Lives Saved Tool Technical Note
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Estimating coverage using utilization and quality/readiness with trend

Background

LiST includes 12 antenatal care interventions. Of these only three (intermittent prophylactic treatment for malaria, tetanus vaccine and iron supplementation) are routinely measured in household surveys and we use the estimates of coverage of IPTp and iron supplementation from the household surveys. Three nutrient supplementations (e.g., calcium, multiple micronutrient) are set at 0 for baseline (Table 1). For the other interventions (e.g., management of hypertension, management of malaria), there are no data on coverage from household surveys (Table 1). Eighteen of the 19 interventions around childbirth, except C-section also do not have data on coverage from household surveys (Table 2).

Table 1. Antenatal care interventions

Intervention	*Default data source for coverage*
Prevention of malaria in pregnancy	DHS, MICS and other nationally representative household surveys
Iron supplementation	
Syphilis detection and treatment	Calculated from utilization (at least 1 ANC visit) and quality
Hypertensive disorders case management	Calculated from utilization (at least 4 ANC visit) and quality
Diabetes case management	
Malaria case management	
Fetal growth restriction detection and management	Calculated from utilization (at least 4 ANC visit) and quality; quality data not available set at 0 for baseline
Calcium supplementation	Not available, set at 0 for baseline
Multiple micronutrient supplementation	
Balanced energy-protein supplementation	
Tetanus toxoid vaccination	WHO/UNICEF Immunization surveillance, assessment, and monitoring
Prevention of mother to child transmission of HIV	Coverage pulled from AIM module

Table 2. Childbirth interventions

Intervention	*Default data source for coverage*
Clean birth environment	Calculated from utilization (health facility delivery) and quality
Immediate drying and additional stimulation	
Thermal protection	
Clean cord care	
MgSO4 for eclampsia	
Antibiotics for preterm or prolonged PROM	
Antibiotics for maternal sepsis	
Assisted vaginal delivery	

Neonatal resuscitation	
Uterotonics for postpartum hemorrhage	
Manual removal of placenta	
Removal of retained products of conception	
Induction of labor for pregnancies lasting 41+ weeks	
Blood transfusion	
Delayed cord clamping	Calculated from utilization (health facility delivery) and quality; quality data not available set at 0 for baseline
Antenatal corticosteroids for preterm birth	
Kangaroo mother care	
Full supportive care for prematurity/iKMC	Not available, set at 0 for baseline
Cesarean delivery	DHS, MICS and other nationally representative household surveys, adjusted for nonmedically necessary elective c-section.

Quality/readiness-adjusted coverage

For these interventions, we instead estimate coverage by multiplying utilization by quality/readiness of clinics to provide that service:

$$\text{Coverage estimates} = \text{Quality} \times \text{Utilization}$$

Utilization is specified by indicators used to assess contact with the health system. For antenatal care interventions, utilization is based on antenatal clinic attendance. For interventions around childbirth, we use institutional delivery as our utilization measure. These utilization metrics were collected by major household surveys (DHS, MICS). Quality is a factor that influences overall coverage, adjusting for the proportion of women who go to antenatal care or give birth in a facility have access to appropriate care. Two major facility-survey programs—Service Provision Assessments (SPA) and Service Availability and Readiness Assessment (SARA) collect information about what services different types of health facilities can provide. To do this they check on drugs, supplies equipment and tests available at the clinic. In addition, they check on training and supervision of service providers.

How to estimate a weighted average quality/readiness by level of facility

For each of the interventions in antenatal care and for birth we first used WHO guidance on recommended standards for testing and drugs. For example, for syphilis detection and treatment, the facility would need to have a test for syphilis and the drug for treatment. For our analyses, a facility had to have at least one valid test (RDT, RPR or VDRL) and at least one unexpired unit of injectable penicillin. Then at each level of facilities we identified the percentage of those facilities which had all the necessary components to provide the service. Using our syphilis example, we could say that only 15% of health posts had both a test and injectable penicillin, while 20% of clinics had both and 80% of hospitals were able to provide this service. We then matched the readiness data and utilization data by types of facility to calculate a weighted average quality/readiness, using SPA or SARA and household surveys conducted within two years of each other. The DHS survey also records where the mother received this care (e.g., hospital, clinic, or health post). From this household survey we can then determine of all births during this period, what percentage of pregnant women did not have antenatal care, and of those who did

receive care we know how many visits they made and at what level of facility. For example, in one country 15% of women reported no antenatal visits, 40% reported at least one visit to a health post, 30% had at least one antenatal visit at a clinic and the remaining 15% had an antenatal visit at a hospital. The quality/readiness for syphilis detection and treatment is 24%, calculated as:

