UNAIDS Reference Group on Estimates, Modelling, and Projections
Recommendations | July 2024

Recommendation	Lead person(s)	Timeline
Session 1: Advanced HIV disease **Objectives:** • Validate Spectrum estimates of AHD prevalence (defined as CD4 < 200/mL) • Identify needs for future AHD estimates from modelled results and surveillance data sources		
<u>Spectrum AHD outputs:</u> Overall, Spectrum and Shiny90 model results for the percentage of CD4 <200 were consistent with available PHIA survey, GAM, IeDEA and systematic review data on CD4 <200 among untreated PLHIV (PHIA surveys; African countries) and among those diagnosed or initiating ART (GAM, IeDEA, WHO systematic review). Based on this, the Reference Group recommended to add new Spectrum outputs for estimates of Advanced HIV Disease (AHD): • Report outputs for AHD both among <u>all people living with HIV</u> and AHD <u>at ART initiation</u> (relatable to clinical programme data). • Stratify Spectrum outputs showing estimated numbers and proportions with AHD in the following sub-groups: unaware of HIV positive status, Know status but not on ART, On ART but not VLS, and on ART and VLS. • *Provisional recommendation:* Add PLHIV untreated with CD4 200-249 to 'AHD population' to approximately reflect those with AHD-defining clinical conditions, but CD4 >200, consistent with previous practice for ART eligibility CD4 200. ○ Provisional pending review of impact on Spectrum AHD estimates compared to available data. PHIA survey data indicate that around 4% of PLHIV who are virally suppressed have CD4 <200. This represents a large proportion (~half) of all PLHIV with CD4 <200, but clinically those VL suppressed are perceived to have low risk of opportunistic infections; this may vary for different conditions. Therefore, recommended to (1) include those with VLS in modelled AHD outputs, but (2) stratify reported AHD estimates among those on ART by VL suppression status.	Avenir Health	Oct 2024 Reference Group meeting

<u>Spectrum AHD data input and validation:</u>
 	
• Add input editors for users to record routine programme data on AHD that are currently reported to GAM:
  ○ CD4 distribution among new diagnoses and ART initiators
  ○ Cryptococcal meningitis treatment cascade
	Avenir Health	Oct 2024 Reference Group meeting

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• Add validation plots to compare routine programme data on AHD and cryptococcal meningitis with Spectrum outputs.		
<u>Spectrum model structure and assumptions:</u>		
• Among those on ART, Spectrum only represents CD4 at ART initiation, not <u>current</u> CD4 category. To produce modelled estimates for AHD among those on ART, review data to develop model approximation for: o Proportion with CD4 <200 among those on ART with unsuppressed VL, by duration on ART (<6 months, 6-12 months, 12+ months) o Proportion with CD4 <200 among PLHIV on ART with suppressed VL	TBD	Oct 2024 Reference Group meeting
• Spectrum model outputs indicated a rapid increase in recent years in percentage with CD4 <200 among the 'diagnosed but untreated population' (largely treatment interrupters), which was inconsistent with data from PHIA surveys. This may be an artefact of moving interrupters only one CD4 category higher, i.e. someone who initiated at CD4 of <100 will be in 100-200 when interrupting (i.e. still defined as AHD) regardless of duration on ART before interruption. *Recommendation:* o Review evidence on CD4 recovery on ART and CD4 decline following treatment interruption o Assess whether alternative assumptions about CD4 recovery are more consistent with data on AHD among diagnosed but untreated	TBD	Oct 2024 Reference Group meeting
• The Shiny90 sub-model is used to produce estimates for CD4 <200 stratified by undiagnosed and diagnosed but untreated for countries in sub-Saharan Africa. Confirm that Spectrum AIM simulation and Shiny90 model simulation produce internally consistent outputs for number with CD4 <200.	Avenir Health	Oct 2024 Reference Group meeting
• Extend evaluation to concentrated epidemic countries: confirm CSAVR and Spectrum-AIM results for CD4 <200 are internally consistent and review CSAVR outputs for CD4 <200 at diagnosis vs. available data.	Avenir Health	Oct 2024 Reference Group meeting
<u>Further data triangulation and validation:</u>		
• Review available data from new PEPFAR disaggregation of TX_NEW indicator by CD4 at initiation. o Compare with Spectrum outputs o Assess evidence of association between CD4 testing coverage and advanced HIV disease, indicating potential selection bias in those receiving CD4	Oli Stevens/ Sara Herbst	May 2025

