Users can enter final estimates when available (John Stover)
- Impact of entering excess COVID-19 deaths in Spectrum is expected to be small (John Stover, Leigh Johnson)

- A country consultation will be conducted before the excess COVID-19 estimates are finalised. Sharing of preliminary estimates can be explored with WHO (William Msemburi)
- COVID-19 may be more severe in 2021 than 2020 in sub-Saharan Africa and extrapolating to 2021 should be prioritised (Patrick Gerland)

- **Recommendations:**
    - **Retain monthly ART editor in Spectrum**
    - **No adjustment required for excess COVID-19 mortality in PLHIV**
    - **Countries should be offered the option to enter excess COVID-19 deaths in DemProj**

Session 3 – Naomi and the AIDS Data Repository (ADR)

Jonathan Pearson presented the Estimates Navigator, a new tool to support users through the modelling steps in the UNAIDS estimates process. The UNAIDS estimates process requires the use of a variety of tools, models, and web interfaces, requiring significant technical assistance. The Navigator will break the workflow down into key stages, providing objectives and prompts to guide users. The Navigator will interface with Spectrum, Naomi, and other tools through the AIDS Data Repository (ADR) to determine user progress.

Jonathan Berry presented updates to the AIDS Data Repository. The ADR now implements saving versions of data sets when they are updated. Versioning tracks changes and metadata for all datafiles. Users can browse current and previous versions. For the 2021 estimates, users could pull model inputs into Naomi. Interoperability has been expanded for the 2022 estimates: users can now push Naomi results to the ADR and pull Spectrum files into Spectrum on the web.

Emma Russell presented development for the Naomi model web interface:

- Improved ADR integration, allowing users to pull inputs and push model results to the ADR
- ShinyRob, a standalone web application for countries to review district-level programme data, has been integrated into Naomi, streamlining the data review process.
- A new visualisation of calibration results has been added, displaying the impact of calibrating Naomi estimates to Spectrum results.
- Portuguese language support has been added alongside English and French
- Future development will add a data exploration mode to permit countries that are not using Naomi to access the data review tools.

Jeff Eaton presented Naomi model updates:

- District populations have different growth rates but Naomi assumes national survivorship and net-migration. For countries with district populations over time, growth rates will be estimated from population data with estimates of PLHIV scaled accordingly. This will prevent sharp changes in district-level HIV prevalence due to migration
- Calibration to Spectrum results uses the interpolation of mid-year ART which Spectrum calculates internally and is not visible to the user. This can be confusing. Naomi will now use end-year Spectrum ART estimates, providing an exact match to treatment numbers in Spectrum.
- New infections are not produced for ages 0-4 as PMTCT cannot be reliably estimated at district level. Naomi will now distribute the total number of new child infections in Spectrum proportional to the district-level adult female PLHIV and paediatric population size
- Several countries have multiple household surveys with HIV prevalence and ART data. Naomi will now accept both surveys rather than use only the most recent survey, which would lead to loss of valuable data.

Key points from discussion

- The Navigator may make the estimates process more cumbersome for experienced users (John Stover), but Navigator steps can be skipped automatically by progressing through the models (Jonathan Berry)
- A “new items” summary would be a useful addition to the Navigator for experienced users (Tim Brown)
- Development of an integrated model should be prioritised (Ian Wanyeki)
- District-level data should be used to populate all higher levels of aggregation within Spectrum automatically (Mary Mahy)
- Web tools can be challenging to use on intermittent connections and it can be challenging to visualise Naomi results (Isaac Taramusi)

Session 4: Key population data in sub-Saharan Africa

Oli Stevens presented a key population Excel workbook that will assist country teams to review and validate surveillance data for female sex workers, men who have sex with men, people who inject drugs, and transgender people towards creating national-level estimates of new HIV infections. The workbook will be pre-populated with data from UNAIDS, Global Fund, and CDC key population databases. Users will be guided through several steps:

- searching for and entering data;
- reviewing data against regional comparisons;
- forming national consensus estimates for population size and HIV prevalence; and
- creating estimates of new HIV infections for each key population.

