Unequal treatment: challenging socioeconomic and living area disparities in oral rehydration therapy and continued feeding in 35 Sub-Saharan African countries

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Abstract

Background

While the 2030 global goal has motivated proliferation of equity-oriented studies globally, we did not find sweeping studies on disparity in Oral Rehydration Therapy (ORT) and continued feeding at the level of the Sub-Saharan Africa (SSA) region. Yet, exploring the within and between-country variations of the service could help synthesize useful policy lessons that can be applied to other settings within the region. We aimed to generate evidence on inequality in use of the service at the level of SSA in order to suggest the way forward to advance the momentum already gained in the region with respect to improving coverage of this lifesaving interventions.

Method

We applied the World Health Organization's Health Equity Assessment Toolkit for the analysis. Data were obtained from Demographic and Health Surveys conducted between 2012 and 2016. Thirty-five countries were selected from different income categories in SSA. ORT and continued feeding disparity was analyzed with respect to five dimensions of inequality (wealth, education, sex, residence and subnational regions) through four measures of inequality: difference, ratio, population attributable risk and fraction.

Results

Disparity in use of ORT and continued feeding plagued SSA and consistently favored advantaged population subgroups. In 20 out of 35 countries, the service was disproportionately concentrated among children from well to do households. The inequality was strikingly pronounced in Angola, Guinea, Cameroon and Mali. We also recorded sizable variations with respect to residence and education in 23 and 11 countries. Interestingly, male and female children get the service almost equally in most countries, with only four countries (Niger, Kenya, Guinea-Bissau, and Senegal) suffered sex differentials, generally to the favor of male children.

Conclusion

In SSA, unjustified disparity around use of ORT and continued feeding is a pervasive problem that requires resolute policy response soon. Eliminating the disparity would set the region miles ahead to reaching the child health related global goals to be attained in 2030. The region might benefit from equitable economic and education policies.

Results

Background

Diarrhea is among the most common health problems affecting children worldwide (1). In 2016, diarrhea claimed the lives of between 1, 244, 073 and 2, 366, 552 people at all age groups, making it one of the

most lethal health problems. Also, diarrhea is the fifth important cause of mortality among under-five children, with between 390 894 and 504 613 under-five children died of it in 2016 alone. This translates to an average mortality rate of 22.4 deaths per 100 000 in all ages and 70.6 deaths per 100 000 among under-five children, and the mortality rate varied hugely between and with regions. SSA hosts the highest rate of the problem, with Chad (499 deaths per 100 000), Central African Republic (384.2 deaths per 100 000), and Niger (376 per 100 000) being outliers by reporting the highest mortality rate of diarrhea (2).

Globally, diarrhea had a share of nearly 9% of all deaths in children younger than five years, with female children experiencing slightly higher deaths toll on average. Worldwide, absolute number of diarrheal deaths in children aged under-five dropped by closely 57% over the last nearly two decades. However, the same success has not been made for diarrhea incidence, where it decreased by only between 10.6% and 14.8% during the same time period. In terms of morbidity, diarrhea was responsible for an average share of 74.4 million DALYs, an overwhelming 63% of which happened among children younger than 5 years (2).

The burden of diarrheal death is distributed systematically and unevenly worldwide. The reality is that not just does diarrheal deaths show marked variations between countries, but it disproportionately impacts poor and marginalized individuals within countries (3). It is fairly acceptable to recognize diarrheal related death as a key marker of inequality of health between individuals and countries. If such disparities are not to be tackled soon, they are likely to jeopardize the chance to attain child health related global goals that world countries pledge to achieve by the 2030 (3, 4). The fact that diarrhea obstructs chance of achieving the SDG is especially more conspicuous for world's poorest settings such as SSA, where the highest number of unequal countries in the world exist (5).

At country level, much more needs to be done to raise coverage of effective interventions for the poor and the most disadvantaged subpopulations as well as the entire population to decrease burden of diarrheal deaths. To this end, WHO and UNICE issued a *Global Action Plan for Pneumonia and Diarrhea (GAPD)* with the intent to reduce, among other aims, mortality from diarrhea in under-five children to less than 1 per 1000 live births by 2025. The action plan outlines effective interventions to stop deaths due to diarrhea among under-five children. Oral rehydration salts (ORS) and continued feeding is among the interventions mentioned under the “treat” portion of the plan’s Protect, Prevent and Treat framework (6, 7). It is defined as the percentage of children aged 0–59 months who had diarrhea in the two weeks prior to the survey and were treated with oral rehydration therapy – oral rehydration salts or an appropriate household solution – and continued feeding (8). ORS has been shown to reduce diarrheal deaths up to 93% (9). This means that by ensuring that the intervention reaches to all population groups, irrespective of wealth, education, place of residence or regions, stopping unnecessary death that is being caused by diarrhea is within the global community’s grasp (3). In fact, addressing health inequality has been the basic tenet of the sustainable development goals since 2015 (4). In any country, health inequality monitoring aims to generate information that could be used to create effective policies, programs and practices to reduce health inequity (10). But, high-quality evidence is always necessary to inform effective interventions that end the observable disparity in use of a health indicator such as ORS. After survey of

literatures, we found that studies that discuss the situation of disparity in use of ORS and continued feeding among children with diarrhea in SSA are lacking. WHO examined the state of inequality in ORT in several countries of low income and middle income using data collected through DHS conducted until 2013(11). However, we significantly updated the available evidence by incorporating data from more recent DHSs. The study aims to generate high quality information on status of ORT disparity in SSA and put the way forward about the possibility to challenge the unacceptable disparity. The evidence could be of help to identify subgroups of a population that require big policy attention and in so doing would potentially lead to attainment of ensuring universal reproductive, maternal and child health care target of the 2030 SDG.

Methods

Data

We used data from Demographic and Health Surveys (DHS) of 35 African countries: Ghana (2014), Algeria (2012), Angola (2015), Benin (2014), Burundi (2016), Cameroon (2014), Chad (2014), Comoros (2012), Congo (2014), Democratic Republic of Congo (2013), Eswatini (2014), Ethiopia (2016), Gabon (2012), Gambia (2013), Guinea (2016), Guinea Bissau (2014), Kenya (2014), Lesotho (2014), Liberia (2013), Malawi (2015), Mali (2015), Mauritania (2015), Mozambique (2015), Namibia (2013), Niger (2012), Nigeria (2013), Rwanda (2014), Sao Tome (2014), Senegal (2014), Sierra Leone (2013), Togo (2013), Uganda (2016), United Republic of Tanzania (2015), Zambia (2013) and Zimbabwe (2014). Selection of the countries in our analysis was partly based on the fact that, they are from different country level income categories (low income, lower middle and upper middle income), and this could allow us to benchmark the disparity situation in one country in a specific income category to that of another nation in a different income category. This in turn facilitates interpretation of state of inequality in ORT in a way that could potentially lead to emergence of policy relevant suggestions. Also, we included the DHSs carried out between 2012 and 2016, as DHSs conducted until 2013 were analyzed by the WHO as mentioned in the background; we continued from where previous high quality study ends.

DHS is a nationally representative household survey conducted at regular time intervals to provide countries with updated information on a different health topics such as maternal and child health, reproductive health, fertility, nutrition, mortality, and HIV/AIDS to mention just a few. The United States Agency for International development (USAID) and each country's statistical agency cooperate to run the survey with technical support from Inner City Fund (ICF) international.

Method of DHS has been described in detail in the final DHS report of each country and readers can read relevant sections of the respective countries' DHS report to learn the methodology. Concisely, it follows a two stage stratified cluster sampling design. Big geographic areas like enumeration area (EA) are selected in the first stage though Probability Proportional to Size (PPS) approach (citation), where relatively larger EA is more likely to be selected than smaller EA. In the second stage, a pre-calculated (28 to 30) number of households are selected from each EA. In the selected household, eligible participants (women aged 15

to 49 years and men 15 to 59 years) interviewed on wide range of areas using questionnaires that are comparable across countries. To capture some useful information on health topics that would be of relevant in a country only, country specific questions are also included in the model questionnaire. The similarity of the methodologies in all the DHS makes it easy for sound comparison of findings across the 35 countries.

Variables

We measured inequality for ORT and continued feeding in under-five children with diarrhea. ORT and continued feeding is the the percentage of children age under-five who had diarrhea in the two weeks prior to the survey and were treated with ORT, oral rehydration salts or any appropriate solution prepared in household. A child is said to have diarrhea if he/she has passage of three or more loose or watery stools per day (12). The ORT and continued feeding was calculated for the children who were born five years prior to the respective surveys. We disaggregated utilization of ORT and continued feeding using five dimensions of inequality which included wealth (economic status), education, residence, region and sex. While educational status is classified as no education, primary and secondary education, wealth index is classified into five categories: poorest, poor, middle, rich and richest. In all the DHSs, wealth index has been used as proxy for economic status and is computed based on household assets and possessions using a statistical technique called Principal Component Analysis (13). Residence is a binary variable classified as urban vs. rural and sex as male and female. Sub-categories of a region differ based on where which country the study is done. See Tables 6 in the result section for detail on this.

Statistical analysis

We approached investigation of the inequality in utilization of oral rehydration therapy and continued feeding in two steps. First, we disaggregated utilization of ORT and continued feeding by the aforementioned equity stratifiers. This is a preliminary, but critically important step to correctly interpret findings obtained through summary measures in the later stage of our analysis. Again as part of the first step, we also presented the population share of each subgroup alongside their respective coverage of the health indicator; this is very important in the interpretation of uncertainty intervals of point estimates. Secondly, we analyzed the inequality in oral rehydration therapy and continued feeding through calculation of four measures of inequality: Difference, Population Attributable risk (PAR), Ratio and Population Attributable Fraction (PAF). When we interpret findings produced using any of these measures, we feedback to the first step to check how the summary was estimated.

Detailed account of the methods followed in this study have been found elsewhere (10, 14). PAR is calculated as the difference between the estimate for the reference subgroup y_{ref} and the national average μ : $PAR = y_{ref} - \mu$. The selection of the reference subgroup y_{ref} depends on the type of health indicator and on the characteristics of the dimension of inequality, for which PAR is calculated. The health care indicator in this study is ORT and continued feeding and it is favorable. Thus, for residence

and sex dimensions, y_{ref} refers to the subgroup with the highest estimate, which are respectively urban and male subcategories. For ordered dimensions, in our study they are wealth and education, y_{ref} refers to the most-advantaged subgroup (wealthiest and secondary education groups). For subnational region, y_{ref} refers to the subgroup with the highest estimate which are different in the two series DHSs. PAF is calculated by dividing the population attributable risk (PAR) by the national average μ and multiplying the fraction by 100: $PAF = [PAR / \mu] * 100$.

D is calculated as the difference between two subgroups: $D = y_{high} - y_{low}$. For binary dimensions (residence and sex for our study), y_{high} refers to the subgroup with the highest estimate (urban and male) and y_{low} to the subgroup with the lowest estimate of ORT and continued feeding (rural and female). For ordered dimensions (wealth and education for our study), y_{high} refers to the most-advantaged subgroup (richest and secondary education) and y_{low} to the most-disadvantaged subgroup (poorest and illiterate group). For subnational region, y_{high} refers to the subgroup with the highest estimate and y_{low} to the subgroup with the lowest estimate. The calculation of R parallels that of D except that it is a ratio of two estimates instead of subtracting one from another.

The PAR and PAF are complex measures of inequality that show a potential for improvement in the national level of a health indicator if all sub-groups are performing equally with the best performing subgroup. If there is no inequality, PAR and PAF takes the value of zero. They take positive values for favorable health intervention indicators like ORT and negative for adverse health indicators. The larger the absolute value of PAF and PAR, the larger the degree of inequality. They become zero if no further improvement can be achieved, i.e. if all subgroups have reached the same level of health or health indicator of interest as the reference subgroup.

On the other hand, Difference (D) and Ratio (R) are simple measures of inequality that show inequality between just two subgroups of an equity stratifier with two or more categories. If there is no inequality, D takes the value of zero and R becomes one. The further the value of D and R from zero and 1, respectively, the higher the level of inequality becomes. While D and PAR are absolute measures, PAF and R are relative measures of inequality. Complex measures are able to account for all subgroups of an equity stratifier, not just two groups unlike simple measures. This feature of complex measures of inequality makes them robust choice especially in the event of population shift. However, simple measures do not possess this property. While complex measures have the drawback of complicated interpretation and calculation, simple measures have the strength of straightforward interpretation and calculation. WHO recommends adoption of simple and complex, absolute and relative measures in a study to increase the credibility and consumption of the evidence, and we followed that recommendation (10).

We measure the statistical significance of the inequality in ORT and continued feeding through 95% Uncertainty Intervals (UI). For the disparities to be statistically significantly different between dimensions of inequality across the countries, the UIs should not overlap. We analyzed the inequality in ORS using the

WHO’s HEAT software. We accessed the latest offline version of the application from internet, and did the analysis and interpret findings in accordance with equity analysis principles contained in the WHO health equity analysis book (10).

Ethical Consideration

Ethical permissions are not required for this study since we used DHS datasets already publicly available. Ethical procedures were the responsibility of the institutions that commissioned, funded, or managed the surveys. All DHS surveys are approved by ICF international as well as an Institutional Review Board (IRB) in respective country to ensure that the protocols are in compliance with the U.S. Department of Health and Human Services regulations for the protection of human subjects.