$$(.15 \times 0) + (.40 \times .15) + (.30 \times .2) + (.15 \times .8) = 24\%$$

And for this intervention we use at least one antenatal care (ANC) visits as our measure of utilization because testing and treatment could be done in a single visit. If the 85% of pregnant women sought ANC at any level of facilities, the calculated coverage for syphilis detection is .85*.24 or 20.4%. Other interventions, such as management of hypertensive disorder would use a different measure of utilization (4 or more ANC visits) as it is a monitoring process. For institutional delivery we also divide women into three levels of facilities. Again, readiness is based on availability of drugs, equipment and supplies and for each level of facility we have the percent that are ready to provide that service if needed. Such

Trends in Antenatal and Childbirth Intervention Quality

Using the distribution in level of facility, we calculated the average intervention quality adjusting for differential quality by level of facility. The 17 countries with empirical data were assigned the country-specific quality estimates to the year in which the health facility assessment (SPA or SARA) was completed.

An exploratory analysis of the association between available covariates and quality showed GNI had the strongest association with quality (Fig 1). As a result, we assigned countries without linked surveys an intervention quality score based on their World Bank income classification and the distribution of scores from countries with data. The score was applied in the country-specific survey year closest to 2012, as 2012 was the average health facility assessment (HFA) data collection year for the 17 countries contributing quality scores. For countries without a household survey in LiST, the quality score was applied to the year 2012.

Score based on World Bank classification:

Classification	Quality Score
Low-income	25th percentile
Lower Middle	Median
Upper Middle	75th percentile
High-income	95th percentile

Few countries currently have multiple HFAs, and repeated HFAs that can be linked to a household survey are even less common. As such, an alternative source of information for estimating trends in intervention quality was needed. In the absence of HFA data, we used country-specific trends in the content of ANC and c-section coverage from household surveys to adjust estimates of intervention quality over time. For ANC intervention quality we used the average change in coverage in blood, urine, and blood pressure testing during ANC. For childbirth interventions, the trend was derived 50% from the ANC coverage trend and 50% from change in c-section coverage. In each survey year with data on ANC content and c-section coverage, we estimated an average content score.

For each country, we established a ratio between quality and average content for each intervention in the survey year with quality data. In order to bound the resulting quality score by zero but allow it to achieve 100% quality with perfect content, the ratio was dependent on whether the observed content in a survey year was higher or lower than the reference year (~2012). When the content score is lower than the reference year, we apply a simple ratio of quality score to content score. When the content score is higher than the reference year, the ratio uses the difference between 100 and the quality and content score.

For example, in Bangladesh the quality of hypertensive disorder case management was 24.21% in 2014. In that survey year, the average ANC content score was 69.1%. We could then estimate quality over time based on the difference in ANC content relative to the reference year (2014). In the 2004 Bangladesh household survey the ANC content score was 55%. The quality score for hypertension case management in 2004 would be calculated:

$$Quality\ in\ 2004 = 24.21 + \left(\frac{24.21}{69.1} * (55 - 69.1)\right) = 19.3$$

When the content score is higher than the reference, our ratio is constructed using the difference between the reference value and 100%. For example, in the 2017 Bangladesh household survey the ANC content score increased to 77%. The quality score for hypertension case management in 2017 would be calculated:

$$Quality\ in\ 2017 = 24.21 + \left(\frac{(100 - 24.21)}{(100 - 69.1)} * (77 - 69.1)\right) = 43.6$$

Using this approach, we calculated quality scores for each intervention in years with survey data. For years without surveys, we apply the same rule LiST uses for other intervention coverage estimates, linearly imputing values between survey years.

Further readings:

Kanyangarara M, Walker N, Boerma T. Gaps in the implementation of antenatal syphilis detection and treatment in health facilities across sub-Saharan Africa. PLoS One 2018; 13 (6): e0198622

Chou VB, Walker N, Kanyangarara M. Estimating the global impact of poor quality of care on maternal and neonatal outcomes in 81 low-and middle-income countries: A modeling study. PLoS medicine 2019; 16 (12): e1002990

Kanyangarara M, Chou VB, Creanga AA, Walker N. Linking household and health facility surveys to assess obstetric service availability, readiness and coverage: evidence from 17 low-and middle-income countries. Journal of global health 2018; 8 (1)

Kanyangarara M, Munos MK, Walker N. Quality of antenatal care service provision in health facilities across sub–Saharan Africa: Evidence from nationally representative health facility assessments. Journal of global health 2017; 7 (2)

Figure 1. Correlation between GNI and average readiness in 17 countries