Recommendation	Lead person(s)	Timeline

testing in settings with incomplete AHD testing coverage
 	
• Review data on CD4 and VL measurement at ART initiation to assess AHD among those virally suppressed at ART initiation
  ○ Baseline CD4 and VL measurement collected in Zambia surveillance
  ○ VL suppression at ART initiation likely largely reflect clients who are on ART and silent transferring
	Jake Pry, CIDRZ, Zambia	May 2025

Session 2: Causes of death **Objectives:** • Review implementation of CM and TB death estimates in Spectrum, within the envelope of Spectrum-estimated HIV-related deaths		
<u>Tuberculosis:</u> Comparison of WHO-published estimates of TB-HIV deaths and UNAIDS-published estimates of AIDS-related deaths showed unexpectedly high or low proportions of all AIDS deaths due to TB in some countries. The Reference Group recommended to not yet implement output for TB-HIV deaths as proportion of AIDS-related deaths in the next round of Spectrum estimates, pending further review of estimates. Form a Working Group with WHO TB team to review unexpectedly (high and low) implausible proportions of WHO estimated TB-HIV deaths relative to UNAIDS estimated AIDS deaths) in some country-years. • Review consistency of AIDS deaths estimates with surveillance data in countries where TB estimation data perceived strong; examples: Colombia, Peru, Cambodia, Myanmar Review implications of any methodological changes to TB estimation methods result from September 2024 WHO Task Force meeting. Working group activities will commence after these potential changes have been determined. Compare case notification data on HIV prevalence and ART coverage among TB cases, used by WHO TB model, to UNAIDS/Spectrum modelled HIV estimates results across countries. WHO TB-HIV mortality model currently uses these case notification data to determine how TB case fatality ratios (not receiving ART or receiving ART) are applied to the HIV population. Considerations for potential development of TB-HIV deaths modelling strategy: • Higher rates of TB testing among PLHIV than HIV-negative people may bias HIV prevalence among TB notifications	Working Group	Meetings to commence after the Task Force meeting in September Next feedback to the Reference Group in May 2025

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• Request for gender stratification in TB-HIV death estimates • Update the review of TB case fatality ratios (CFR) among people living with HIV • Consider using Spectrum model outputs for duration on ART (by country and calendar year) as input to TB model for applying stratified CFRs • Update the systematic review of the proportion of HIV deaths that are due to TB. Previous two systematic reviews were from the pre-ART-for-all era.		
Review evidence and consider modelling strategies for whether assumed national mortality rates among people with HIV in Spectrum should vary according to national TB burden	TBD	May 2025
<u>Cryptococcal meningitis (CM):</u> *Spectrum model outputs:* Implement the University of Minnesota model in Spectrum, updated using Spectrum internal calculations as inputs for numbers with CD4 <200 by HIV care cascade stages • Report CM model estimate outputs for: ○ Cryptococcal meningitis cases among PLHIV ○ Number of CM-HIV deaths ○ CM-HIV deaths as a proportion of AIDS deaths ○ Disaggregate cases and deaths results by HIV care cascade stages (unknown HIV status, aware but untreated, on ART). *Spectrum model inputs:* • Create CM programme data input editor in Spectrum for users to input annual data on: ○ Coverage of screening of PLHIV for CrAg, prevalence of CrfAg and treatment with fluconazole preventive therapy if diagnosed (the cascade piloted in 2024 GAM – in numbers and %s) ○ • Where possible, prepopulate input editor with 2024 GAM-reported CM screening coverage, CrAg prevalence and treatment coverage. For CrAg prevalence, a second default for countries not reporting this to GAM 2024, can be the value used in UMN's analysis. • In validation plots, compare CM cascade programme data and modelled CM cases *Further model validation:* • Validate CM results for Botswana and South Africa from work resulting from the Ambition trial in Botswana, and the NICD in South Africa.	Avenir Health TBD	Oct 2024 Reference Group meeting May 2025