Results

Wealth based inequality

Table 1 presents utilization of ORT and continued feeding for each subgroup of the economic status stratifier across the 35 low income, lower middle income and upper middle income SSA countries along with the population share of each.

Table 1

utilization of ORT and continued feeding for each subgroup of the economic status stratifier across the 35 low income, lower middle income and upper middle income SSA countries

Setting	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
Ghana	2014	Quintile 1 (poorest)	40.16(32.36,48.49)	26.37345	41.5043
		Quintile 2	43.15(34.95,51.740)	25.67383	41.5043
		Quintile 3	36.27(27.92,45.55)	20.94055	41.5043
		Quintile 4	43.33(28.31,59.68)	16.25041	41.5043
		Quintile 5 (richest)	48.26(32.49,64.39)	10.76177	41.5043
Algeria	2012	Quintile 1 (poorest)	40.09(32.73,47.93)	23.93135	41.73203
		Quintile 2	36.58(27.52,46.70)	24.41469	41.73203
		Quintile 3	40.12(32.16,48.64)	18.40896	41.73203
		Quintile 4	42.41(34.64,50.56)	18.62111	41.73203
		Quintile 5 (richest)	54.15(44.00,63.97)	14.6239	41.73203
Angola	2015	Quintile 1 (poorest)	27.43(22.84,32.55)	19.5731	39.68827
		Quintile 2	33.53(28.58,38.86)	23.10405	39.68827
		Quintile 3	43.05(36.10,50.28)	22.36672	39.68827
		Quintile 4	42.32(33.53,51.62)	19.44796	39.68827
		Quintile 5 (richest)	56.16(46.86,65.05)	15.50817	39.68827
Benin	2014	Quintile 1 (poorest)	28.05(21.70,35.42)	21.3574	32.54792
		Quintile 2	31.98(25.84,38.81)	20.12819	32.54792
		Quintile 3	31.00(24.48,38.38)	22.32397	32.54792
		Quintile 4	35.60(28.02,43.98)	21.33978	32.54792
		Quintile 5 (richest)	37.70(28.43,47.96)	14.85066	32.54792

Setting	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
Burundi	2016	Quintile 1 (poorest)	31.65(27.61,36.00)	24.07388	34.95439
		Quintile 2	32.21(28.14,36.57)	23.54476	34.95439
		Quintile 3	37.66(33.02,42.53)	20.69663	34.95439
		Quintile 4	37.69(33.03,42.60)	18.96193	34.95439
		Quintile 5 (richest)	37.76(32.52,43.30)	12.7228	34.95439
Cameroon	2014	Quintile 1 (poorest)	29.41(22.99,36.77)	36.38363	39.29078
		Quintile 2	37.54(31.76,43.70)	24.52436	39.29078
		Quintile 3	47.46(39.76,55.29)	19.50633	39.29078
		Quintile 4	48.74(40.43,57.13)	11.29913	39.29078
		Quintile 5 (richest)	55.68(45.82,65.10)	8.286552	39.29078
Chad	2014	Quintile 1 (poorest)	24.78(20.69,29.38)	22.99905	28.88636
		Quintile 2	26.2(21.84,31.28)	21.46346	28.88636
		Quintile 3	30.54(26.08,35.41)	20.63436	28.88636
		Quintile 4	29.64(24.54,35.31)	18.16671	28.88636
		Quintile 5 (richest)	34.97(30.83,39.35)	16.73641	28.88636
Comoros	2012	Quintile 1 (poorest)	42.44(29.79,56.16)	21.86407	53.94333
		Quintile 2	52.14(38.79,65.19)	26.10099	53.94333
		Quintile 3	53.81(43.76,63.56)	21.8048	53.94333
		Quintile 4	70.43(57.13,80.98)	15.80697	53.94333
		Quintile 5 (richest)	56.76(43.31,69.27)	14.42317	53.94333
Congo	2014	Quintile 1 (poorest)	36.33(32.17,40.71)	26.99686	42.24259
		Quintile 2	37.76(31.53,44.42)	22.61654	42.24259
		Quintile 3	46.79(38.79,54.95)	23.70311	42.24259

Setting	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
Democratic Republic of the Congo	2013	Quintile 4	48.67(38.10,59.36)	15.47905	42.24259
		Quintile 5 (richest)	47.01(34.83,59.55)	11.20444	42.24259
		Quintile 1 (poorest)	32.22(27.70,37.10)	22.11872	39.94501
		Quintile 2	41.93(36.12,47.98)	20.3818	39.94501
		Quintile 3	42.45(36.89,48.21)	17.5361	39.94501
		Quintile 4	41.13(32.75,50.07)	21.77431	39.94501
		Quintile 5 (richest)	43.24(36.99,49.72)	18.18908	39.94501
		Quintile 1 (poorest)	45.38(35.66,55.47)	24.64696	46.37177
		Quintile 2	42.35(33.10,52.18)	25.42505	46.37177
		Quintile 3	59.32(47.64,70.03)	21.65247	46.37177
Ethiopia	2016	Quintile 4	40.04(23.45,59.27)	17.34297	46.37177
		Quintile 5 (richest)	42.30(24.44,62.43)	10.93255	46.37177
		Quintile 1 (poorest)	23.84(17.54,31.53)	20.66412	28.65617
		Quintile 2	34.24(25.29,44.47)	23.14477	28.65617
		Quintile 3	28.52(21.26,37.09)	21.78754	28.65617
Gabon	2012	Quintile 4	25.52(16.47,37.32)	20.64595	28.65617
		Quintile 5 (richest)	31.38(21.22,43.70)	13.75762	28.65617
		Quintile 1 (poorest)	53.44(46.83,59.93)	23.05507	51.90965
		Quintile 2	46.54(36.24,57.15)	22.88687	51.90965
		Quintile 3	52.79(41.63,63.67)	25.56293	51.90965
		Quintile 4	56.01(41.00,70.00)	19.25994	51.90965
		Quintile 5 (richest)	50.36(30.35,70.25)	9.235194	51.90965

Setting	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
Gambia	2013	Quintile 1 (poorest)	45.46(35.70,55.58)	18.60457	50.84321
		Quintile 2	48.78(40.93,56.68)	22.01013	50.84321
		Quintile 3	54.75(47.19,62.09)	19.14623	50.84321
		Quintile 4	56.77(48.68,64.52)	20.97492	50.84321
		Quintile 5 (richest)	48.04(36.23,60.08)	19.26415	50.84321
Guinea	2016	Quintile 1 (poorest)	32.55(25.30,40.75)	23.38568	44.17994
		Quintile 2	46.59(37.20,56.22)	21.31853	44.17994
		Quintile 3	37.88(29.63,46.90)	21.44252	44.17994
		Quintile 4	48.71(39.90,57.60)	17.28433	44.17994
		Quintile 5 (richest)	60.89(51.64,69.43)	16.56895	44.17994
Guinea-Bissau	2014	Quintile 1 (poorest)	48.29(40.19,56.50)	20.4378	54.61463
		Quintile 2	50.44(41.34,59.52)	18.95342	54.61463
		Quintile 3	55.97(47.37,64.23)	20.75555	54.61463
		Quintile 4	59.24(48.25,69.38)	25.1164	54.61463
		Quintile 5 (richest)	58.91(49.28,67.90)	14.73684	54.61463
Kenya	2014	Quintile 1 (poorest)	39.21(35.39,43.16)	26.97726	45.1324
		Quintile 2	43.17(38.66,47.79)	22.85396	45.1324
		Quintile 3	44.55(38.79,50.46)	18.44987	45.1324
		Quintile 4	49.88(43.87,55.89)	17.77935	45.1324
		Quintile 5 (richest)	54.51(47.23,61.61)	13.93956	45.1324
Lesotho	2014	Quintile 1 (poorest)	50.74(38.34,63.05)	23.5475	61.38574
		Quintile 2	58.67(45.27,70.90)	22.94458	61.38574
		Quintile 3	63.59(50.86,74.66)	20.5444	61.38574

Setting	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
Liberia	2013	Quintile 4	74.18(58.20,85.56)	18.49361	61.38574
		Quintile 5 (richest)	63.51(44.54,79.04)	14.46991	61.38574
		Quintile 1 (poorest)	40.90(34.20,47.96)	27.80155	46.43533
		Quintile 2	46.12(39.69,52.68)	23.096	46.43533
		Quintile 3	40.22(33.34,47.50)	18.49649	46.43533
		Quintile 4	56.40(47.37,65.02)	18.8366	46.43533
		Quintile 5 (richest)	53.91(40.07,67.17)	11.76936	46.43533
		Quintile 1 (poorest)	55.52(51.36,59.61)	25.49789	56.68572
		Quintile 2	52.71(48.71,56.67)	23.42749	56.68572
		Quintile 3	58.30(53.79,62.69)	18.02529	56.68572
Malawi	2015	Quintile 4	58.00(53.33,62.53)	17.38706	56.68572
		Quintile 5 (richest)	61.17(53.64,68.21)	15.66228	56.68572
		Quintile 1 (poorest)	22.87(18.05,28.53)	22.17164	28.70292
		Quintile 2	23.73(19.26,28.86)	23.23614	28.70292
		Quintile 3	27.42(22.49,32.99)	20.08137	28.70292
Mali	2015	Quintile 4	32.73(26.86,39.20)	18.74054	28.70292
		Quintile 5 (richest)	41.04(35.12,47.24)	15.77031	28.70292
		Quintile 1 (poorest)	29.11(24.50,34.19)	26.2099	34.50784
		Quintile 2	29.46(25.27,34.04)	27.03965	34.50784
		Quintile 3	41.39(35.90,47.10)	20.9822	34.50784
Mauritania	2015	Quintile 4	40.05(33.33,47.17)	16.64085	34.50784
		Quintile 5 (richest)	38.98(29.33,49.57)	9.12741	34.50784

Setting	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
Mozambique	2015	Quintile 1 (poorest)	28.06(18.00,40.93)	23.96414	43.02846
		Quintile 2	39.37(28.76,51.08)	25.08219	43.02846
		Quintile 3	48.54(35.87,61.40)	20.93607	43.02846
		Quintile 4	60.70(48.43,71.75)	16.14818	43.02846
		Quintile 5 (richest)	46.59(36.45,57.02)	13.86943	43.02846
Namibia	2013	Quintile 1 (poorest)	50.30(42.25,58.34)	28.4082	51.98061
		Quintile 2	54.44(45.82,62.81)	23.81028	51.98061
		Quintile 3	50.37(42.12,58.60)	22.05145	51.98061
		Quintile 4	57.02(47.05,66.46)	16.40956	51.98061
		Quintile 5 (richest)	45.68(31.24,60.89)	9.320512	51.98061
Niger	2012	Quintile 1 (poorest)	33.29(26.22,41.19)	18.80169	42.96736
		Quintile 2	42.07(33.83,50.79)	19.04196	42.96736
		Quintile 3	44.06(36.99,51.37)	20.24891	42.96736
		Quintile 4	46.83(40.56,53.19)	23.01669	42.96736
		Quintile 5 (richest)	47.60(41.43,53.85)	18.89076	42.96736
Nigeria	2013	Quintile 1 (poorest)	16.43(13.44,19.93)	28.04678	29.23584
		Quintile 2	25.88(22.51,29.57)	26.07713	29.23584
		Quintile 3	34.69(29.02,40.84)	18.50417	29.23584
		Quintile 4	37.51(31.18,44.30)	15.16292	29.23584
		Quintile 5 (richest)	47.23(40.61,53.94)	12.209	29.23584
Rwanda	2014	Quintile 1 (poorest)	18.53(13.68,24.61)	29.05479	19.46708
		Quintile 2	17.59(12.63,23.95)	25.62788	19.46708
		Quintile 3	20.12(14.66,26.97)	18.91029	19.46708

Setting	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
		Quintile 4	23.03(16.42,31.30)	14.8677	19.46708
		Quintile 5 (richest)	20.31(13.06,30.20)	11.53934	19.46708
Sao Tome and Principe	2014	Quintile 1 (poorest)	63.70(52.01,73.97)	24.57356	61.02909
		Quintile 2	69.18(58.35,78.24)	25.02055	61.02909
		Quintile 3	50.86(35.49,66.07)	15.9972	61.02909
		Quintile 4	56.27(43.49,68.27)	25.59041	61.02909
		Quintile 5 (richest)	62.68(40.22,80.75)	8.818278	61.02909
Senegal	2014	Quintile 1 (poorest)	52.81(46.24,59.28)	27.18121	48.59681
		Quintile 2	50.32(44.33,56.29)	21.1315	48.59681
		Quintile 3	46.93(39.24,54.78)	17.29135	48.59681
		Quintile 4	37.46(25.85,50.73)	18.27034	48.59681
		Quintile 5 (richest)	53.61(44.13,62.84)	16.12561	48.59681
Sierra Leone	2013	Quintile 1 (poorest)	57.62(50.33,64.60)	22.22783	57.57013
		Quintile 2	60.08(53.52,66.30)	22.29513	57.57013
		Quintile 3	54.14(46.04,62.03)	20.87473	57.57013
		Quintile 4	56.03(48.36,63.42)	19.55251	57.57013
		Quintile 5 (richest)	60.50(50.90,69.35)	15.04979	57.57013
Togo	2013	Quintile 1 (poorest)	40.94(35.38,46.75)	28.48436	33.42139
		Quintile 2	32.95(26.88, 39.65)	24.30891	33.42139
		Quintile 3	26.22(19.61,34.11)	20.28351	33.42139
		Quintile 4	27.85(19.42,38.20)	15.24718	33.42139
		Quintile 5 (richest)	35.79(25.33,47.80)	11.67604	33.42139