John Stover presented a proposed Spectrum interface for visualising key population estimates alongside estimates in the total population. Countries will upload the Excel workbook to Spectrum after EPP has been fitted, storing it within the PJNZ file. Spectrum will plot estimates of prevalence and ART coverage, and subtract estimates of key population new infections from sex-matched estimates of new infections in the total population.

Five points were raised for discussion:

1. How should estimates be derived in the absence of any national data?

- Population size estimates can be derived from neighbouring countries, but data on HIV prevalence and ART coverage from neighbouring countries is harder to use (Keith Sabin)
- Regression-based estimates through key population HIV prevalence or ART coverage and total population HIV prevalence and ART coverage should be used (Jeff Eaton). There may not be an association between KP and total population HIV prevalence (Tim Brown, Mathieu Maheu-Giroux)
- Applying a regional average for ART coverage can mask poor attainment or stigma issues in a country. Leaving ART coverage blank would be preferable (John Stover, Mary Mahy)
- It is important to highlight data gaps to encourage countries to collect local data (Tim Brown, Wolfgang Hladik)

Recommendation: In the absence of local data use model-based estimates for PSE and HIV prevalence. Leave ART coverage blank.

2. Guidance for extrapolation for PSE and HIV prevalence;

- More evidence should be sought on urban:rural ratios to inform PSE extrapolation (Leigh Johnson)

Recommendation: PSE should be extrapolated from urban data to national level using an urban:rural ratio. No extrapolation should be conducted for HIV prevalence.

3. Use of ART programme data;

- Coverage of ART programmes can be heterogeneous and hard to generalise to the national level (Parviez Hosseini)
- ART programme data should be used as lower bounds for size estimates, but not to inform estimates of ART coverage (Parviez Hosseini, Leigh Johnson)

4. Inclusion of CFSW and partners of KP; and

Recommendation: Countries can enter data on CFSW and partners of KPs but will not be required to produce estimates for these populations.

5. The time period for including data

Recommendation: PSE and prevalence data can be older than 5 years, but ART coverage data should be recent.

Further discussion

- Estimates of HIV incidence in female sex workers may be derived from surveys of recently initiated sex workers (Tim Brown)
- It is difficult to represent uncertainty in the consensus estimates, both the statistical uncertainty bounds and the confidence in those data (Leigh Johnson, Oli Stevens). A 'traffic light' system could be used to represent confidence in estimates (Jeff Eaton)
- It is important to bring community groups and key populations into the estimation process (Tim Brown, Lucy Platt)

Session 4: Concentrated epidemic estimation tools and CSAVR

Tim Brown presented an addition to EPP, visualising former key population status in concentrated epidemics. Information on turnover is supplied in the 'Reassigns' menu in EPP, showing the prevalence in all subpopulation groups after turnover has been included, and the source of PLHIV within each group. This is now represented graphically, assisting countries in understanding where PLHIV in the general male and female population have been infected.

Guy Mahiane presented CSAVR model development to the incidence rate ratio (IRRs) model, fitting to CD4 count at diagnosis, and constraining fits for Middle East and North Africa (MENA) countries in the absence of mortality calibration data. Implausible IRRs had been estimated during the 2021 estimates round. The IRR model has now been simplified, with prior densities narrowed and IRRs held constant before 1980 before data were available. Estimated IRRs are now plausible throughout the epidemic.

CSAVR results imply a higher CD4 count at diagnosis than indicated by observed distributions of CD4 count at diagnosis across several countries. Six models were tested that:

- Updated priors on the diagnosis model and/or;
- Added a parameter to decrease diagnosis rates at high CD4 counts and/or;
- Adjusted the natural history model; and/or
- Calibrated to CD4 distribution at diagnosis

The fit to CD4 at diagnosis data can be improved with the addition of different testing rates for individuals with higher CD4 counts, or by adjusting the national history model.