Recommendation	Lead person(s)	Timeline
• Review alignment of CM indicators specified in GAM, PEPFAR MER, and UNAIDS 2030 targets.		
Session 3: Mortality among PLHIV on ART **Objectives:** • Validate Spectrum estimates of on-ART mortality against various sources • Present new approach to Spectrum mortality structure given incomplete CD4 data in most IeDEA cohorts		
Comparison of ART mortality rates recorded through PEPFAR TX_ML indicator vs Spectrum estimates for mortality on ART: • Across countries, there was wide variation in mortality rates reported through PEPFAR routine TX_ML indicators, ranging between 50% to 80% lower than Spectrum modelled estimates. This likely reflects variation in completeness of death ascertainment in clinical records, rather than providing evidence about overall mortality rates. • *Review further evidence on sex ratios in ART mortality*. Across countries, PEPFAR TX_ML reporting consistently implied higher male-to-female mortality ratios than Spectrum on-ART estimates. • *Review ART mortality rates among young adults 15-24 years old from IeDEA and other sources*. In PEPFAR data, mortality increases by age, while in Spectrum mortality is higher among 15–24-year-olds than among 25-29-year-olds.	Sara Herbst, Jeff Imai-Eaton, Reshma Kassanjee	May 2025
Review new ART patient tracing studies, including routine programme tracing results that may not be published in academic journals. *Example:* Ethiopia cohort review.	UNAIDS	Feedback by May 2025
IeDEA analyses: • Compare all-cause mortality on ART (aggregating over age/sex/CD4) between IeDEA and Spectrum (by region) • Compare mortality among ART clients recorded through IeDEA surveillance to mortality recorded through routine PEPFAR reporting at the same health facilities.	Avenir Health / Reshma Kassanjee	May 2025
Analyse mortality among ART patients from clinical records in countries with strong electronic medical record systems. Example countries: Kenya, Zimbabwe, Rwanda, Botswana, Eswatini, Zambia	TBD	May 2025
Compare excess mortality among people living with HIV from population HIV cohort studies to Spectrum (AHRI, South Africa; Rakai, Uganda; Siaya, Kenya; Manicaland, Zimbabwe)	TBD	May 2025
Compare vital registration AIDS mortality recorded in Botswana to Spectrum.	TBD	May 2025

Recommendation	Lead person(s)	Timeline
Review Mozambique and Sierra Leone sample vital registration data for AIDS deaths or deaths among PLHIV	TBD	May 2025
Session 4: Excess mortality among PLHIV **Objective:** • Review method to separate AIDS vs non-AIDS deaths within AIM's IeDEA-based all-cause mortality rates		
Implement in Spectrum a non-AIDS excess mortality rate among people living with HIV by sex / age / CD4 category. The non-AIDS excess mortality will apply to all PLHIV irrespective of ART status. For all regions outside sub-Saharan Africa, establish default parameters for non-AIDS excess mortality based on proposed method, fitting to the percentage of non-AIDS deaths from Trickey *et al.* review in high-income countries. Adjust AIDS-related mortality rates on ART, such that total all-cause mortality among PLHIV remains consistent with IeDEA-based all-cause mortality rates on ART between AIDS. Retain standard AIM outputs at all-cause deaths among PLHIV and AIDS-related deaths. Add an additional output reporting the modelled excess mortality among PLHIV stratified by AIDS-related and non-AIDS deaths. *Impact of this change is anticipated to be largest in high-income countries, with high ART coverage and low mortality rates among those on ART. Impacts are anticipated to be modest in other global regions where AIDS-related mortality rates are higher among those on ART.*	Avenir Health	2025 estimates
Review assumptions of derived excess non-AIDS mortality rates to address unexpected pattern that more excess deaths are due to non-AIDS causes at lower CD4 categories.	Avenir Health	Oct 2024 Reference Group meeting
Recommend not to apply excess non-AIDS mortality in Africa region, due to lack of data quantifying non-AIDS excess mortality among PLHIV in this region, and uncertainty about generalizing patterns derived from high-income countries to more generalised epidemic patterns in sub-Saharan Africa. Data identified in Trickey *et al.* review were exclusively from high-income settings, there is low confidence in generalizing these patterns to other regions, and priority to identify additional mortality data for country and region-specific recommendations for all non-high-income regions.		