Setting	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
Uganda	2016	Quintile 1 (poorest)	34.12(30.36,38.09)	25.49751	37.38395
		Quintile 2	33.69(29.79,37.82)	22.57913	37.38395
		Quintile 3	37.10(32.42,42.03)	19.02055	37.38395
		Quintile 4	39.31(34.10,44.78)	16.46589	37.38395
		Quintile 5 (richest)	45.89(39.81,52.11)	16.43692	37.38395
United Republic of Tanzania	2015	Quintile 1 (poorest)	36.89(30.29,44.02)	18.46905	45.45398
		Quintile 2	45.18(37.37,53.25)	20.84221	45.45398
		Quintile 3	49.36(40.11,58.65)	19.80412	45.45398
		Quintile 4	47.24(38.70,55.95)	20.98889	45.45398
		Quintile 5 (richest)	47.89(38.41,57.52)	19.89573	45.45398
Zambia	2013	Quintile 1 (poorest)	51.68(45.86,57.46)	22.3005	56.17617
		Quintile 2	50.66(45.96,55.36)	21.90483	56.17617
		Quintile 3	57.75(51.77,63.50)	20.3411	56.17617
		Quintile 4	66.16(59.93,71.87)	21.10007	56.17617
		Quintile 5 (richest)	54.63(45.61,63.36)	14.35349	56.17617
Zimbabwe	2014	Quintile 1 (poorest)	48.26(42.74,53.82)	22.88103	56.36424
		Quintile 2	57.50(52.22,62.61)	22.07989	56.36424
		Quintile 3	55.22(49.40,60.91)	17.80418	56.36424
		Quintile 4	62.28(56.87,67.41)	25.47947	56.36424
		Quintile 5 (richest)	58.87(51.45,65.90)	11.75543	56.36424

In the vast majority of the studied countries, ORT and continued feeding is higher among the richest subgroups. There are also few countries with disproportionately higher coverage in quintiles 3 and 4. For instance, in Mozambique and Lesotho, the average coverage among quintile 4 is higher than among quintile 5. In the other few countries, coverage is higher among the poorest subgroup than among the

richest subgroup. For instance, the coverage is, on average, higher among the poorest subgroups in Togo, Namibia, Gabon and Eswatini (Table 1).

The summary measures showed considerable absolute and relative wealth-based inequality in 20 countries, and just half of which saw disparity by all the four measures. However, 15 countries did not see any economic status inequality: Burundi, Comoros, Eswatini, Ethiopia, Gabon, Gambia, Guinea Bissau, Lesotho, Namibia, Rwanda, Sao Tome, Sierra Leone, Togo, Tanzania and Zambia. Of all the countries with economic inequality, the highest, at least on average, wealth related inequality was observed in Nigeria, Angola, Guinea and Cameroon. The difference in point estimates between the richest and poorest subgroups, showed that there were nearly 31 percentage point (pp) in Nigeria, nearly 29 pp in Angola, 28 pp in Guinea and 26 pp in Cameroon (Table 2).

Table 2

wealth-related inequality in ORT and continued feeding in the 35 low income, lower middle income and upper middle income SSA countries

Country	Year	Type and value of inequality measure with 95% CI			
		D	R	PAR	PAF
Ghana	2014	8.10 (-10.22, 26.44)	1.20 (0.72, 1.67)	6.76 (0.37, 13.15)	16.29 (0.89, 31.70)
Algeria	2012	14.06 (1.39, 26.72)	1.35 (0.99, 1.71)	12.42 (7.79, 17.05)	29.77 (18.67, 40.87)
Angola	2015	28.73 (18.35, 39.11)	2.04 (1.55, 2.54)	16.48 (12.38, 20.57)	41.52 (31.19, 51.85)
Benin	2014	9.64 (-2.37, 21.66)	1.34 (0.86, 1.82)	5.15 (0.26, 10.03)	15.83 (0.82, 30.84)
Burundi	2016	6.10 (-0.72, 12.93)	1.19 (0.96, 1.42)	2.80 (-0.23, 5.85)	8.03 (-0.68, 16.75)
Cameroon	2014	26.26(14.34, 38.18)	1.89 (1.33, 2.44)	16.38 (13.11, 19.66)	41.71(33.38, 50.04)
Chad	2014	10.18 (4.10, 16.27)	1.41 (1.11, 1.71)	6.08 (3.49, 8.67)	21.07 (12.11, 30.03)
Comoros	2012	14.31 (-4.48, 33.12)	1.33 (0.81, 1.86)	2.81 (-5.37, 11.00)	5.22 (-9.96, 20.40)
Congo	2014	10.67 (-2.61, 23.96)	1.29 (0.91, 1.67)	4.77 (0.83, 8.70)	11.29 (1.98, 20.60)
Democratic Republic of the Congo	2013	11.02 (3.09, 18.94)	1.34 (1.06, 1.62)	3.30 (0.03, 6.57)	8.26 (0.08, 16.45)
Eswatini	2014	-3.08 (-25.30, 19.14)	0.93 (0.44, 1.41)	0 (-8.17, 8.17)	0 (-17.63, 17.63)
Ethiopia	2016	7.54 (-5.79, 20.88)	1.31 (0.70, 1.92)	2.73 (-2.04, 7.50)	9.53 (-7.12, 26.18)
Gabon	2012	-3.08 (-25.11, 18.94)	0.94 (0.53, 1.35)	0 (-6.46, 6.46)	0 (-12.45, 12.45)
Gambia	2013	2.58 (-13.12, 18.29)	1.05 (0.70, 1.41)	0 (-5.64, 5.64)	0 (-11.11, 11.11)
Guinea	2016	28.34(16.51, 40.17)	1.87 (1.34, 2.39)	16.72 (10.47, 22.96)	37.84 (23.70, 51.98)
Guinea-Bissau	2014	10.61 (-1.83, 23.06)	1.21 (0.93, 1.50)	4.29 (-2.17, 10.77)	7.87 (-3.98, 19.72)

Country	Year	Type and value of inequality measure with 95% CI			
		D	R	PAR	PAF
Kenya	2014	15.30 (7.09, 23.51)	1.39 (1.16, 1.62)	9.38 (6.40, 12.36)	20.79 (14.18, 27.3)9
Lesotho	2014	12.77 (-8.99, 34.53)	1.25 (0.78, 1.71)	2.12 (-7.46, 11.72)	3.46 (-12.16, 19.10)
Liberia	2013	13.00 (-2.45, 28.46)	1.31 (0.91, 1.72)	7.47 (3.18, 11.77)	16.10 (6.85, 25.35)
Malawi	2015	5.64 (-2.75, 14.05)	1.10 (0.94, 1.25)	4.49 (1.71, 7.27)	7.92 (3.01, 12.82)
Mali	2015	18.17(10.15, 26.18)	1.79 (1.30, 2.28)	12.34 (9.10, 15.58)	43.00 (31.70, 54.29)
Mauritania	2015	9.86 (-1.44, 21.17)	1.33 (0.92, 1.75)	4.47 (1.13, 7.80)	12.96 (3.30, 22.62)
Mozambique	2015	18.53(3.02, 34.03)	1.66 (0.88, 2.43)	3.56 (-3.18, 10.32)	8.29 (-7.40, 23.99)
Namibia	2013	-4.61 (-21.85, 12.61)	0.90 (0.57, 1.24)	0 (-5.50, 5.50)	0 (-10.59, 10.59)
Niger	2012	14.31 (4.56, 24.07)	1.43 (1.05, 1.80)	4.64 (-0.04, 9.32)	10.80 (-0.09, 21.70)
Nigeria	2013	30.79 (23.36, 38.23)	2.87 (2.17, 3.57)	17.99 (15.71, 20.28)	61.55 (53.73, 69.37)
Rwanda	2014	1.78 (-8.32, 11.89)	1.09 (0.53, 1.65)	0.85 (-3.10, 4.80)	4.36 (-15.96, 24.70)
Sao Tome and Principe	2014	-1.01 (-24.85, 22.82)	0.98 (0.61, 1.35)	1.65 (-7.12, 10.44)	2.71 (-11.67, 17.11)
Senegal	2014	0.80 (-10.62, 12.23)	1.01 (0.79, 1.23)	5.01 (0.24, 9.79)	10.32 (0.50, 20.15)
Sierra Leone	2013	2.87 (-8.84, 14.60)	1.04 (0.84, 1.25)	2.93 (-2.30, 8.16)	5.09 (-3.99, 14.18)
Togo	2013	-5.15 (-17.84, 7.54)	0.87 (0.57, 1.170)	2.37 (-2.53, 7.28)	7.10 (-7.58, 21.80)
Uganda	2016	11.77 (4.49, 19.05)	1.34 (1.10, 1.58)	8.51 (5.50, 11.52)	22.77 (14.72, 30.83)
United Republic of Tanzania	2015	10.99 (-0.85, 22.84)	1.29 (0.94, 1.65)	2.43 (-3.57, 8.44)	5.36 (-7.86, 18.58)
Zambia	2013	2.95 (-7.72, 13.62)	1.05 (0.84, 1.26)	0 (-4.05, 4.05)	0 (-7.22, 7.22)

Country	Year	Type and value of inequality measure with 95% CI			
		D	R	PAR	PAF
Zimbabwe	2014	10.60 (1.46, 19.74)	1.21 (1.01, 1.420)	2.50 (-2.10, 7.11)	4.44 (-3.73, 12.62)

Educational Inequality

Eswatini, Senegal, Sierra Leone, Togo and Gambia had the average coverage highest among non-education group. In other 7 countries (Ghana, Algeria, Comoros, DR Congo, Ethiopia, Gabon and Liberia), the average coverage is higher among the primary group. In Rwanda, we observed unusual concentration of the service, where the coverage is highest among no education, followed by primary and secondary. In the remaining countries, it is higher among children born into women who completed the secondary education (Table 3).

Table 3

utilization of ORT and continued feeding for each subgroup of the education status stratifier across the 35 low income, lower middle income and upper middle income SSA countries

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
Ghana	2014	No education	38.82(30.10, 48.31)	33.16994	41.5043
		Primary school	51.38(40.67, 61.97)	19.29688	41.5043
		Secondary school +	39.36(31.97, 47.27)	47.53319	41.5043
Algeria	2012	No education	36.14(26.59, 46.93)	14.57784	41.73203
		Primary school	46.84 (38.73, 55.12)	20.97527	41.73203
		Secondary school +	41.33 (36.54, 46.28)	64.44688	41.73203
Angola	2015	No education	29.85 (25.05, 35.12)	27.03046	39.68827
		Primary school	41.66 (37.05, 46.42)	40.60347	39.68827
		Secondary school +	45.42 (40.04, 50.90)	32.36607	39.68827
Benin	2014	No education	32.06 (28.14, 36.25)	67.97112	32.54792
		Primary school	31.01 (23.75, 39.33)	23.47904	32.54792
		Secondary school +	37.37 (27.69, 48.18)	8.549847	32.54792
Burundi	2016	No education	31.76 (28.82, 34.85)	47.54028	34.95439
		Primary school	36.98 (33.74, 40.35)	44.59535	34.95439
		Secondary school +	42.71 (35.07, 50.72)	7.864367	34.95439
Cameroon	2014	No education	33.06 (27.61, 39.00)	46.81973	39.29078

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
		Primary school	39.02 (34.23, 44.03)	33.56198	39.29078
		Secondary school +	54.61 (47.87, 61.18)	19.61829	39.29078
Chad	2014	No education	25.66 (23.05, 28.46)	59.05637	28.88636
		Primary school	30.56 (26.63, 34.80)	29.17677	28.88636
		Secondary school +	40.86 (34.63, 47.40)	11.76686	28.88636
Comoros	2012	No education	48.65 (39.93, 57.45)	46.24903	53.94333
		Primary school	59.12 (46.22, 70.87)	25.64578	53.94333
		Secondary school +	57.65 (46.86, 67.74)	28.10519	53.94333
Congo	2014	No education	41.20 (32.46, 50.52)	10.35354	42.24259
		Primary school	41.20 (35.89, 46.72)	33.93906	42.24259
		Secondary school +	45.28 (39.88, 50.79)	55.7074	42.24259
Democratic Republic of the Congo	2013	No education	35.34 (29.53, 41.61)	16.89113	39.94501
		Primary school	42.00 (37.65, 46.48)	44.65941	39.94501
		Secondary school +	39.56 (34.33, 45.05)	38.44947	39.94501
Eswatini	2014	No education	55.55 (37.17, 72.52)	6.741546	46.37177
		Primary school	48.64 (38.49, 58.89)	34.03322	46.37177
		Secondary school +	44.02 (36.12, 52.23)	59.22523	46.37177
Ethiopia	2016	No education	27.59 (22.65, 33.15)	62.45697	28.65617

