Inequality in the Continuum of Maternal Health Service Utilisation in 16 Sub-Saharan African Countries

Introduction

Large within-country socioeconomic and geographic inequalities in coverage of maternal and newborn health interventions exist in Sub-Saharan Africa (SSA). For example, lower coverage of antenatal care (ANC) and facility-based childbirth have been reported among the poor in Cameroon, Ethiopia, Madagascar, Uganda, Zambia, and Zimbabwe. Concurrently with increasing population-level coverage, the inequality gaps were widening over time in three of these countries (Cameroon, Madagascar, and Uganda) . The persistent poverty-related inequalities in coverage and outcomes of maternal and child health pose a challenge for countries to achieve the Sustainable Development Goal (SDG) targets and in the long term, will impede the achievement of universal health coverage (UHC). In this paper, we reflect on inequalities in completion of maternal continuum of care vis-à-vis countries' health system performance in maternal and child health which we believe is key to identifying and prioritising areas of improvement for evidence-based policy making . Comparative health system performance analysis across countries in a particular region allows for contextual benchmarking, cross-country learning, and advocating for effective political leadership. Further, there is also a need to continuously monitor the progress toward equitable access to and utilisation of key maternal and child health services in regions with high maternal and child mortality burden. This study aims to fill the gap in the literature by (1) estimating country-by-country coverage of ANC, facility-based childbirth and PNC and comparing these across countries; (2) measuring wealth-based inequalities in coverage of maternal continuum of care and; (3) determining factors contributing to the inequalities by using the most recent nationally-representative surveys from 16 SSA countries.

Methods

Study design and participants

This study is based on secondary analysis of standard DHS data from 16 countries in SSA (Angola, Benin, Burundi, Cameroon, Ethiopia, Gambia, Guinea, Liberia, Malawi, Mali, Nigeria, Sierra Leone, South Africa, Tanzania, Uganda, and Zambia). The countries were selected based on the criterion of having a recent Standard DHS (conducted between 2015 and the time of the analysis in 2022). Standard DHSs have large sample sizes to allow adequate power to estimate key health indicators in a population. In this study, we used individual women's datasets (individual recode) and included women aged 15 - 49 years who reported a livebirth in the five years preceding the survey. For women who gave birth more than once in the five-year recall period, the most recent birth was considered in this study as key maternity care variables (e.g ANC) are only collected for women's most recent birth. A total of 133,709 women were included in the study with each country having a sample size between 3,036 (South Africa) and 21,792 (Nigeria). Data from each country were analysed separately.

Indicators and definitions

Antenatal care: receipt of ANC was defined as a woman reporting any facility-based ANC visit during the pregnancy of the most recent live birth.

Facility-based childbirth: women who reported having given birth in a health facility, regardless of the type and ownership of the facility, were considered as having had facility-based childbirth.

Postnatal care (PNC) within two days of birth by a skilled provider: women who reported receiving a PNC for themselves, in a health facility or at home by a skilled provider, within the first 48 hours of birth were considered as having received PNC within two days.
Maternal continuum of care: the outcome variable of this study is completion of maternal continuum of care, a composite variable, defined as having had at least one ANC visit AND birth in a health facility AND PNC by a skilled provider within two days of birth.
Wealth index: living standard of women's households computed by the DHS program based on ownership of selected assets and stratified in quintiles as poorest, poorer, medium, richer, and richest.

Data analysis

Data for all countries were analysed separately using StataSE v.16 (StataCorp, College Station, Texas, United States). To account for the complexity and multi-stage cluster sampling design of the DHS, we used weighted data analysis, based on women's individual sample weights, and adjusted for clustering and stratification. In the datasets of all countries included in this study, there were no missing values for the variables which were used to construct the three key maternal health variables (ANC, facility-based childbirth, and PNC) which were used to define maternal continuum of care. To estimate absolute inequality in maternal continuum of care across wealth quintiles (poorest, poorer, middle, richer, and richest), we applied the Erreygers normalised concentration index analyses using the *conindex* Stata command accounting for clustering; we presented concentration indices with their corresponding 95% confidence intervals (95% CI) and concentration curves. The Erreygers concentration index—*E(h)*—is specially designed for estimating absolute inequalities in outcome variables with binary (yes/no) responses; the formula is displayed below .

$$E(h) = \frac{8}{n^2(b_h - a_h)} \sum_{i=1}^{n} z_i h_i$$

*where "h" is the health variable; "n" is number of individuals in the study; "b_h" is the upper bound of the health variable; "a_h" is the lower bound of the health variable; and "**z**" derivative of the socioeconomic rank of individuals.*

To quantify the observed wealth-based inequality in maternal continuum of care contributed by sociodemographic and regional factors in each country, we also conducted decomposition analyses using the modified Wagstaff decomposition method ; the formula is displayed below.

$$\mathrm{CCI} = \sum_{k=1}^{K} \mathrm{C_k}(\beta_k \bar{Z}_k / \mu h) + (\mathrm{GC}\varepsilon / \mu h)$$

where C_k is the concentration index of the k^{th} contributing factor, β_k is a coefficient derived from linear equation of the contributing factors, $\bar{Z}_k$ is mean of the k^{th} contributing factor, GCε is the generalized concentration index of the error factor (residual component).