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Session 5: Treatment Interruption **Objectives:** • Review outcomes from 2024 estimates • Provide recommendations on guidance and definitions for calculating Spectrum interruption inputs		
No change to Spectrum default treatment interruption rates, on the basis that (1) national ART programs are not able to accurately measure rates of treatment interruption (different from programme observed loss to follow-up) and (2) there is not a clear relationship between treatment interruption rates and LTFU rates.		

Reinforce to country teams in Spectrum user guidance, how treatment interruption differs from that for LTFU.
• **Lost to follow-up:** Not seen at service delivery site >28 days after missed appointment
  • Excludes individuals recorded as deceased or transferred
  • Includes those with unknown outcomes—including non-ascertained deaths, silent transfers
• **Treatment interruption:** 'Clinically meaningful' gap in treatment
 	
Users should not use LTFU measured in routine programme reporting as Spectrum's treatment interruption input (including the PEPFAR IIT [interruption in treatment] indicator, which actually measures LTFU and not interruption). It is anticipated that true treatment interruption rates are substantially lower than reported LTFU / PEPFAR IIT rates, given high rates of silent transfer.		

Session 6: World Population Prospects 2024 update **Objective:** • Review impact of new population estimates on HIV estimates		
Do a preliminary Spectrum analysis with updated demographic inputs to determine countries most likely to have substantial changes in HIV estimates due to changes in demographic input parameters. Then provide support to countries to anticipate and understand changes in HIV estimates resulting from large shifts in population and/or births. Review subnational demographic inputs (fertility rates, mortality rates, population structure, and net migration patterns) for all countries using sub-national Spectrum files.	UNAIDS	2025 estimates