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
		Primary school	31.87 (24.98, 39.67)	30.10607	28.65617
		Secondary school +	24.50 (14.04, 39.18)	7.436958	28.65617
Gabon	2012	No education	31.17 (13.14, 57.54)	4.16072	51.90965
		Primary school	55.29 (46.67, 63.60)	26.72619	51.90965
		Secondary school +	51.84 (44.29, 59.31)	69.11309	51.90965
Gambia	2013	No education	53.32 (47.65, 58.90)	54.98156	50.84321
		Primary school	46.38 (36.93, 56.09)	17.09523	50.84321
		Secondary school +	48.69 (41.96, 55.46)	27.92321	50.84321
Guinea	2016	No education	40.77 (36.45, 45.24)	70.64731	44.17994
		Primary school	42.89 (32.70, 53.72)	14.57406	44.17994
		Secondary school +	61.70 (51.71, 70.80)	14.77862	44.17994
Guinea-Bissau	2014	No education	49.70 (43.11, 56.31)	51.7701	54.61463
		Primary school	55.84 (48.22, 63.20)	29.94337	54.61463
		Secondary school +	66.48 (55.89, 75.64)	18.28654	54.61463
Kenya	2014	No education	36.97 (30.97, 43.40)	10.96732	45.1324
		Primary school	42.92 (39.51, 46.39)	60.10298	45.1324
		Secondary school +	52.81 (47.79, 57.77)	28.92971	45.1324
Lesotho	2014	No education	NA	0.623956	61.38574

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
		Primary school	52.40 (43.47, 61.17)	51.47592	61.38574
		Secondary school +	70.53 (62.18, 77.70)	47.90012	61.38574
Liberia	2013	No education	42.78 (37.65, 48.06)	40.51356	46.43533
		Primary school	49.59 (43.60, 55.59)	32.20204	46.43533
		Secondary school +	48.13 (39.16, 57.21)	27.2844	46.43533
Malawi	2015	No education	52.27 (45.63, 58.82)	11.23334	56.68572
		Primary school	56.45 (53.74, 59.12)	68.98157	56.68572
		Secondary school +	59.99 (54.20, 65.50)	19.78509	56.68572
Mali	2015	No education	26.34 (23.72, 29.15)	81.46065	28.70292
		Primary school	32.76 (26.59, 39.60)	11.97664	28.70292
		Secondary school +	37.38 (28.73, 46.92)	6.562711	28.70292
Mauritania	2015	No education	33.12 (28.82, 37.71)	38.87771	34.50784
		Primary school	32.84 (27.45, 38.73)	24.21533	34.50784
		Secondary school +	33.95 (29.76, 38.41)	36.90696	34.50784
Mozambique	2015	No education	30.85 (20.74, 43.21)	24.80309	43.02846
		Primary school	45.36 (38.40, 52.50)	61.28754	43.02846
		Secondary school +	54.43 (42.79, 65.59)	13.90937	43.02846
Namibia	2013	No education	45.78 (32.13, 60.10)	5.002066	51.98061

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
		Primary school	51.86 (44.97, 58.67)	30.06316	51.98061
		Secondary school +	52.51 (47.83, 57.14)	64.93478	51.98061
Niger	2012	No education	43.45 (39.40, 47.58)	83.6847	42.96736
		Primary school	38.68 (31.58, 46.30)	10.84407	42.96736
		Secondary school +	44.83 (35.18, 54.90)	5.471227	42.96736
Nigeria	2013	No education	22.68 (19.82, 25.83)	55.23032	29.23584
		Primary school	34.05 (29.57, 38.83)	18.63456	29.23584
		Secondary school +	39.63 (34.93, 44.54)	26.13512	29.23584
Rwanda	2014	No education	21.28 (14.59, 29.95)	16.7548	19.46708
		Primary school	19.46 (16.32, 23.03)	74.03515	19.46708
		Secondary school +	16.19 (9.45, 26.33)	9.210052	19.46708
Sao Tome and Principe	2014	No education	NA	5.513231	61.02909
		Primary school	60.08 (52.87, 66.88)	66.75923	61.02909
		Secondary school +	61.02 (47.16, 73.29)	27.72754	61.02909
Senegal	2014	No education	51.46 (46.36, 56.53)	65.45181	48.59681
		Primary school	42.33 (31.67, 53.74)	22.83674	48.59681
		Secondary school +	44.78 (32.10, 58.17)	11.71145	48.59681
Sierra Leone	2013	No education	58.23 (53.76, 62.58)	69.36893	57.57013

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
		Primary school	54.15 (44.80, 63.22)	14.00004	57.57013
		Secondary school +	57.65 (49.48, 65.42)	16.63103	57.57013
Togo	2013	No education	36.59 (32.35, 41.05)	46.21846	33.42139
		Primary school	29.58 (24.16, 35.65)	35.01645	33.42139
		Secondary school +	32.75 (25.13, 41.41)	18.76509	33.42139
Uganda	2016	No education	35.50 (29.61, 41.87)	10.23754	37.38395
		Primary school	36.58 (34.07, 39.16)	62.6337	37.38395
		Secondary school +	39.93 (35.43, 44.61)	27.12877	37.38395
United Republic of Tanzania	2015	No education	38.25 (30.16, 47.05)	16.56646	45.45398
		Primary school	45.66 (40.78, 50.62)	65.43236	45.45398
		Secondary school +	51.31 (42.52, 60.02)	18.00118	45.45398
Zambia	2013	No education	50.46 (42.38, 58.53)	10.98515	56.17617
		Primary school	56.74 (53.02, 60.38)	55.00752	56.17617
		Secondary school +	57.22 (51.87, 62.41)	34.00733	56.17617
Zimbabwe	2014	No education	48.90 (34.94, 63.03)	3.129189	56.36424
		Primary school	53.13 (49.10, 57.12)	40.16053	56.36424
		Secondary school +	59.06 (55.51, 62.51)	56.71028	56.36424

Among the 35 countries included in the study, in Sao Tome and Lesotho the results are not applicable as the estimate is missing for some groups. Of the 33 countries, 11 countries, namely Angola, Benin,

Burundi, Cameron, Chad, Guinea, Guinea Bissau, Kenya, Mali, Mozambique and Nigeria had educational status inequality in ORT and continued feeding. However, the extent of the inequality fluctuated in different measures across countries. For instance, the average absolute educational inequality based on simple measure (D) was highest in Mozambique (23.6%), Cameron (21.5%) and Guinea (21%). On the other hand, based on the complex measure (PAR), the average absolute inequality was highest in Guinea (17.5%), Cameron (15.3%) and Mozambique (11.4%). The relative inequality was highest in Chad (41.5%), Guinea (39.7%) and Cameron (39%) using the complex measure (PAF) (Table 4).

Table 4

education-related inequality in ORT and continued feeding in the 35 low income, lower middle income and upper middle income SSA countries

Country	Year	D	R	PAR	PAF
Ghana	2014	0.53 (-11.40, 12.48)	1.01 (0.70, 1.32)	0 (-5.41, 5.41)	0 (-13.04, 13.04)
Algeria	2012	5.18 (-6.19, 16.56)	1.14 (0.79, 1.49)	0 (-6.20, 6.20)	0 (-14.86, 14.86)
Angola	2015	15.57(8.15, 22.98)	1.52 (1.20, 1.83)	5.73 (2.32, 9.14)	14.44 (5.85, 23.04)
Benin	2014	5.31 (-5.81, 16.43)	1.16 (0.81, 1.52)	5.10 (3.29, 6.91)	15.81 (10.21, 21.42)
Burundi	2016	10.95(2.52, 19.37)	1.34 (1.06, 1.62)	7.76 (5.93, 9.58)	22.20 (16.97, 27.43)
Cameroon	2014	21.54 (12.77, 30.31)	1.65 (1.30, 2.00)	15.31 (12.61, 18.02)	38.98 (32.10, 45.87)
Chad	2014	15.19 (8.24, 22.14)	1.59 (1.29, 1.89)	11.97 (10.74, 13.20)	41.45 (37.18, 45.72)
Comoros	2012	8.99 (-4.71, 22.70)	1.18 (0.88, 1.48)	3.78 (-0.89, 8.46)	7.02 (-1.66, 15.70)
Congo	2014	4.08 (-6.53, 14.69)	1.09 (0.82, 1.37)	1.80 (-6.05, 9.67)	4.15 (-13.93, 22.25)
Democratic Republic of the Congo	2013	4.22 (-3.85, 12.31)	1.11 (0.87, 1.36)	0 (-3.92, 3.92)	0 (-9.81, 9.813)
Eswatini	2014	-11.53(-31.58, 8.52)	0.79 (0.49, 1.09)	0 (-17.56, 17.56)	0 (-37.88, 37.88)
Ethiopia	2016	-3.09 (-16.79, 10.59)	0.88 (0.39, 1.37)	0 (-1.97, 1.97)	0 (-6.89, 6.89)
Gabon	2012	20.67 (-3.91, 45.27)	1.66 (0.39, 2.93)	0 (-16.49, 16.49)	0 (-31.76, 31.76)
Gambia	2013	-4.63 (-13.41, 4.15)	0.91(0.75, 1.07)	0 (-2.44, 2.44)	0 (-4.81, 4.81)
Guinea	2016	20.93 (10.36, 31.50)	1.51 (1.22, 1.79)	17.52 (15.19, 19.86)	39.67 (34.38, 44.97)
Guinea-Bissau	2014	16.78 (4.84, 28.72)	1.33 (1.06, 1.60)	11.87 (8.71, 15.03)	21.74 (15.95, 27.52)
Kenya	2014	15.83 (7.83, 23.83)	1.42 (1.15, 1.70)	7.67 (2.58, 12.77)	17.01 (5.72, 28.30)

Country	Year	D	R	PAR	PAF
Lesotho	2014	NA	NA	NA	NA
Liberia	2013	5.34 (-5.12, 15.81)	1.12 (0.87, 1.37)	1.69 (-1.55, 4.94)	3.65 (-3.34, 10.64)
Malawi	2015	7.71 (-0.99, 16.43)	1.14 (0.96, 1.32)	3.30 (-1.29, 7.90)	5.83 (-2.28, 13.94)
Mali	2015	11.03(1.47, 20.60)	1.41 (1.04, 1.79)	9.54 (8.61, 10.47)	34.28 (30.95, 37.62)
Mauritania	2015	0.83 (-5.35, 7.03)	1.02 (0.83, 1.21)	0.59 (-2.07, 3.25)	1.78 (-6.20, 9.76)
Mozambique	2015	23.57(7.41, 39.73)	1.76 (1.01, 2.51)	11.40 (4.67, 18.13)	26.49 (10.86, 42.13)
Namibia	2013	6.72 (-8.32, 21.77)	1.14 (0.77, 1.51)	0.53 (-14.78, 15.85)	1.02 (-28.45, 30.49)
Niger	2012	1.38 (-9.38, 12.15)	1.03 (0.78, 1.28)	1.82 (0.80, 2.85)	4.24 (1.86, 6.62)
Nigeria	2013	16.95(11.28, 22.62)	1.74 (1.43, 2.06)	10.40 (8.91, 11.88)	35.58 (30.50, 40.66)
Rwanda	2014	-5.09 (-16.39, 6.21)	0.76 (0.28, 1.23)	0 (-5.89, 5.89)	0 (-30.27, 30.27)
Sao Tome and Principe	2014	NA	NA	NA	NA
Senegal	2014	-6.68 (-20.86, 7.49)	0.87 (0.59, 1.14)	0 (-2.12, 2.12)	0 (-4.367, 4.36)
Sierra Leone	2013	-0.58 (-9.71, 8.55)	0.99 (0.83, 1.14)	0.08 (-1.77, 1.95)	0.15 (-3.08, 3.38)
Togo	2013	-3.84 (-13.08, 5.40)	0.89 (0.64, 1.14)	0 (-3.26, 3.26)	0 (-9.75, 9.75)
Uganda	2016	4.42 (-3.24, 12.10)	1.12 (0.89, 1.35)	2.55 (-2.69, 7.79)	6.82 (-7.20, 20.85)
United Republic of Tanzania	2015	13.06(0.82, 25.30)	1.34 (0.96, 1.71)	5.86 (-0.58, 12.31)	12.90 (-1.29, 27.09)
Zambia	2013	6.75 (-2.93, 16.45)	1.13 (0.92, 1.34)	1.00 (-5.19, 7.21)	1.79 (-9.24, 12.83)
Zimbabwe	2014	10.15(-4.66, 24.97)	1.20 (0.84, 1.57)	2.69 (-11.43, 16.82)	4.78 (-20.28, 29.85)

Sex Inequality

Without calculating summary measures, in 19 (54%) of the countries, the average coverage of ORT and continued feeding is higher among male children than among female children (Table 5). According to the summary measures, however, we saw sex inequality in Niger, Kenya, Guinea-Bissau, and Senegal only (Table 6).

