Context-specific estimates of vertical transmission

The Spectrum model, used to estimate vertical transmission rates of HIV[1] for WHO and UNAIDS, relies on parameters of vertical transmission and various sources of data, including sentinel surveillance and programmatic data. However, the performance of this model has been questioned because it tends to overestimate vertical transmission rates.[2] Although robust for national estimates, Spectrum does poorly at district level where action is taken, due to sparsity of data. The accuracy and granularity of Spectrum estimates have been improved by Eaton and colleagues[3] with a Bayesian modelling framework, enabling district-level estimates,but estimates on HIV incidence resulting from vertical transmission among children aged 0–14 years have still not been produced.

To further improve this approach, a Bayesian modelling framework could help leverage the wide coverage of programme data while correcting for some inconsistencies (eg, more first antenatal care [ANC1] visits than expected births). Furthermore, by replicating Spectrum's vertical transmission probability tree and implementing it in a Bayesian hierarchical framework, programmatic data could be leveraged at the level of the health districts and consider both gaps in data affecting the completeness of information (eg, as a result of strikes by health-care workers responsbile for data collection or security issues such as terrorist attacks that lead to the closure of health facilities) and the potential internal migration of the population. For each district, the probability tree model will use information on the numbers of ANC1 visits and HIV prevalence (ie, numbers of known HIV-positive individuals on antiretroviral therapy and new cases of HIV), as well as data from programmes for prevention of vertical transmission. The model will also allow for the potential double-counting of women through bias parameters, which will allow the reconciliation of non-concordant information (eg, resulting from migration between districts, underestimations of population denominators, and overestimation of HIV prevalence).[4] Importantly, the resulting uncertainty in parameters relating to both bias and vertical transmission will be propagated through the model's outcomes (ie, through the elicitation of prior probabilities). The hierarchical nature of the model (eg, districts nested within health regions) will allow the sharing of strengths across observational units. The outcomes of the model will include annual district-level estimates of prevention gaps along the full vertical transmission cascade and the resulting number of paediatric HIV infections.

Other areas for improvement might include refining estimates of key parameters such as patterns and duration of breastfeeding, both retrospectively and prospectively, to capture past and current breastfeeding experience among women living with HIV. More setting-adapted vertical transmission assumptions might be obtained for low-prevalence settings through a literature review focusing on grey literature. The quality of routinely collected inputs should also be improved. Countries with low HIV prevalence (eg, in western and central Africa), where population-based HIV impact assessments are not routinely implemented, should be prioritised.

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