Recommendation	Lead person(s)	Timeline
Session 7: Dynamical modelling of HIV trends in key populations in sub-Saharan Africa **Objective:** • Review proposal for technical working group process and composition • Review updates to Goals-ARM		
<u>Key populations modelling Technical Working Group (TWG)</u> TWG to provide expertise and input from intersecting and overlapping (community, national programme experts, strategic information experts) perspectives on the representation of key populations in the Goals-ARM model being developed, prior to its piloting in 2025. 1) TWG: Engage experts beyond epidemiologic modellers to experts in key population behavioural science and epidemiology. 2) TWG: Establish terms of reference for the TWG defining expectations, roles, responsibilities for members of the TWG. 3) Community engagement composition: consultative approach recommended engaging via UNAIDS Community Leadership and leveraging partnerships with community partners experienced in working with modellers of HIV in key populations. 4) Expertise in HIV key population programmes and programmatic data collection: consultative approach recommended via leveraging partnerships with program experts engaged and/or interested in key population-modelling. 5) Country Pilot: two sub-Saharan African countries in the 2025 round, selected for comprehensive and high-quality key population data. Tag mini-workshop to end of December 2024 Estimates Workshop, following the training on Goals-RSM, on Day 5 of the main workshop with all countries participating. The scope of the TWG and above community and program engagement will focus on seeking inputs and validation related to the generation of key population indicators, for which Goals-RSM is currently being used in sub-Saharan Africa. The Key Population modelling TWG will not evaluate or make recommendations about application of Goals-ARM as an alternative to EPP/Spectrum-AIM for producing full national epidemiologic estimates.		
<u>Goals-ARM development</u> Reconciling epidemic growth rates during the early epidemic period: • Prevailing modelled estimates for early epidemic growth rates are heavily dependent on model assumptions and are informed by limited surveillance data. Therefore, while aiming for Goals-Arm calibrations to roughly reproduce AIM/EPP-estimated historic HIV trends, the AIM/EPP estimates for early epidemic growth rates should not be considered as a 'gold standard' for evaluating accuracy of Goals-ARM. Early epidemic growth in Goals-ARM results should be evaluated according to epidemiologic plausibility and triangulation with data, rather than based on discrepancy with existing results for the early epidemic period. • STI co-factors: o Although STI co-factor effects facilitated model alignment (with EPP/Spectrum) for the early epidemic growth rate, there was some concern that allowing the co-factor strengths to vary in calibration might lead to implausible values, "absorbing" other factors not accounted for. o Could add another calibrated factor to absorb these residual 'unexplained' country-specific drivers of transmission. o The scarcity of STI data for key populations and uncertainty on plausible cofactor values separately for symptomatic STI (syndromes) versus any STI infection, were also noted. • Transmission during primary HIV infection: Ensure that the primary infection transmission rate ratio is sufficiently high– and not absorbed in the STI cofactor. Initial peaks in primary infections,		

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combined with typical low condom usage and high STI rates are important for reconciling rapid growth rates in early epidemics. Key population data likelihood and calibration: • Approach to calibrating key population epidemic: Given the lack of nationally representative key population prevalence levels and trends and heterogeneity in key population surveys, consider calibrating to ratios of prevalence between key population and the general population, adjusted by age and location. • Likelihood definition: Consider likelihood approaches (e.g. random effect models) that account for heterogeneity across key population samples rather than assuming key population surveillance data are nationally representative. (example in https://doi.org/10.1136%2Fsti.2009.037341) South Africa case-study recommendations: • Surveillance data suggest minimal heterosexual HIV transmission in South Africa before the late 1980s. Consider seeding the SA epidemic around 1985, to better align with early growth estimated by Thembisa • Consider calibrating to ANC data similar to Thembisa. • Investigate why Goals-ARM estimated all-cause mortality among PLHIV increases rapidly after the most recent year of deaths data used in model calibration.		
Session 8: New infections among key population and their partners **Objective:** • Review methods of estimating uncertainty in estimates		
It is important for dissemination of distribution of new infections to clearly communicate that there is substantial uncertainty in current estimates at country, regional, and global level. Formal statistical uncertainty ranges are difficult to quantify in the multi-source method used to derive estimates across countries. For 2024 UNAIDS update of distribution of infection estimates, use variation across countries within a region in the percent of new infections in each key population as a heuristic representation of the amount of variation in these estimates. Recommend against interpreting variation across countries as a measure of statistical uncertainty ranges. Also caution against adding up upper-bounds or lower-bounds across key populations, which would not reflect the correlated uncertainty across countries and populations.	UNAIDS	2024 update
Session 9: Sub-national HIV estimates in sub-Saharan Africa **Objective:** • Review the SHIPP tool methods and make recommendations about its suitability and/or future development		
SHIPP tool: The group reviewed the methods and workflow of the Subnational HIV Estimate in Priority Populations (SHIPP) tool, a tool to disaggregate district/sex/age results for population size and new		