Table 5

utilization of ORT and continued feeding for each subgroup of the sex stratifier across the 35 low income, lower middle income and upper middle income SSA countries

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
Ghana	2014	Female	38.29 (31.38, 45.72)	41.89582	41.5043
		Male	43.81 (37.73, 50.09)	58.10418	41.5043
Algeria	2012	Female	42.43 (37.00, 48.05)	47.28885	41.73203
		Male	41.10 (36.25, 46.13)	52.71115	41.73203
Angola	2015	Female	39.54 (34.82, 44.46)	46.72852	39.68827
		Male	39.81 (35.85, 43.91)	53.27148	39.68827
Benin	2014	Female	30.18 (26.02, 34.69)	50.82659	32.54792
		Male	34.99 (30.32, 39.97)	49.17341	32.54792
Burundi	2016	Female	35.33 (32.21, 38.58)	46.98909	34.95439
		Male	34.62 (31.80, 37.55)	53.01091	34.95439
Cameroon	2014	Female	39.48 (34.44, 44.75)	48.33535	39.29078
		Male	39.11 (35.13, 43.24)	51.66465	39.29078
Chad	2014	Female	29.34 (26.48, 32.38)	48.71667	28.88636
		Male	28.44 (25.47, 31.61)	51.28333	28.88636
Comoros	2012	Female	57.89 (49.42, 65.91)	48.73714	53.94333
		Male	50.19 (42.14, 58.22)	51.26286	53.94333

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
Congo	2014	Female	44.34 (39.25, 49.54)	49.50343	42.24259
		Male	40.18 (35.26, 45.31)	50.49657	42.24259
Democratic Republic of the Congo	2013	Female	39.73 (35.62, 43.99)	47.28989	39.94501
		Male	40.13 (36.52, 43.84)	52.71011	39.94501
Eswatini	2014	Female	48.29 (40.86, 55.80)	45.53151	46.37177
		Male	44.76 (35.98, 53.88)	54.46849	46.37177
Ethiopia	2016	Female	27.24 (21.94, 33.27)	47.13117	28.65617
		Male	29.91 (24.71, 35.69)	52.86883	28.65617
Gabon	2012	Female	50.31 (42.51, 58.09)	48.83757	51.90965
		Male	53.43 (45.59, 61.10)	51.16243	51.90965
Gambia	2013	Female	49.53 (42.85, 56.21)	45.48225	50.84321
		Male	51.93 (46.68, 57.14)	54.51775	50.84321
Guinea	2016	Female	44.22 (38.37, 50.23)	45.44842	44.17994
		Male	44.14 (38.91, 49.50)	54.55158	44.17994
Guinea-Bissau	2014	Female	48.42 (42.19, 54.70)	45.15448	54.61463
		Male	59.71 (50.98, 67.86)	54.84552	54.61463
Kenya	2014	Female	41.74 (38.31, 45.26)	46.85591	45.1324
		Male	48.11 (44.70, 51.54)	53.14409	45.1324

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
Lesotho	2014	Female	61.65 (52.68, 69.89)	49.22414	61.38574
		Male	61.12 (52.74, 68.88)	50.77586	61.38574
Liberia	2013	Female	45.99 (40.23, 51.86)	48.72026	46.43533
		Male	46.85 (41.83, 51.93)	51.27974	46.43533
Malawi	2015	Female	55.00 (51.47, 58.48)	46.4684	56.68572
		Male	58.14 (55.20, 61.03)	53.5316	56.68572
Mali	2015	Female	29.36 (25.80, 33.20)	46.17599	28.70292
		Male	28.13 (25.01, 31.47)	53.82401	28.70292
Mauritania	2015	Female	31.83 (28.07, 35.84)	48.99037	34.50784
		Male	37.07 (33.39, 40.91)	51.00963	34.50784
Mozambique	2015	Female	42.33 (35.38, 49.61)	45.29924	43.02846
		Male	43.59 (35.67, 51.86)	54.70076	43.02846
Namibia	2013	Female	49.94 (44.32, 55.56)	47.2828	51.98061
		Male	53.80 (48.82, 58.70)	52.7172	51.98061
Niger	2012	Female	45.26 (40.86, 49.75)	47.37863	42.96736
		Male	40.89 (36.37, 45.57)	52.62137	42.96736
Nigeria	2013	Female	29.46 (26.34, 32.79)	50.04135	29.23584
		Male	29.00 (26.08, 32.11)	49.95865	29.23584

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
Rwanda	2014	Female	19.70 (15.96, 24.07)	48.02026	19.46708
		Male	19.24 (15.70, 23.35)	51.97974	19.46708
Sao Tome and Principe	2014	Female	55.48 (46.79, 63.84)	38.32406	61.02909
		Male	64.47 (56.26, 71.91)	61.67594	61.02909
Senegal	2014	Female	44.68 (39.81, 49.66)	45.32852	48.59681
		Male	51.83 (46.20, 57.41)	54.67148	48.59681
Sierra Leone	2013	Female	55.82 (51.31, 60.23)	50.82598	57.57013
		Male	59.37 (54.24, 64.31)	49.17402	57.57013
Togo	2013	Female	32.58 (28.51, 36.93)	48.72497	33.42139
		Male	34.21 (29.88, 38.82)	51.27503	33.42139
Uganda	2016	Female	35.51 (32.38, 38.76)	46.24513	37.38395
		Male	38.99 (36.07, 42.00)	53.75487	37.38395
United Republic of Tanzania	2015	Female	46.05 (40.66, 51.53)	49.85485	45.45398
		Male	44.85 (39.41, 50.42)	50.14515	45.45398
Zambia	2013	Female	56.47 (52.43, 60.43)	47.86177	56.17617
		Male	55.89 (52.22, 59.50)	52.13823	56.17617
Zimbabwe	2014	Female	56.68 (52.88, 60.41)	50.24892	56.36424
		Male	56.04 (52.44, 59.57)	49.75108	56.36424

Table 6

sex-related inequality in ORT and continued feeding in the 35 low income, lower middle income and upper middle income SSA countries

Country	Year	Type and value of inequality measure with 95% CI			
		D	R	PAR	PAF
Ghana	2014	-5.51 (-14.99, 3.95)	0.87 (0.66, 1.07)	0 (-3.24, 3.24)	0 (-7.81, 7.81)
Algeria	2012	1.33 (-6.08, 8.75)	1.03 (0.84, 1.21)	0.70 (-1.76, 3.17)	1.68 (-4.23, 7.59)
Angola	2015	-0.27 (-6.55, 6.01)	0.99 (0.83, 1.15)	0 (-2.02, 2.02)	0 (-5.09, 5.09)
Benin	2014	-4.81 (-11.29, 1.67)	0.86 (0.69, 1.03)	0 (-2.66, 2.66)	0 (-8.17, 8.17)
Burundi	2016	0.71 (-3.57, 4.99)	1.02 (0.89, 1.14)	0.37 (-1.26, 2.01)	1.07 (-3.61, 5.77)
Cameroon	2014	0.37 (-6.18, 6.92)	1.00 (0.84, 1.17)	0.19 (-2.27, 2.65)	0.48 (-5.77, 6.75)
Chad	2014	0.90 (-3.34, 5.14)	1.03 (0.87, 1.18)	0.46 (-0.96, 1.88)	1.60 (-3.33, 6.53)
Comoros	2012	7.69 (-3.84, 19.24)	1.15 (0.90, 1.40)	3.94 (-0.27, 8.16)	7.31 (-0.50, 15.13)
Congo	2014	4.15 (-3.04, 11.35)	1.10 (0.91, 1.29)	2.09 (-0.30, 4.50)	4.96 (-0.72, 10.65)
Democratic Republic of the Congo	2013	-0.39 (-5.95, 5.16)	0.99 (0.85, 1.12)	0 (-1.70, 1.70)	0 (-4.26, 4.26)
Eswatini	2014	3.53 (-8.16, 15.23)	1.07 (0.80, 1.35)	1.92 (-2.34, 6.19)	4.15 (-5.05, 13.35)
Ethiopia	2016	-2.67 (-10.55, 5.20)	0.91 (0.65, 1.16)	0 (-2.38, 2.38)	0 (-8.32, 8.32)
Gabon	2012	-3.12 (-14.15, 7.90)	0.94 (0.74, 1.14)	0 (-3.45, 3.45)	0 (-6.66, 6.66)
Gambia	2013	-2.40 (-10.89, 6.07)	0.95 (0.79, 1.11)	0 (-2.46, 2.46)	0 (-4.85, 4.85)
Guinea	2016	0.08 (-7.86, 8.03)	1.00 (0.82, 1.18)	0.04 (-3.21, 3.30)	0.10 (-7.26, 7.46)
Guinea-Bissau	2014	-11.29 (-21.83, -0.74)	0.81 (0.65, 0.96)	0 (-2.99, 2.99)	0 (-5.47, 5.47)

Country	Year	Type and value of inequality measure with 95% CI			
		D	R	PAR	PAF
Kenya	2014	-6.37 (-11.25, -1.49)	0.86 (0.77, 0.96)	0 (-1.72, 1.72)	0 (-3.81, 3.81)
Lesotho	2014	0.53 (-11.28, 12.35)	1.00 (0.81, 1.20)	0.26 (-4.81, 5.35)	0.43 (-7.84, 8.72)
Liberia	2013	-0.85 (-8.55, 6.84)	0.98 (0.81, 1.14)	0 (-2.61, 2.61)	0 (-5.62, 5.62)
Malawi	2015	-3.14 (-7.70, 1.41)	0.94 (0.86, 1.02)	0 (-1.51, 1.51)	0 (-2.67, 2.67)
Mali	2015	1.23 (-3.67, 6.13)	1.04 (0.86, 1.22)	0.66 (-1.02, 2.35)	2.31 (-3.57, 8.19)
Mauritania	2015	-5.24 (-10.64, 0.15)	0.85 (0.72, 0.99)	0 (-2.00, 2.00)	0 (-5.79, 5.79)
Mozambique	2015	-1.26 (-12.06, 9.53)	0.97 (0.72, 1.21)	0 (-3.65, 3.65)	0 (-8.48, 8.48)
Namibia	2013	-3.85 (-11.33, 3.62)	0.92 (0.79, 1.06)	0 (-3.28, 3.28)	0 (-6.31, 6.31)
Niger	2012	4.37 (-2.01, 10.76)	1.10 (0.94, 1.27)	2.30 (0.08, 4.51)	5.35 (0.20, 10.51)
Nigeria	2013	0.46 (-3.94, 4.87)	1.01 (0.86, 1.16)	0.23 (-1.40, 1.87)	0.79 (-4.81, 6.40)
Rwanda	2014	0.46 (-5.08, 6.01)	1.02 (0.73, 1.31)	0.24 (-2.20, 2.69)	1.24 (-11.35, 13.83)
Sao Tome and Principe	2014	-8.99 (-20.52, 2.53)	0.86 (0.69, 1.02)	0 (-4.04, 4.04)	0 (-6.62, 6.62)
Senegal	2014	-7.14 (-14.58, 0.28)	0.86 (0.72, 0.99)	0 (-2.65, 2.65)	0 (-5.47, 5.47)
Sierra Leone	2013	-3.55 (-10.27, 3.16)	0.94 (0.83, 1.04)	0 (-2.84, 2.84)	0 (-4.94, 4.94)
Togo	2013	-1.62 (-7.75, 4.49)	0.95 (0.77, 1.12)	0 (-2.93, 2.93)	0 (-8.78, 8.78)
Uganda	2016	-3.48 (-7.83, 0.86)	0.91 (0.80, 1.01)	0 (-1.65, 1.65)	0 (-4.41, 4.41)
United Republic of Tanzania	2015	1.20 (-6.54, 8.94)	1.02 (0.85, 1.20)	0.60 (-2.30, 3.50)	1.32 (-5.07, 7.72)
Zambia	2013	0.58 (-4.83, 5.99)	1.01 (0.91, 1.10)	0.30 (-1.76, 2.37)	0.53 (-3.14, 4.22)

Country	Year	Type and value of inequality measure with 95% CI			
		D	R	PAR	PAF
Zimbabwe	2014	0.64 (-4.53, 5.82)	1.01 (0.91, 1.10)	0.32 (-2.17, 2.81)	0.56 (-3.86, 5.00)

Residence Inequality

The present study shows that out of the 35 countries, in twenty six of them, the average coverage of the ORT and continued feeding is higher among urban residents as compared to the rural residents. However, in Algeria, Burundi, Eswatini, Gabon, Sao Tome, Benin, Gambia, Senegal and Togo, at least the point estimate is higher among the rural than among urban residents (Table 7).