As the outcome variable of our study is binary, we applied the generalised linear model with a binomial family and probit link in the decomposition analysis . In addition to wealth quintiles, based on existing evidence on contributors to health inequalities, we also included six independent variables (contributing factors) in the model—age group, marital status, place of residence, educational status, parity, and region within country.

Results

Utilisation of maternal health services

Antenatal care

The percentage of women who had at least one ANC visit was lowest in Ethiopia (62.3%) followed by Nigeria (74.0%), and highest in Burundi (99.2%). (Table 1).

Table 1. Coverage of maternal health services and gaps in maternal continuum of care

	Levels of coverage				Drop offs in continuum of care (percentage point)[¥]			
Countries	ANC1*	ANC4**	FBCB[§]	PNC 2 days[†]	ANC1 - ANC4	ANC1 - FBCB	FBCB - PNC 2 days	MCoC[‡] (95% CI)
Angola	81.9%	61.5%	50.1%	20.7%	20.4	31.8	29.4	20.0% (18.5, 21.5)
Benin	89.1%	52.1%	85.3%	69.0%	37.0	3.8	16.3	65.2% (63.1, 67.4)
Burundi	99.3%	49.3%	84.4%	49.6%	50.0	14.9	34.8	47.2% (45.4, 48.9)
Cameroon	87.2%	64.8%	69.3%	56.5%	22.4	17.9	12.8	52.8% (50.1, 55.4)
Ethiopia	62.9%	31.8%	31.7%	14.4%	31.1	31.2	17.3	12.5% (11.1, 14.0)
Gambia	99.5%	78.5%	85.3%	85.9%	21.0	14.2	-0.6	78.5% (76.6, 80.3)
Guinea	86.0%	35.3%	54.1%	43.8%	50.7	31.9	10.3	39.3% (36.5, 42.2)
Liberia	97.9%	87.3%	81.8%	74.5%	10.6	16.1	7.3	71.3% (68.8, 73.7)
Malawi	98.2%	50.6%	92.3%	42.6%	47.6	5.9	49.7	41.7% (40.2, 43.2)
Mali	80.7%	43.3%	69.9%	53.6%	37.4	10.8	16.3	48.5% (45.4, 51.5)
Nigeria	74.0%	56.9%	41.1%	37.4%	18.8	34.6%	3.7	32.4% (31.0, 33.8)
Sierra Leone	98.5%	78.6%	84.6%	80.3%	19.9	13.9	4.3	75.5% (73.4, 77.4)
South Africa	94.3%	75.5%	96.1%	87.8%	18.8	-1.8	8.3	81.4% (79.3, 83.3)
Tanzania	98.0%	50.7%	66.2%	35.0%	47.3	31.8	31.2	33.0% (31.3, 34.8)
Uganda	98.1%	59.9%	75.2%	52.6%	38.2	22.9	22.6	49.9% (48.0, 51.7)
Zambia	98.1%	63.5%	85.6%	68.9%	35.4	13.3	16.7	66.5% (64.3, 68.5)

**ANC1 – at least one antenatal visit*
***ANC4 – at least four antenatal visits*
[§]FBCB – facility-based childbirth [†]PNC 2 days – postnatal visit within two days of childbirth
[¥]percentage points between use of maternal health services in the continuum
[‡]MCoC – maternal continuum of care: at least one antenatal visit and a facility-based childbirth and postnatal visit within two days of childbirth
Color codes: terciles of ranked coverages (ANC1, ANC4, FBCB, PNC 2 days, PMCoC, and SMCoC) and drop offs (ANC1 - ANC4, ANC1 - FBCB, FBCB - PNC 2 days)
Green – highest tercile; Orange – middle tercile; Red – lowest tercile. Highest tercile indicates favourable/better proportion.

Facility-based childbirth

The percentage of births which took place in health facilities was more than 80% in eight of the 16 countries, the highest being in South Africa (96.1%) (Table 1).

Postnatal care

In seven of the 16 countries, fewer than half of the women received PNC within two days of birth, the least in Ethiopia (14.4%) followed by Angola (20.7%) (Table 1).

Maternal continuum of care

The percentage of women who completed the maternal continuum of care was highest in South Africa (81.4%) and the Gambia (78.5%) and lowest in Ethiopia (12.5%) (Table 1).

Wealth-based inequality in the continuum of maternal care

As shown in Figure 1, the level of maternal continuum of care was highest among women in the richest household quintile in all countries except South Africa, where coverage did not follow a progressive pattern. The results of the concentration index analyses are displayed in Figure 2. There was statistically significant pro-rich inequality in the maternal continuum of care in all 16 countries. The concentration indices ranged from 0.05 in South Africa and Liberia (least unequal) to 0.34 in Nigeria (most unequal); the second-highest inequality was in Benin (0.25), followed by Mali and Cameroon (0.22). Concentration indices were less than 0.1 in five countries, indicating a relatively equitable coverage of continuum of maternal care (Figure 2).