Recommendation	Lead person(s)	Timeline
infections from Naomi to risk populations (not sexually active, single cohabiting/marital partner, non-regular sexual partner) to support country programme planning aligned to the Global AIDS Strategy 2021-2026. There were concerns about disaggregation of key population sizes and new infections by district, sex, and age group, considering the extremely sparse stratified data informing these stratifications. Therefore, the group recommended the SHIPP tool be revised to **only report national-level key population disaggregation**, and key population results should not be reported at the district level. Further development suggestions: • Review assumptions and additional available data for disaggregating key population estimates by age. • Investigate sensitivity of results when distributing men who have sex with men population size estimate only among sexually active men, vs. classifying some into the not sexually active group. Reiterate need for new data sources to guide subnational key population size and epidemiologic estimates, particularly use of key population programme data.	Katie Risher	Oct 2024 Reference Group meeting

<u>Key population size estimates</u>
• *Provisional recommendation:* If a consensus national key population size estimate was reported by country team in the key population workbook submitted with their Spectrum file, use this as the consensus PSE for other estimates and modelling purposes.
  ○ Recommendation is pending validating and finalising remaining pending queries on key population 2022 and 2023 workbooks submitted to UNAIDS.
• In the absence of an updated (or reconfirmed old) workbook, use PSEs determined by UNAIDS and used in 2024 Goals calibrations for 2024 regional key population estimates. These were determined according to a hierarchy:
  ○ For SSA countries, the Stevens et al. *Lancet Glob Health* 2024 synthesis, and
  ○ For 6 smaller concentrated-epidemic countries in SSA, used latest EPP estimate or an imputed (ESA or WCA) regional median.
• To enable logical workflow and alignment across tools (Spectrum, Goals, SHIPP) and results (national, subnational and UNAIDS regional KP estimates), *the key population workbook updating with country teams should be completed as a separate process before the Spectrum estimation starts (recommended timeline September to November)*
	UNAIDS	September 2024

Recommendation	Lead person(s)	Timeline
<u>Naomi</u> • District population estimates: Display district-level population pyramids to support review and validation of inaccurate district population inputs • Implement validation comparison of Spectrum and Naomi ART and ANC programme data inputs to alert users to discrepancies in district-level and national programme data reports • Commission development of Microsoft Excel dashboard tool to enable more interactive review of district HIV estimates	Avenir Health	Oct 2024 Reference Group meeting May 2025
Session 10: Sub-national EPP stratification **Objective:** • Review likelihood structure and make recommendations about removing sub-national (including urban/rural) EPP stratification.		

• Provide improved guidance to users about rationale for EPP subpopulation stratification:
  ○ Clarify primary rationale: adjusting for historical non-representativeness of surveillance data
  ○ This has lesser importance for recent estimates in current era, thanks to more nationally representative surveillance (household surveys, routine ANC testing)
 	
• *Provisional recommendation:* Encourage users with urban/rural population structures to consider switching to a consolidated single national EPP region.
 	
• Confirmation of this recommendation is provisional on further review impact on changes to estimates in pre-data period on outputs of interest, e.g., incidence, prevalence, AIDS deaths, number of orphans, and children living with HIV.
	UNAIDS
	
	Avenir Health
		2025 estimates
		
		Oct 2024 Reference Group meeting

• For countries with sub-national stratification of EPP fits or subnational Spectrum files, share further information about the rationale for more aggregated regions in EPP to enable more precise trend estimates, but allow users to continue to choose regional or national stratification to EPP fitting ○ There is perceived high importance of region-specific results from EPP and Spectrum which are not available from Naomi, namely HIV incidence trends, PMTCT indicators, and AIDS-related deaths estimates.	UNAIDS	2025 estimates