Table 7

utilization of ORT and continued feeding for each subgroup of the residence stratifier across the 35 low income, lower middle income and upper middle income SSA countries

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
Ghana	2014	Rural	41.42 (35.38, 47.72)	59.86536	41.5043
		Urban	41.62 (33.89, 49.78)	40.13464	41.5043
Algeria	2012	Rural	43.40 (36.70, 50.36)	41.2527	41.73203
		Urban	40.55 (35.82, 45.47)	58.7473	41.73203
Angola	2015	Rural	31.10 (27.25, 35.23)	37.04501	39.68827
		Urban	44.73 (40.38, 49.16)	62.95499	39.68827
Benin	2014	Rural	32.63 (28.26, 37.33)	56.76038	32.54792
		Urban	32.43 (27.32, 37.99)	43.23962	32.54792
Burundi	2016	Rural	35.17 (32.91, 37.50)	92.63887	34.95439
		Urban	32.18 (26.55, 38.39)	7.361135	34.95439
Cameroon	2014	Rural	35.23 (30.89, 39.82)	67.66472	39.29078
		Urban	47.78 (41.70, 53.92)	32.33528	39.29078
Chad	2014	Rural	27.82 (25.07, 30.75)	79.71847	28.88636
		Urban	33.05 (29.40, 36.91)	20.28153	28.88636
Comoros	2012	Rural	50.08 (42.35, 57.81)	73.52621	53.94333
		Urban	64.66 (51.87, 75.64)	26.47379	53.94333

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
Congo	2014	Rural	36.83 (33.33, 40.48)	39.94055	42.24259
		Urban	45.83 (40.26, 51.51)	60.05945	42.24259
Democratic Republic of the Congo	2013	Rural	37.40 (33.51, 41.45)	65.95068	39.94501
		Urban	44.87 (40.15, 49.68)	34.04932	39.94501
Eswatini	2014	Rural	47.57 (41.72, 53.48)	77.92063	46.37177
		Urban	42.13 (26.36, 59.68)	22.07937	46.37177
Ethiopia	2016	Rural	27.85 (23.86, 32.23)	89.729	28.65617
		Urban	35.64 (20.82, 53.85)	10.271	28.65617
Gabon	2012	Rural	56.12 (50.33, 61.75)	16.91667	51.90965
		Urban	51.05 (43.99, 58.06)	83.08333	51.90965
Gambia	2013	Rural	51.31 (45.43, 57.16)	49.553	50.84321
		Urban	50.37 (43.16, 57.57)	50.447	50.84321
Guinea	2016	Rural	39.44 (34.98, 44.08)	68.96698	44.17994
		Urban	54.70 (47.69, 61.53)	31.03302	44.17994
Guinea-Bissau	2014	Rural	50.03 (45.21, 54.86)	56.07638	54.61463
		Urban	60.45 (51.59, 68.68)	43.92362	54.61463
Kenya	2014	Rural	40.84 (37.93, 43.81)	66.33608	45.1324
		Urban	53.58 (49.28, 57.83)	33.66392	45.1324

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
Lesotho	2014	Rural	57.90 (51.35, 64.19)	75.28493	61.38574
		Urban	71.98 (56.75, 83.41)	24.71507	61.38574
Liberia	2013	Rural	41.92 (38.00, 45.94)	54.40137	46.43533
		Urban	51.81 (45.13, 58.44)	45.59863	46.43533
Malawi	2015	Rural	56.01 (53.70, 58.29)	84.28087	56.68572
		Urban	60.30 (51.92, 68.11)	15.71913	56.68572
Mali	2015	Rural	27.17 (24.36, 30.17)	82.89218	28.70292
		Urban	36.11 (30.74, 41.86)	17.10782	28.70292
Mauritania	2015	Rural	33.15 (29.86, 36.62)	65.70554	34.50784
		Urban	37.09 (31.92, 42.57)	34.29446	34.50784
Mozambique	2015	Rural	40.86 (34.04, 48.05)	76.48823	43.02846
		Urban	50.07 (42.60, 57.53)	23.51177	43.02846
Namibia	2013	Rural	51.96 (46.87, 57.02)	58.81007	51.98061
		Urban	52.00 (45.99, 57.95)	41.18993	51.98061
Niger	2012	Rural	42.03 (38.10, 46.07)	84.62476	42.96736
		Urban	48.10 (41.16, 55.11)	15.37524	42.96736
Nigeria	2013	Rural	24.19 (21.66, 26.92)	67.69464	29.23584
		Urban	39.79 (35.40, 44.36)	32.30536	29.23584

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
Rwanda	2014	Rural	19.00 (15.95, 22.47)	86.32555	19.46708
		Urban	22.38 (15.42, 31.32)	13.67445	19.46708
Sao Tome and Principe	2014	Rural	62.59 (50.66, 73.17)	30.55162	61.02909
		Urban	60.33 (52.80, 67.41)	69.44838	61.02909
Senegal	2014	Rural	50.00 (45.49, 54.52)	58.57504	48.59681
		Urban	46.60 (39.13, 54.22)	41.42496	48.59681
Sierra Leone	2013	Rural	56.97 (52.62, 61.22)	73.22478	57.57013
		Urban	59.18 (53.28, 64.83)	26.77522	57.57013
Togo	2013	Rural	34.26 (30.69, 38.02)	74.40346	33.42139
		Urban	30.96 (23.83, 39.13)	25.59654	33.42139
Uganda	2016	Rural	36.06 (33.69, 38.49)	81.43196	37.38395
		Urban	43.17 (37.87, 48.64)	18.56804	37.38395
United Republic of Tanzania	2015	Rural	43.48 (38.86, 48.22)	68.14753	45.45398
		Urban	49.65 (41.79, 57.53)	31.85247	45.45398
Zambia	2013	Rural	54.29 (50.72, 57.83)	61.96463	56.17617
		Urban	59.23 (53.95, 64.31)	38.03537	56.17617
Zimbabwe	2014	Rural	55.62 (52.56, 58.65)	76.30031	56.36424
		Urban	58.72 (53.35, 63.90)	23.69969	56.36424

Table 8 shows sizable absolute and relative place of residence inequality in ORT and continued feeding in Angola, Cameron, Congo, Democratic Republic of Congo, Guinea, Kenya, Liberia, Mali, Nigeria and Uganda by the four measures. However, in Ethiopia, Lesotho, Mozambique, Niger, Malawi, Mauritania, Rwanda, Tanzania and Zambia the inequality was observed only by the complex measures. On the other hand, in 12 of the SSA countries: Ghana, Benin, Burundi, Algeria, Eswatini, Gabon, Gambia, Namibia, Sao Tome, Sierra Leone, Togo and Senegal, we did not record any urban-rural inequality.

Table 8

residence-related inequality in ORT and continued feeding in the 35 low income, lower middle income and upper middle income SSA countries

Country	Year	Type and value of inequality measure with 95% CI			
		D	R	PAR	PAF
Ghana	2014	0.20 (-9.87, 10.28)	1.00 (0.76, 1.24)	0.12 (-3.01, 3.25)	0.29 (-7.25, 7.84)
Algeria	2012	-2.85 (-11.24, 5.53)	0.93 (0.74, 1.11)	0 (-3.11, 3.11)	0 (-7.46, 7.46)
Angola	2015	13.62 (7.69, 19.55)	1.43 (1.20, 1.67)	5.04 (2.29, 7.80)	12.72 (5.77, 19.66)
Benin	2014	-0.20 (-7.21, 6.79)	0.99 (0.77, 1.20)	0 (-2.28, 2.28)	0 (-7.00, 7.00)
Burundi	2016	-2.98 (-9.34, 3.36)	0.91 (0.73, 1.09)	0 (-0.48, 0.48)	0 (-1.38, 1.38)
Cameroon	2014	12.55 (4.98, 20.12)	1.35 (1.11, 1.60)	8.49 (6.69, 10.29)	21.61 (17.02, 26.20)
Chad	2014	5.22 (0.52, 9.92)	1.18 (1.00, 1.36)	4.16 (3.40, 4.92)	14.42 (11.79, 17.05)
Comoros	2012	14.57 (0.29, 28.86)	1.29 (0.97, 1.60)	10.71 (8.12, 13.31)	19.87 (15.06, 24.68)
Congo	2014	8.99 (2.32, 15.66)	1.24 (1.04, 1.43)	3.59 (0.63, 6.55)	8.50 (1.50, 15.50)
Democratic Republic of the Congo	2013	7.47 (1.27, 13.66)	1.19 (1.01, 1.37)	4.92 (3.61, 6.23)	12.33 (9.06, 15.60)
Eswatini	2014	-5.43 (-23.61, 12.73)	0.88 (0.50, 1.26)	0 (-2.47, 2.47)	0 (-5.33, 5.33)
Ethiopia	2016	7.79 (-9.75, 25.33)	1.27 (0.63, 1.92)	6.99 (6.08, 7.90)	24.39 (21.22, 27.57)
Gabon	2012	-5.07 (-14.14, 4.00)	0.90 (0.75, 1.06)	0 (-7.82, 7.82)	0 (-15.07, 15.07)
Gambia	2013	-0.93 (-10.24, 8.36)	0.98 (0.80, 1.16)	0 (-2.72, 2.72)	0 (-5.35, 5.35)
Guinea	2016	15.26 (6.97, 23.55)	1.38 (1.14, 1.62)	10.52 (8.07, 12.97)	23.82 (18.28, 29.37)
Guinea-Bissau	2014	10.41 (0.56, 20.26)	1.20 (1.00, 1.41)	5.84 (2.94, 8.73)	10.69 (5.39, 16.00)

Country	Year	Type and value of inequality measure with 95% CI			
		D	R	PAR	PAF
Kenya	2014	12.74 (7.55, 17.94)	1.31 (1.17, 1.45)	8.45 (7.13, 9.78)	18.73 (15.80, 21.67)
Lesotho	2014	14.07 (-0.82, 28.98)	1.24 (0.97, 1.51)	10.59 (7.69, 13.49)	17.26 (12.53, 21.99)
Liberia	2013	9.89 (2.14, 17.65)	1.23 (1.03, 1.43)	5.38 (2.91, 7.85)	11.59 (6.28, 16.91)
Malawi	2015	4.29 (-4.17, 12.76)	1.07 (0.92, 1.22)	3.61 (2.92, 4.31)	6.38 (5.15, 7.60)
Mali	2015	8.94 (2.66, 15.22)	1.32 (1.07, 1.57)	7.41 (6.53, 8.29)	25.83 (22.77, 28.88)
Mauritania	2015	3.93 9-2.36, 10.23)	1.11 (0.92, 1.31)	2.58 (1.09, 4.07)	7.48 (3.17, 11.80)
Mozambique	2015	9.20 (-1.03, 19.45)	1.22 (0.94, 1.50)	7.04 (4.77, 9.30)	16.36 (11.10, 21.62)
Namibia	2013	0.03 (-7.81, 7.88)	1.00 (0.84, 1.15)	0.01 (-2.87, 2.91)	0.03 (-5.53, 5.61)
Niger	2012	6.06 (-1.98, 14.12)	1.14 (0.94, 1.34)	5.13 (4.12, 6.14)	11.95 (9.60, 14.29)
Nigeria	2013	15.60 (10.40, 20.79)	1.64 (1.38, 1.90)	10.56 (9.37, 11.75)	36.12 (32.06, 40.19)
Rwanda	2014	3.38 (-5.18, 11.94)	1.17 (0.71, 1.64)	2.91 (1.85, 3.97)	14.98 (9.54, 20.43)
Sao Tome and Principe	2014	-2.25 (-15.68, 11.17)	0.96 (0.75, 1.17)	0 (-7.59, 7.59)	0 (-12.43, 12.43)
Senegal	2014	-3.40 (-12.19, 5.38)	0.93 (0.75, 1.10)	0 (-2.44, 2.44)	0 (-5.04, 5.04)
Sierra Leone	2013	2.20 (-4.98, 9.40)	1.03 (0.91, 1.16)	1.61 (-0.07, 3.30)	2.80 (-0.12, 5.73)
Togo	2013	-3.30 (-11.78, 5.18)	0.90 (0.66, 1.14)	0 (-1.74, 1.74)	0 (-5.21, 5.21)
Uganda	2016	7.11 (1.21, 13.01)	1.19 (1.02, 1.36)	5.79 (4.92, 6.66)	15.49 (13.16, 17.83)
United Republic of Tanzania	2015	6.16 (-3.02, 15.35)	1.14(0.92, 1.36)	4.20 (2.19, 6.20)	9.24 (4.83, 13.65)
Zambia	2013	4.93 (-1.35, 11.22)	1.09 (0.97, 1.21)	3.05 (1.37, 4.74)	5.44 (2.43, 8.45)

Country	Year	Type and value of inequality measure with 95% CI			
		D	R	PAR	PAF
Zimbabwe	2014	3.09 (-2.99, 9.19)	1.05 (0.94, 1.16)	2.36 (0.98, 3.74)	4.19 (1.74, 6.64)

Sub-national Regional Inequality

Table 9 shows significant regional disparities in the utilization of ORT and continued feeding in the SSA countries. We recorded within country subnational regional disparities in the service in the studied countries, albeit the extent of disparities varied by country. With the exception of Comoros, Gabon, Rwanda, Sao Tome and Sierra Leone where no regional inequality was observed, other countries saw regional inequality with at least one measure. In Burundi, Cameroon, Democratic Republic of Congo, Eswatini, Ethiopia, Guinea, Guinea Bissau, Kenya, Mali, Mauritania, Niger, Nigeria, Senegal, Togo, Uganda, Zambia and Zimbabwe, both absolute and relative regional inequality were demonstrated by all the four measures. The magnitude of regional inequality varied based on the measures of inequality. For instance, based on the PAF measure, the average regional disparity was highest in Ethiopia (105.2%) followed by Ghana (80.1%) and Mali (67.2%). By the Difference measure, the highest were in Guinea Bissau (59.6%) followed by Ghana (53%) and Angola (51.3%). See Table 10.