MENA countries have historically used estimates of AIDS deaths from the Global Burden of Disease study. These estimates, however, rely on low quality vital registration data and were previously recommended by the Reference Group not to be used as CSAVR inputs [cite]. When calibrating CSAVR to new diagnoses alone, the estimates of AIDS deaths are meaningless and depend on the incidence prior. One method to constrain mortality fits is to impute AIDS deaths using mortality patterns from MENA countries with higher quality data, and fit the model to observed new diagnosis data and imputed mortality data.

Key points in discussion were:

- Observed variation in disease progression and CD4 count from African cohorts and CASCADE data do not align with the natural history model adjustment required for CSAVR to reconcile CD4 data (Rob Glaubius, Jeff Eaton)
- Countries should be offered the option to fit to CD4 count at diagnosis (Leigh Johnson) but if these data are not well reconciled with AIDS deaths and new diagnoses this may cause confusion (Rob Glaubius)
- It would be preferable to provide a stricter prior for incidence or fix diagnosis rate parameters and fit without mortality data rather than impute AIDS deaths in MENA (Deepa Jahagirdar, Jeff Eaton, Leigh Johnson)

Rob Glaubius presented updates to the CSAVR interface in Spectrum. Users will now be able to switch between incidence models that have previously been fit without refitting, and a new menu will inform users whether the last fit remains valid. Age and sex IRRs can be fit separately, enabling countries with sex stratified data only to use IRR fitting. The AIM IRR interface has also been updated so it is clearer when IRRs fit in CSAVR are being used by Spectrum. CSAVR will be available in the web version of Spectrum which will permit national runs of multiple incidence models in parallel, speeding up the CSAVR workflow.

Rob Glaubius presented a model for estimating IRR from age-stratified ART data. Countries with generalized HIV epidemics can use HIV prevalence from household surveys to estimate IRRs in Spectrum. Countries with concentrated epidemics can estimate during CSAVR fitting or use default PWID/non-PWID patterns. However, ART by age outputs in Spectrum often do not line up well with programme data in concentrated epidemic settings. Twenty-five countries had consistent age-stratified ART data, sixteen by GAM age groups and nine by five-year age groups. IRRs calibrated to five-year age group ART data are plausible, whilst those calibrated to GAM age groups are of mixed quality.

Key points from discussion

- Generalised epidemic countries with household surveys and ART by age data could fit IRRs jointly to both datasets (Jeff Eaton)
- Explore beta distribution when estimating IRRs from ART data and when estimating IRRs from household surveys in generalised epidemics (Leigh Johnson, Rob Glaubius)

Keith Sabin presented data on the number of new HIV diagnoses during COVID-19 for thirteen countries in Latin America, Eastern Europe, and Central Asia. The number of new diagnoses decreased in the majority of countries. It was not known whether this was caused by a fall in HIV testing, or disruption between HIV testing and reporting of test results.

Key points from discussion

- CD4 count at diagnosis and recording of advanced HIV disease/AIDS should be used to validate estimates of new infections (Jeff Eaton)
- Collecting data on number of HIV tests conducted would help to validate trends in new diagnoses and estimated number of new infections (Leigh Johnson)

UNAIDS Reference Group on Estimates, Modelling, and Projections
Technical updates

Tuesday 5th – Thursday 7th October 2021
All times are London time (GMT+1)

Time	Duration (mins)	Topic	Presenter(s)/ Lead Discussant
15.30	10	Welcome and introductions	Peter Ghys
15.40	10	Meeting objectives and recommendation review	Jeff Eaton
15.50	15	2021/22 estimates round: process and timelines	Mary Mahy
16.05	10	Discussion	
Session 1: Spectrum updates and on-ART mortality (chaired by Josh Salomon)			
16.15	5	Session background and objectives	

16.20	30	Spectrum updates
		• Timesteps and intercalation of new infections
		• On-ART mortality
		  ○ Revising treatment duration categories
		  ○ Stratification by baseline CD4 at long treatment duration
		• ART coverage validation
		  ○ Displaying ART coverage beyond 100%
		• Spectrum on the web
			John Stover / Rob Glaubius