Recommendation	Lead person(s)	Timeline
• Further study accuracy of applying EPP at regional versus national level according to statistical goodness of fit criteria, such as out-of-sample predictions to guide recommendations and user decisions about level of stratification and confidence in subnational trend estimates from EPP.		
• For users who retain subnational Spectrum PJNZ files, provide improved guidance and tools for reallocating ART, ANC, and PMTCT programme data to align numerators and denominators and ensure accurate service coverage, service, need and programme impact estimates. • Communicate to users the intrinsic challenge that uncertainty in numerators (with some women attending ANC outside from the province they live in) and denominators (e.g., sub-national fertility rates, sub-national population estimates) is often greater than the margin of the service coverage gaps that Spectrum seeks to inform.	UNAIDS	2025 estimates
Session 11: ART coverage data discrepancies **Objectives:** • Plan further work to resolve or reduce ART coverage data discrepancies • Develop guidance and examples for countries to improve validation and data quality improvement of ART results • Review current uncertainty on ART numbers and propose adjustments		
<u>Improved guidance to users</u> • Develop guidance for countries on common reporting discrepancies and reasons for adjustments to programme data. • Collate and provide users with cases studies of ART programme data adjustments inputted to Spectrum estimates, including strategies and data sources for determining magnitude of adjustments. • Establish default adjustment options in Spectrum editor. As a default specify adjusted ART coverage that is halfway between ART coverage predicted from routine ANC data and reported ART programme data • Encourage detailed triangulation of facility ART reporting data with national supply chain and dispensing data as part of data review process preceding HIV estimates updating. This data review process will require more time and preparation before estimates process. • Discourage ART adjustments focused solely on resolving logically inconsistent estimates (such as >100% coverage for the latest estimated year.	UNAIDS	2025 estimates

Recommendation	Lead person(s)	Timeline
<u>Spectrum Program Statistics inputs editor and validation visualisations</u> • Place the ART adjustment multipliers in the main Spectrum (adult and child) ART editors, instead of pop-out editor, to give more prominence to the adjustment tool and set expectation this may be used • Add visualizations of how national ART scale-up compares with trends in other countries, to assist countries to identify and address implausible or otherwise abnormal entries • Communicate in user guidance that errors and duplication in routine data are expected and therefore a non-zero adjustment is often appropriate. • Move the comparison of ART coverage by ART program data versus ANC/PMTCT data (% of PMTCT initiated before current pregnancy) into the Program Statistics ART editor [currently displayed in Validation editor] • Add visualization(s) of the effect of alternative adjustments, e.g. aligning with ANC/PMTCT-based coverage, or halfway between ANC-based adjustment and unadjusted.	Avenir Health	Oct 2024 Reference Group meeting
<u>Recommendations for national ANC data</u> Accurate ascertainment ART usage prior to first ANC visit are critical data for triangulating population ART coverage. Accurate reporting of routine ANC data is weak in some countries, particularly in West and Central Africa where data also imply larger discrepancies with prevailing national ART coverage estimates from ART programme data. Reporting in these countries may also be susceptible to higher rates of non-disclosure of ART use related to higher stigma and services access challenges (e.g. stock outs). *Recommendation:* UNAIDS and partners should support national programmes to review and ensure accurate reporting of routine ANC indicators. *Recommendation:* To rapidly address uncertainties about population ART coverage and routine ANC reporting, particularly in Western and Central Africa countries, support countries to conduct viral load testing among pregnant women newly diagnosed or 'known positive' with HIV at first ANC presentation at a representative sample of ANC clinics. • May also consider tenofovir urine assay to assess ARV usage (easier, less expensive, directly measures whether on ART).	UNAIDS UNAIDS	2025 estimates September 2024

