

## APPENDIX 3

Service Provision Assessment (SPA) surveys are nationally representative surveys of health facilities that measure the capability of health facilities to provide services, including for maternal and newborn health. SPA surveys collect information on the availability of services, existence of critical infrastructure, equipment and supplies, provider performance and client perceptions via exit interviews. Using data from health facilities collected via SPA survey combined with data from women collected via Demographic & Health Survey (DHS), we aimed to demonstrate a method of estimating coverage of births with a skilled birth attendant in an enabling environment.

We used data from the Kenya 2014 DHS report[1] and Allen and colleagues' (2017) analysis[2] of the Kenya 2010 SPA survey's facility inventory assessment to estimate the proportion of births with skilled health professionals in facilities meeting the signal functions for routine maternal care and basic emergency obstetric care (BEmOC). While signal functions are not intended to capture every service that should be provided or available during labour, delivery and the early postpartum period, they are useful to indicate the level of care and capability of individual health facilities. Table S3 shows the signal functions and corresponding variable(s) on the facility inventory used in the analysis of the Kenya 2010 SPA. As noted by Allen and colleagues (2017), assisted vaginal delivery with forceps or vacuum is not routinely taught or performed in many countries, so the BEmOC signal functions are often modified to exclude this item and indicated as BEmOC-1[2].

**Table S3. Signal functions and corresponding indicators for routine maternal care and basic emergency obstetric care.**

Signal function	Tracer items on facility inventory
<b>Routine maternal care</b>	
Monitoring and management of labour using partograph	Blank partograph + fetoscope (pinard or electric)
Infection prevention during childbirth	Clean water source + hand soap + gloves
Routine injection of oxytocin within one minute of delivery	Practice reported as routine + injectable oxytocin/syntocin or ergometrine/methergine with valid date
Controlled cord traction	Practice reported as routine + cord clamp/ties and scissors/blade
Uterine massage after delivery of placenta	Practice reported as routine
<b>Basic Emergency Obstetric Care (BEmOC)</b>	
Parenteral antibiotics	Performed in the last 3 months + injectable ampicillin/amoxicillin or gentamicin
Parenteral oxytocin	Performed in the last 3 months + injectable oxytocin
Parenteral anticonvulsants	Performed in the last 3 months + injectable diazepam or magnesium sulphate
Manual removal of placenta	Performed in the last 3 months
Removal of retained products	Reported as able to perform function + functioning vacuum aspirator or D&C kit
Assisted vaginal delivery	Performed in the last 3 months + functioning ventouse vacuum extractor

*Adapted from Allen et al. (2017)*

We then extracted estimates of the percentage of live births in the five-year survey recall period (2009-2014) attended by skilled health personnel (i.e., doctor, nurse or midwife) in health facilities, as listed in the Kenya 2014 DHS report. We multiplied these estimates by the percentage of total

facility births taking place in facilities meeting the signal functions for routine maternal and emergency obstetric care (Table S3). The estimates in Table S4, column C extracted from the paper by Allen and colleagues, reflect the percentage of facilities meeting the required signal functions, weighted by the individual facility's delivery caseload[2]. This results in an estimate of total facility births taking place in a facility meeting the required signal functions and adjusts for the fact that higher capability facilities conduct larger numbers of deliveries on average, compared to lower capability (and often lower level) facilities[2].

**Table S4. Calculation of live births attended by skilled health personnel in a facility equipped to provide routine maternal care or BEmOC signal functions.**

A. % of live births in five-year recall attended by skilled health personnel <sup>1</sup>	B. % of live births in five-year recall attended by skilled health personnel that took place in facilities <sup>1</sup>	C. % of total facility births taking place in a facility meeting capability criteria <sup>2</sup>	Resulting % of births with skilled health personnel in a facility meeting the capability criteria [A*B*C]
61.8	99.2	Routine maternal care: 36	<b>Routine maternal care: 22.1%</b>
		BEmOC-1: 46	<b>BEmOC-1: 28.2%</b>

<sup>1</sup> Extracted from Kenya 2014 DHS report, Table 9.6.

<sup>2</sup> Extracted from Allen et al. (2017), Table 6.

We found that in Kenya, 22.1% of live births were assisted by a skilled health personnel and in a facility meeting the criteria for routine maternal care and 28.2% of live births were assisted by a skilled health personnel in a facility meeting the criteria for basic emergency obstetric care (BEmOC-1). This approach to estimating the percentage of deliveries could be expanded to consider other elements of the enabling environment for skilled attendance, including signal functions for newborn care.

## References

- 1 Kenya National Bureau of Statistics, Ministry of Health/Kenya, National AIDS Control Council, *et al.* Kenya Demographic and Health Survey 2014. Nairobi, Kenya and Rockville, MD: ICF International 2015.
- 2 Allen SM, Opondo C, Campbell OMR. Measuring facility capability to provide routine and emergency childbirth care to mothers and newborns: An appeal to adjust for delivery caseload of facilities. *PLoS One* 2017;**12**:e0186515. doi:10.1371/journal.pone.0186515