Table 9

utilization of ORT and continued feeding for each subgroup of the sub-national region stratifier across the 35 low income, lower middle income and upper middle income SSA countries

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
Ghana	2014	01 western	74.75 (50.62, 89.53)	5.905278	41.5043
		02 central	56.50 (39.56, 72.04)	7.995808	41.5043
		03 greater accra	33.27 (16.76, 55.26)	9.86924	41.5043
		04 volta	21.67 (8.16, 46.27)	4.500855	41.5043
		05 eastern	50.49 (37.18, 63.73)	12.47621	41.5043
		06 ashanti	36.71 (26.52, 48.23)	22.079	41.5043
		07 brong ahafo	25.93 (19.35, 33.81)	12.84888	41.5043
		08 northern	38.47 (25.91, 52.78)	16.79098	41.5043
		09 upper east	58.67 (45.15, 71.00)	4.115501	41.5043
		10 upper west	49.70 (38.70, 60.73)	3.418246	41.5043
Algeria	2012	01 EPT 1 : Nord-Centre	44.44 (36.51, 52.66)	40.08263	41.73203
		02 EPT 2 : Nord-Est	51.43 (40.67, 62.05)	8.174198	41.73203
		03 EPT 3 : Nord-Ouest	39.36 (30.79, 48.64)	15.81673	41.73203

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
		04 EPT 4 : Hauts Plateaux-Centre.	32.54 (21.97, 45.26)	3.454743	41.73203
		05 EPT 5 : Hauts Plateaux-Est	40.02 (31.47, 49.23)	12.70428	41.73203
		06 EPT 6 : Hauts Plateaux-Ouest	42.68 (35.22, 50.49)	4.701748	41.73203
		07 EPT 7 : Sud	34.98 (28.38, 42.21)	15.06566	41.73203
Angola	2015	01 cabinda	37.99 (23.26, 55.32)	1.429851	39.68827
		02 zaire	55.02 (47.22, 62.59)	1.509453	39.68827
		03 uige	47.68 (39.45, 56.04)	4.982247	39.68827
		04 luanda	47.58 (40.56, 54.70)	29.63476	39.68827
		05 cuanza norte	53.96 (43.91, 63.71)	1.283703	39.68827
		06 cuanza sul	26.43 (19.21, 35.19)	11.06411	39.68827
		07 malanje	47.78 (37.23, 58.52)	5.528303	39.68827
		08 lunda norte	40.53 (31.96, 49.73)	3.243005	39.68827
		09 benguela	23.41 (16.37, 32.30)	12.06692	39.68827

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
		10 huambo	40.31 (30.10, 51.43)	7.782538	39.68827
		11 bie	29.84 (19.63, 42.56)	4.009771	39.68827
		12 moxico	34.12 (16.33, 57.90)	1.202983	39.68827
		13 cuando cubango	3.68 (1.10, 11.59)	1.212588	39.68827
		14 namibe	39.71(31.3,0 48.78)	1.640764	39.68827
		15 huila	46.42 (35.0,9 58.14)	9.021541	39.68827
		16 cunene	43.62 (31.80, 56.20)	2.580286	39.68827
		17 lunda sul	35.11 (24.77, 47.07)	1.384203	39.68827
		18 bengo	46.53 (25.12 69.29)	0.422983	39.68827
Benin	2014	01 Alibori	36.31 (22.95, 52.17)	9.892942	32.54792
		02 Atacora	26.06 (15.80, 39.84)	4.657463	32.54792
		03 Atlantique	27.84 (17.93, 40.52)	14.64508	32.54792
		04 Borgou	37.82 (28.70, 47.88)	14.08653	32.54792
		05 Collines	46.40 (35.60, 57.55)	5.088295	32.54792

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
		06 Couffo	19.16 (10.48, 32.42)	7.405164	32.54792
		07 Donga	42.41 (30.91, 54.80)	6.001471	32.54792
		08 Littoral	36.65 (29.09, 44.92)	4.549076	32.54792
		09 Mono	33.14 (23.54, 44.37)	6.966779	32.54792
		10 OuAemAe	33.71 (24.39, 44.50)	11.5029	32.54792
		11 Plateau	29.32 (20.17, 40.51)	7.680445	32.54792
		12 Zou	25.29 (16.70, 36.37)	7.523851	32.54792
Burundi	2016	01 bubanza	36.26 (29.81, 43.24)	6.395139	34.95439
		02 bujumbura rural	38.31 (28.35, 49.35)	4.80518	34.95439
		03 bururi	26.72 (17.82, 38.01)	2.00979	34.95439
		04 cankuzo	48.05 (35.73, 60.61)	1.784976	34.95439
		05 cibitoke	29.15 (22.40, 36.96)	6.250945	34.95439
		06 gitega	35.03 (27.23, 43.71)	8.799289	34.95439

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
		07 karusi	39.44 (29.99, 49.75)	5.363564	34.95439
		08 kayanza	35.06 (27.80, 43.09)	6.570189	34.95439
		09 kirundo	32.59 (27.13, 38.56)	9.196535	34.95439
		10 makamba	37.76 (26.52, 50.49)	5.076695	34.95439
		11 muramvya	39.28 (29.27, 50.28)	3.300714	34.95439
		12 muyinga	42.78 (35.85, 50.01)	10.94294	34.95439
		13 mwaro	15.74 (8.98, 26.12)	2.599108	34.95439
		14 ngozi	26.82 (20.20, 34.66)	8.990888	34.95439
		15 rutana	31.45 (23.67, 40.44)	3.965691	34.95439
		16 ruyigi	37.23 (26.55, 49.32)	3.92302	34.95439
		17 bujumbura mairie	30.60 (21.70, 41.22)	3.814018	34.95439
		18 rumonge	40.01 (30.38, 50.49)	6.211325	34.95439
Cameroon	2014	01 Adamaoua	47.61 (38.28, 57.11)	6.342471	39.29078
		02 Centre (sans Yaounde)	40.13 (29.65, 51.60)	6.22058	39.29078

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
		03 Douala	40.95 (27.08, 56.43)	4.714651	39.29078
		04 Est	47.68 (39.35, 56.15)	6.43828	39.29078
		05 Extreme-Nord	32.98 (26.52, 40.16)	42.34943	39.29078
		06 Littoral (sans Douala)	62.80 (42.56, 79.36)	1.778312	39.29078
		07 Nord	33.24 (26.15, 41.17)	16.30826	39.29078
		08 Nord-Ouest	45.14 (30.64, 60.52)	3.23699	39.29078
		09 Ouest	59.06 (44.51, 72.17)	3.940744	39.29078
		10 Sud	50.26 (36.20, 64.28)	1.940016	39.29078
		11 Sud-Ouest	41.91 (21.98, 64.88)	3.099422	39.29078
		12 Yaounde	60.62 (46.02, 73.54)	3.630837	39.29078
Chad	2014	01 batha	11.86 (5.69, 23.08)	3.154713	28.88636
		02 borkou/tibesti	20.48 (9.57, 38.52)	0.264882	28.88636
		03 chari baguirmi	19.51 (14.04, 26.47)	4.599069	28.88636
		04 guera	34.02 (25.10, 44.24)	3.506524	28.88636

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
		05 hadjer-lamis	32.99 (23.62, 43.93)	7.300334	28.88636
		06 kanem	26.14 (14.43, 42.62)	2.882109	28.88636
		07 lac	28.64 (18.31, 41.81)	3.708807	28.88636
		08 logone occidental	20.79 (15.15, 27.84)	6.460039	28.88636
		09 logone oriental	27.00 (20.53, 34.62)	14.1775	28.88636
		10 mandoul	30.63 (21.50, 41.59)	8.386816	28.88636
		11 mayo kebbi est	36.34 (24.43, 50.20)	7.960461	28.88636
		12 mayo kebbi ouest	26.10 (19.42, 34.11)	5.900511	28.88636
		13 moyen chari	36.50 (27.34, 46.75)	4.792608	28.88636
		14 ouaddai	22.52 (14.47, 33.29)	4.50461	28.88636
		15 salamat	18.07 (13.15, 24.30)	1.720352	28.88636
		16 tandjile	35.50 (26.84, 45.23)	8.099291	28.88636
		17 wadi fira	37.36 (26.51, 49.66)	0.829301	28.88636

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
		18 ndjamena	34.07 (28.13, 40.54)	8.687822	28.88636
		19 barh el gazal	28.78 (16.94, 44.46)	0.880659	28.88636
		20 ennedi	35.99 (23.34, 50.94)	0.175428	28.88636
		21 sila	21.41 (14.92, 29.74)	2.008161	28.88636
Comoros	2012	01 Moheli	48.64 (34.97, 62.51)	5.862743	53.94333
		02 Ndzouani	57.13 (47.10, 66.60)	61.83141	53.94333
		03 Ngazidja	48.80 (40.53, 57.13)	32.30585	53.94333
Congo	2014	01 kouilou	48.81 (39.70, 58.00)	3.065135	42.24259
		02 niari	46.10 (38.12, 54.29)	7.223779	42.24259
		03 lekoumou	32.54 (23.53, 43.05)	2.121613	42.24259
		04 bouenza	41.68 (33.83, 49.97)	5.894389	42.24259
		05 pool	36.11 (26.93, 46.43)	7.740024	42.24259
		06 plateaux	36.89 (20.82, 56.50)	3.841696	42.24259

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
		07 cuvette	24.38 (16.54, 34.39)	4.024014	42.24259
		08 CUVETTE OUEST	27.97 (19.37, 38.57)	1.489775	42.24259
		09 sangha	41.41 (32.92, 50.43)	2.559722	42.24259
		10 likouala	34.16 (27.32, 41.73)	6.653182	42.24259
		11 brazzaville	45.85 (38.59, 53.29)	41.69874	42.24259
		12 POINTE-NOIRE	45.32 (35.89, 55.11)	13.68792	42.24259
Democratic Republic of the Congo	2013	01 Kinshasa	45.80 (38.12, 53.67)	8.106149	39.94501
		02 Bandundu	44.03 (34.79, 53.71)	13.23387	39.94501
		03 Bas-Congo	58.55 (46.53, 69.63)	3.300011	39.94501
		04 Equateur	40.48 (33.54, 47.84)	13.1954	39.94501
		05 Kasai-Occidental	35.82 (30.34, 41.70)	10.68861	39.94501
		06 Kasai-Oriental	38.11 (29.77, 47.23)	12.73778	39.94501
		07 Katanga	38.47 (29.82, 47.91)	12.19382	39.94501

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
		08 Maniema	46.08 (34.47, 58.13)	1.784687	39.94501
		09 Nord-Kivu	42.62 (28.09, 58.54)	6.77575	39.94501
		10 Orientale	32.56 (24.01, 42.45)	7.174815	39.94501
		11 Sud-Kivu	34.28 (24.66, 45.39)	10.80911	39.94501
Eswatini	2014	01 Hhohho	62.00 (50.22, 72.51)	17.29594	46.37177
		02 Manzini	36.63 (25.87, 48.90)	36.79971	46.37177
		03 Shiselweni	61.41 (52.56, 69.56)	24.56155	46.37177
		04 Lubombo	33.19 (23.55, 44.48)	21.3428	46.37177
Ethiopia	2016	01 tigray	25.50 (16.12, 37.87)	7.266876	28.65617
		02 afar	20.53 (14.16, 28.80)	0.976671	28.65617
		03 amhara	26.84 (18.18, 37.73)	21.99933	28.65617
		04 oromia	26.77 (20.33, 34.36)	39.69011	28.65617
		05 somali	26.10 (13.32, 44.79)	2.342253	28.65617

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
		06 benishangul	58.82 (44.38, 71.88)	0.833683	28.65617
		07 snnpr	32.20 (24.99, 40.37)	24.51446	28.65617
		08 gambela	25.94 (17.88, 36.03)	0.299314	28.65617
		09 harari	37.15 (24.59, 51.72)	0.212697	28.65617
		10 addis adaba	55.08 (38.75, 70.39)	1.429125	28.65617
		11 dire dawa	29.75 (20.35, 41.24)	0.435477	28.65617
Gabon	2012	01 libreville-port-gentil	49.42 (38.51, 60.38)	48.26995	51.90965
		02 estuaire	61.96 (47.73, 74.40)	11.51206	51.90965
		03 haut-ogooe	56.47 (43.21, 68.87)	12.21345	51.90965
		04 moyen-ogooe	49.68 (36.49, 62.91)	3.405032	51.90965
		05 ngounie	58.45 (46.15, 69.78)	5.169357	51.90965
		06 nyanga	63.58 (52.26, 73.57)	3.212648	51.90965
		07 ogooue maritime	37.71 (17.35, 63.57)	0.939501	51.90965

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
		08 ogooue-ivindo	45.62 (35.07, 56.57)	6.027516	51.90965
		09 ogooue-lolo	41.39 (30.94, 52.68)	4.087521	51.90965
		10 woleu-ntem	47.83 (36.45, 59.44)	5.162971	51.90965
Gambia	2013	01 Banjul	41.73 (33.16, 50.83)	2.386239	50.84321
		02 Kanifing	51.78 (41.75, 61.67)	22.24152	50.84321
		03 Brikama	49.72 (40.42, 59.04)	37.02072	50.84321
		04 Mansakonko	57.26 (44.25, 69.34)	4.197206	50.84321
		05 Kerewan	53.97 (45.73, 62.00)	8.70192	50.84321
		06 Kuntaur	52.23 (38.27, 65.86)	7.923484	50.84321
		07 Janjanbureh	40.22 (30.22, 51.10)	7.051451	50.84321
		08 Basse	55.77 (44.25, 66.71)	10.47746	50.84321
Guinea	2016	01 BokAe	52.24 (41.59, 62.70)	8.392693	44.17994
		02 Conakry	57.32 (47.85, 66.28)	19.72138	44.17994

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
		03 Faranah	24.23 (15.14, 36.42)	5.768013	44.17994
		04 Kankan	50.02 (42.61, 57.42)	23.10604	44.17994
		05 Kindia	50.01 (39.17, 60.84)	9.982872	44.17994
		06 LabAe	13.36 (7.96, 21.55)	15.50914	44.17994
		07 Mamou	43.12 (34.19, 52.52)	11.88409	44.17994
		08 N'ZAerAekorAe	59.32 (43.47, 73.44)	5.635769	44.17994
Guinea-Bissau	2014	01 Tombali	75.13 (62.52, 84.54)	6.575518	54.61463
		02 Quinara	46.11 (34.46, 58.20)	4.109466	54.61463
		03 Oio	15.51 (8.97, 25.47)	12.77767	54.61463
		04 Biombo	60.92 (51.46, 69.63)	10.2329	54.61463
		05 Bolama/Bijagos	62.55 (47.75, 75.33)	1.725259	54.61463
		06 Bafata	58.31 (48.96, 67.09)	14.63102	54.61463
		07 Gabu	49.56 (38.77, 60.38)	9.249641	54.61463
		08 Cacheu	47.91 (35.96, 60.10)	7.243852	54.61463