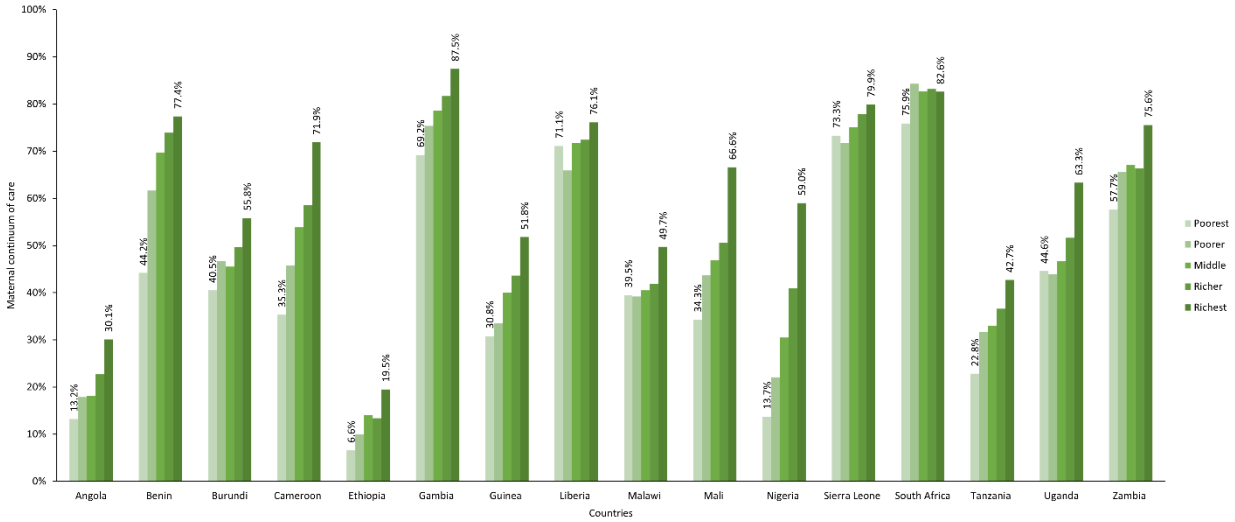

Figure 1. Percentage of women completing maternal continuum of care, by wealth index, by country

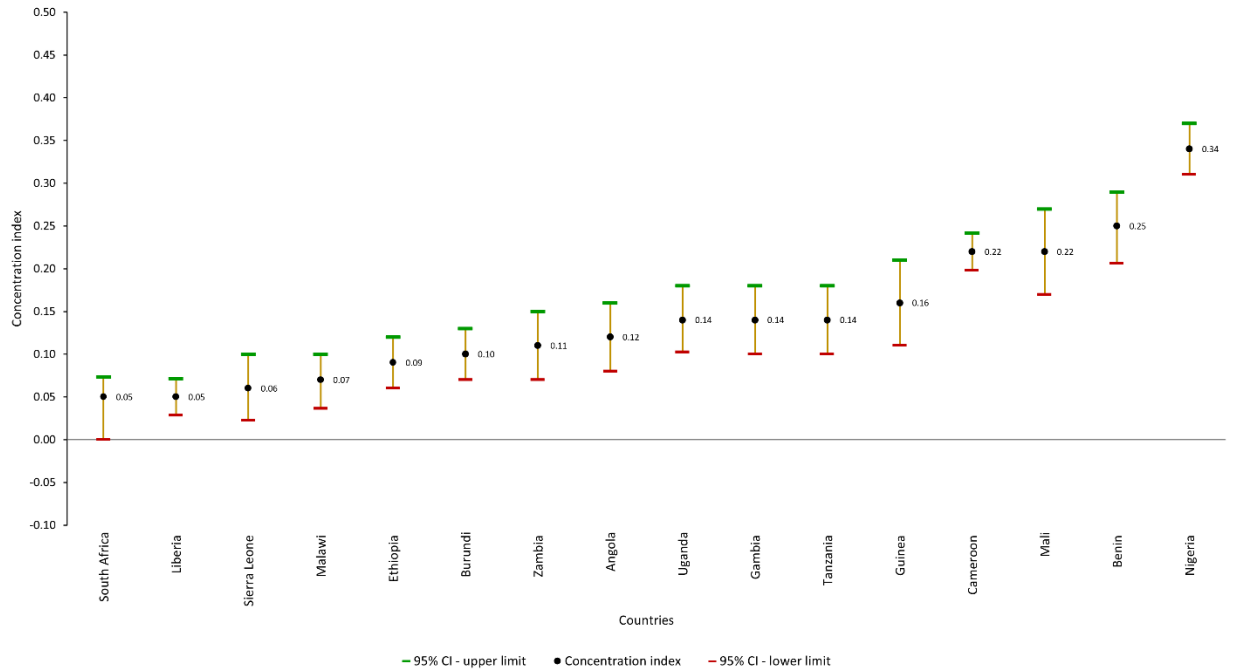

Figure 2. Concentration indices of maternal continuum of care across countries (0 = equality)