16.50	10	IeDEA mortality estimates • Additional ART duration categories • Continuous age structure	Leigh Johnson
17.00	10	On-ART mortality • Impact of revised duration compartments on estimates of HIV incidence and AIDS mortality • South Africa case study	Jeff Eaton
17.10	30	Discussion	
17.40	10	Break	
Session 2: Calibrating to ART coverage data in EPP (chaired by John Stover)			
17.50	10	Comparing the ART age distribution in programme data with Spectrum modelled estimates in SSA	Mary Mahy
18.00	10	EPP updates • ART input editors by subpopulation	Tim Brown
18.10	15	Calibrating to ART survey data in EPP-ASM and changes to estimates of HIV prevalence and incidence	Jeff Eaton
18.25	15	Assessing bias in self reported ANC ART coverage data from South African sentinel surveillance data	Leigh Johnson
18.40	30	Discussion	
19.10	10	Recommendations	
19.20	CLOSE		

Time	Duration (mins)	Topic	Presenter(s)/ Lead Discussant
15.30	10	Recommendation review	Jeff Eaton
Session 3: COVID-19 and HIV (chaired by Mary Mahy)			
15.40	20	HIV service disruptions in 2021	Luisa Frescura
16.00	15	Excess COVID-19 mortality in PLHIV	John Stover
16.15	15	Global estimates of excess COVID-19 mortality by age and sex	William Msemburi
16.30	10	Impact of COVID-19 on new diagnosis data in CSAVR	Keith Sabin
16.40	30	Discussion • *Have HIV testing and treatment services been disrupted by COVID-19 in 2021?* • *Should Spectrum adjust mortality rates for PLHIV due to the COVID-19 pandemic?* • *Should the COVID-19 mortality shock be taken into account by DemProj?*	
17.10	10	Break	
Session 4: Naomi, the ADR, and the UNAIDS Estimates Navigator (chaired by Tim Brown)			
17.20	15	UNAIDS Estimates Navigator	Jonathan Pearson
17.35	10	The AIDS Data Repository • Versioning • Spectrum on the web	Jonathan Berry
17.50	15	Naomi interface updates	Emma Russell
18.05	20	Discussion	
18.25	15	Naomi model development • ART attendance • District-level net migration	Rachel Esra / Jeff Eaton
18.40	10	Discussion	
18.50	10	Recommendations	Tim Brown
19.00	CLOSE		

Time	Duration (mins)	Topic	Presenter(s)/ Lead Discussant
Session 5: Key populations in sub-Saharan Africa (chaired by Leigh Johnson)			
15.30	40	Consolidated guidance for collating and reviewing key population data	Oli Stevens
16.10	5	Key population estimate editors in Spectrum	John Stover
16.15	60	Discussion	
17.15	10	Break	
Session 6: CSAVR and concentrated epidemics (chaired by Jeff Eaton)			
17.25	10	Visualising former key population status in concentrated epidemic	Tim Brown

17.35	30	CSAVR model development
		• Updates to incidence rate ratio fitting
		  ○ Constraining estimates in the pre-data period
		  ○ Constraining large age IRR estimates
		  ○ Separating age- and sex- IRR fitting for countries with sex disaggregated data
		• Constraining MENA fits in the absence of mortality data
		• CD4 model and validation with ECDC model
			Guy Mahiane

18.05	30	Discussion • *Reach guidance on the usage of GBD death estimates or adjusted vital registration data as CSAVR inputs*	
18.35	10	CSAVR interface updates	Rob Glaubius
18.45	15	Fitting IRRs to ART data in concentrated epidemics	Rob Glaubius
19.00	10	Impact of COVID-19 on new diagnosis data in CSAVR	Keith Sabin
19.10	15	Discussion	
19.25	5	Recommendations	Jeff Eaton
19.30	CLOSE		