Recommendation	Lead person(s)	Timeline
<u>Use of routine ANC HIV testing data in concentrated epidemic settings</u> Consider the current use and UNAIDS guidance on routine ANC HIV testing data to triangulate HIV prevalence and ART coverage in concentrated HIV epidemic settings. Potential uses of routine ANC testing and prevalence data: • Triangulating with CSAVR-estimated historic HIV prevalence and ART coverage trends, to select among alternative CSAVR incidence curves. • Fitting relative fertility among PLHIV via the local adjustment factor, to estimate PMTCT (and paediatric ART) coverage. • Validating incidence sex ratios (from CSAVR, concentrated-epidemic defaults, or fitted to ART by age data) by comparing ART coverage of pregnant versus all adult women. Recommended analyses: • Coverage of ANC HIV testing, out of total births and ANC clients • Consistency over recent years in annual ANC testing volume, and positivity • HIV prevalence among all adult women vs. routine ANC HIV prevalence, adjusted for testing coverage • ART coverage among all adult women vs. pregnant women attending routine ANC	Jeff Imai-Eaton, Maggie Walters, Eline Korenromp	May 2025
<u>Uncertainty in ART numbers</u> • Recommend not change to the current approach of proportional uncertainty ranges on ART numbers based on pre-2019 DQAs • For countries with direct estimates of ART coverage from household surveys (e.g. PHIAs), compare survey confidence intervals and current Spectrum uncertainty ranges to assess whether Spectrum ART coverage uncertainty ranges are systematically wider than survey uncertainty ranges ○ This may imply a revised approach, to obtain narrower ranges in countries with a recent PHIA survey whose ART coverage estimate was used in EPP fitting. • Investigate impact of approaches to expressing uncertainty in the percentage ART coverage rather than in the absolute number on ART, such that uncertainty in ART numbers and in PLHIV become related.	Avenir Health	May 2025

Recommendation	Lead person(s)	Timeline
<u>District level ART coverage, unmet need, and target setting</u> Develop guidance for how to propagate national ART adjustments to district ART coverage and unmet need in Naomi model estimates Develop guidance for users on how to specify district ART targets in settings where ART programme data are adjusted downwards for HIV estimates, resulting in difference in ART data recorded in DHIS reporting and ART totals implied in modelled ART coverage numerators.	Rachel Esra PEPFAR/GHSD, UNAIDS, Avenir Health	2025 estimates
Session 12: Age distribution of new infections in generalized epidemics **Objectives:** • Review the need to update generalized epidemic default age incidence rate ratios • Review evidence on incidence shifting to older ages • Consider Spectrum default patterns and specification for time-varying age incidence rate ratios		
Recent empirical HIV incidence data from Eastern and Southern African settings and mathematical modelling demonstrate moderately strong evidence that the age distribution of HIV infections is increasing as incidence and prevalence among young adults decline. In contrast, default parameters in Spectrum used by most countries assume static age pattern of HIV incidence over the course of the epidemic. It was recommended not to implement a full age mixing matrix in EPP-ASM or Spectrum-AIM. While this approach could capture underlying transmission dynamics underpinning aging incidence, it would be a large model change; the Reference Group instead recommends to rather focus efforts on the full transmission dynamic model Goals-ARM. As an interim approach, recommended to review incidence patterns by age from empirical data and mathematical models and calculate an average aging pattern for generalized epidemics to serve as updated default incidence rate ratios including ageing of the epidemic. Specifically, review: • Fitted HIV prevalence residuals over time to inform empirical evidence for an average change over time in data • Mathematical model comparison results on age pattern of incidence from October 2020 incidence patterns review (see October 2020 UNAIDS Reference Group meeting)	Avenir Health, Jeff Imai-Eaton, Oliver Stevens	Oct 2024 Reference Group meeting
Do not recommend update of generalised epidemic default age incidence rate ratio pattern. Most countries with a generalized epidemic calibrate country-specific incidence rate ratios use – or should use -- household survey HIV prevalence; only very few should still need the default pattern.		

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Provide examples, user guidance, and user support to identify and resolve instances where alternative data sources (survey HIV prevalence, survey ART coverage, ART programme data by age) imply inconsistent sex/age patterns in HIV prevalence or people living with HIV. • Add validation plots illustrating comparisons of survey-based versus program-reported adult ART numbers • Consolidate validation plots for multiple data sources about prevalence and PLHIV by age, in the IRR fitting tool	Avenir Health	Oct 2024 Reference Group meeting