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
		09 sab	65.45 (55.33, 74.34)	33.45468	54.61463
Kenya	2014	01 coast	42.11 (36.52, 47.92)	12.00712	45.1324
		02 north eastern	31.42 (22.11, 42.51)	1.706665	45.1324
		03 eastern	43.94 (37.35, 50.75)	11.25218	45.1324
		04 central	40.49 (32.44, 49.08)	6.337812	45.1324
		05 rift valley	48.16 (43.96, 52.38)	25.24882	45.1324
		06 western	33.94 (27.33, 41.24)	15.33321	45.1324
		07 nyanza	40.04 (34.87, 45.44)	17.57834	45.1324
		08 nairobi	72.35 (62.49, 80.43)	10.53585	45.1324
Lesotho	2014	01 botha-bothe	NA	4.965781	61.38574
		02 leribe	62.46 (49.25, 74.04)	20.28227	61.38574
		03 berea	59.15(44.17, 72.60)	11.10362	61.38574
		04 maseru	70.18 (53.94, 82.54)	28.21801	61.38574
		05 mafeteng	56.60 (38.61, 73.00)	8.135024	61.38574

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
		06 mohales hoek	55.06 (29.65, 78.07)	7.991718	61.38574
		07 quthing	NA	3.401176	61.38574
		08 qachas-nek	NA	2.202532	61.38574
		09 mokhotlong	35.97 (23.32, 50.92)	8.757536	61.38574
		10 thaba tseka	NA	4.942333	61.38574
Liberia	2013	01 North Western	52.96 (45.59, 60.21)	8.503247	46.43533
		02 South Central	50.73 (43.05, 58.38)	39.72573	46.43533
		03 South Eastern A	38.94 (34.02, 44.09)	9.555145	46.43533
		04 South Eastern B	46.31 (36.94, 55.94)	9.69338	46.43533
		05 North Central	41.71 (36.14, 47.49)	32.5225	46.43533
Malawi	2015	01 northern region	43.39 (35.74, 51.36)	9.453849	56.68572
		02 central region	57.97 (54.27, 61.59)	46.96595	56.68572
		03 southern region	58.17 (55.12, 61.16)	43.5802	56.68572
Mali	2015	01 Kayes	31.25 (26.67, 36.22)	20.23304	28.70292
		02 Koulikoro	32.91 (25.89, 40.78)	14.34522	28.70292

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
		03 Sikasso	25.14 (18.52, 33.17)	13.00799	28.70292
		04 Segou	19.15 (14.56, 24.77)	26.42864	28.70292
		05 Mopti	31.94 (24.26, 40.74)	9.741893	28.70292
		06 Tombouctou	25.28 (18.03, 34.22)	5.601547	28.70292
		07 Gao	33.17 (24.37, 43.33)	2.10544	28.70292
		08 Bamako	48.00 (40.95, 55.14)	8.536235	28.70292
Mauritania	2015	01 Hodh charghy	23.50 (15.68, 33.68)	7.60384	34.50784
		02 Hodh Gharby	32.76 (25.10, 41.45)	10.46105	34.50784
		03 Assaba	34.44 (25.48, 44.65)	10.54789	34.50784
		04 Gorgol	31.37 (25.90, 37.40)	20.82206	34.50784
		05 Brakna	27.65 (18.38, 39.34)	8.951273	34.50784
		06 Trarza	52.77 (43.43, 61.93)	10.18605	34.50784
		07 Adrar	34.42 (24.45, 45.97)	0.381213	34.50784

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
		08 Dakhlett Nouadibou	47.97 (27.99, 68.62)	0.766553	34.50784
		09 Tagant	33.17 (26.89, 40.10)	0.701618	34.50784
		10 Guidimagha	34.68 (28.82, 41.05)	15.04826	34.50784
		11 Tirs-ezemour	41.63 (30.20, 54.04)	0.41333	34.50784
		12 Inchiri	29.13 (18.05, 43.42)	0.189108	34.50784
		13 Nouakchott	36.60 (28.01, 46.13)	13.92776	34.50784
Mozambique	2015	01 niassa	41.33 (31.04, 52.44)	10.49117	43.02846
		02 cabo delgado	56.41 (35.05, 75.63)	8.079485	43.02846
		03 nampula	32.29 (20.31, 47.15)	22.62527	43.02846
		04 zambezia	30.81 (18.70, 46.29)	21.03875	43.02846
		05 tete	67.58 (49.94, 81.32)	5.256539	43.02846
		06 manica	63.54 (42.86, 80.19)	6.577499	43.02846
		07 sofala	44.23 (26.86, 63.13)	7.571609	43.02846

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
		08 inhambane	47.37 (27.41, 68.20)	3.621083	43.02846
		09 gaza	52.33 (39.32, 65.03)	8.408001	43.02846
		10 maputo provincia	NA	3.171028	43.02846
		11 maputo cidade	56.91 (33.81, 77.35)	3.159564	43.02846
Namibia	2013	01 caprivi	54.57 (45.25, 63.58)	11.26575	51.98061
		02 erongo	42.90 (28.59, 58.51)	4.048872	51.98061
		03 hardap	NA	1.547992	51.98061
		04 karas	50.76 (34.96, 66.41)	1.910572	51.98061
		05 kavango	61.16 (52.07, 69.53)	21.50312	51.98061
		06 khomas	49.49 (39.39, 59.64)	17.55895	51.98061
		07 kunene	45.92 (33.37, 59.01)	2.633852	51.98061
		08 ohangwena	38.81 (26.39, 52.88)	10.49002	51.98061
		09 omaheke	55.07 (38.61, 70.48)	2.61765	51.98061
		10 omusati	50.93 (38.51, 63.24)	10.56234	51.98061

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
		11 oshana	44.11 (23.75, 66.66)	3.830878	51.98061
		12 oshikoto	54.48 (43.30, 65.22)	6.493157	51.98061
		13 otjozondjupa	53.89 (38.38, 68.68)	5.536846	51.98061
Niger	2012	01 Agadez	42.97 (30.16, 56.80)	1.582355	42.96736
		02 Diffa	55.94 (43.64, 67.54)	1.711278	42.96736
		03 Dosso	49.55 (40.60, 58.53)	10.28877	42.96736
		04 Maradi	43.12 (35.35, 51.24)	17.09726	42.96736
		05 Tahoua	33.96 (26.55, 42.26)	20.99217	42.96736
		06 Tillaberi	46.87 (38.55, 55.37)	13.38614	42.96736
		07 Zinder	43.28 (35.88, 51.00)	25.4627	42.96736
		08 Niamey	46.75 (37.22, 56.52)	9.479325	42.96736
Nigeria	2013	01 North Central	37.40 (28.69, 47.00)	9.943455	29.23584
		02 North East	23.13 (19.44, 27.29)	35.77472	29.23584

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
		03 North West	26.84 (22.90, 31.18)	32.39882	29.23584
		04 South East	34.99 (27.30, 43.56)	8.963924	29.23584
		05 South South	36.72 (29.04, 45.13)	4.1927	29.23584
		06 South West	44.30 (37.12, 51.72)	8.72638	29.23584
Rwanda	2014	01 kigali city	17.46 (10.86, 26.87)	8.018152	19.46708
		02 south	17.14 (12.26, 23.44)	23.16374	19.46708
		03 west	18.27 (13.26, 24.62)	29.28994	19.46708
		04 north	21.80 (14.17, 32.01)	12.61922	19.46708
		05 east	22.26 (16.43, 29.43)	26.90895	19.46708
Sao Tome and Principe	2014	01 Regiaao Centro Este	60.01 (50.95, 68.44)	62.0037	61.02909
		02 Regiaao Norte Oeste	62.23 (48.73, 74.07)	19.53131	61.02909
		03 Regiaao Sul Este	63.96 (54.51, 72.44)	14.41731	61.02909
		04 Regiaao Autonoma de Principe	60.23 (43.43, 74.92)	4.047688	61.02909

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
Senegal	2014	01 dakar	52.18 (35.45, 68.44)	14.58356	48.59681
		02 ziguinchor	42.41 (23.86, 63.38)	3.355799	48.59681
		03 diourbel	64.72 (57.08, 71.67)	10.51733	48.59681
		04 saint-louis	35.19 (29.51, 41.33)	13.48023	48.59681
		05 tambacounda	62.79 (41.90, 79.79)	4.593456	48.59681
		06 kaolack	49.93 (34.76, 65.11)	8.280867	48.59681
		07 thies	46.47 (36.69, 56.53)	12.85262	48.59681
		08 louga	37.11 (25.51, 50.42)	6.974087	48.59681
		09 fatick	46.95 (35.99, 58.21)	5.475001	48.59681
		10 kolda	54.50 (38.69, 69.45)	4.882447	48.59681
		11 matam	38.54 (28.67, 49.46)	5.251358	48.59681
		12 kaffrine	51.00 (33.95, 67.82)	4.587029	48.59681
		13 kedougou	47.42 (34.19, 61.02)	1.359931	48.59681

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
		14 sedhiou	57.52 (46.38, 67.93)	3.806289	48.59681
Sierra Leone	2013	01 Eastern	55.74 (47.71, 63.49)	19.94911	57.57013
		02 Northern	56.80 (51.80, 61.67)	48.02768	57.57013
		03 Southern	58.64 (49.00, 67.65)	17.61435	57.57013
		04 Western	61.33 (52.51, 69.46)	14.40887	57.57013
Togo	2013	01 grande agglomeration de lome	31.04 (21.72, 42.20)	15.55007	33.42139
		02 maritime (sans agglomeration de lome)	13.43 (7.57, 22.70)	14.08151	33.42139
		03 plateaux	35.04 (29.39, 41.14)	27.50038	33.42139
		04 centrale	34.56 (27.22, 42.71)	9.950897	33.42139
		05 kara	41.28 (33.63, 49.38)	14.19173	33.42139
		06 savanes	41.47 (33.97, 49.39)	18.72541	33.42139
Uganda	2016	01 kampala	35.85 (26.00, 47.05)	3.028061	37.38395
		02 central1	47.24 (37.91, 56.77)	12.68701	37.38395
		03 central2	38.78 (30.34, 47.96)	9.053208	37.38395

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
		04 busoga	33.10 (29.40, 37.02)	13.78741	37.38395
		05 bukedi	45.41 (39.12, 51.85)	6.423967	37.38395
		06 bugishu	29.62 (21.73, 38.95)	3.694834	37.38395
		07 teso	21.03 (17.71, 24.79)	9.388466	37.38395
		08 karamoja	55.66 (43.96, 66.75)	3.335683	37.38395
		09 lango	21.96 (16.02, 29.35)	5.540022	37.38395
		10 acholi	34.58 (27.79, 42.06)	6.139533	37.38395
		11 west nile	41.77 (33.39, 50.64)	5.612174	37.38395
		12 bunyoro	49.75 (41.12, 58.40)	3.009143	37.38395
		13 tooro	45.98 (37.96, 54.22)	8.835254	37.38395
		14 ankole	26.05 (19.36, 34.08)	6.763901	37.38395
		15 kigezi	50.98 (41.42, 60.46)	2.701337	37.38395
United Republic of Tanzania	2015	01 dodoma	NA	3.441052	45.45398
		02 arusha	NA	2.801291	45.45398
		03 kilimanjaro	NA	1.476599	45.45398

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
		04 tanga	NA	2.170607	45.45398
		05 morogoro	NA	3.174978	45.45398
		06 pwani	NA	1.788528	45.45398
		07 dar es salaam	55.82 (38.61, 71.73)	9.608987	45.45398
		08 lindi	44.13 (28.60, 60.89)	2.090084	45.45398
		09 mtwara	60.85 (47.09, 73.07)	3.327305	45.45398
		10 ruvuma	45.86 (26.91, 66.09)	2.459604	45.45398
		11 iringa	NA	1.10595	45.45398
		12 mbeya	54.93 (35.27, 73.15)	6.471929	45.45398
		13 singida	54.45 (33.94, 73.56)	2.749101	45.45398
		14 tabora	40.53 (16.58, 70.02)	3.154757	45.45398
		15 rukwa	20.95 (13.07, 31.84)	4.538253	45.45398
		16 kigoma	37.83 (21.31, 57.76)	8.96169	45.45398
		17 shinyanga	63.10 (35.92, 83.92)	4.439744	45.45398
		18 kagera	47.73 (31.12, 64.85)	4.849433	45.45398

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
		19 mwanza	45.37 (29.06, 62.74)	7.271308	45.45398
		20 mara	44.07 (37.07, 51.31)	6.698983	45.45398
		21 manyara	37.64 (26.03, 50.87)	3.469363	45.45398
		22 njombe	NA	1.091423	45.45398
		23 katavi	29.77 (16.93, 46.84)	1.58284	45.45398
		24 simiyu	41.27 (31.63, 51.62)	5.497825	45.45398
		25 geita	50.62 (37.14, 64.02)	3.424703	45.45398
		26 kaskazini unguja	36.74 (22.75, 53.38)	0.515052	45.45398
		27 kusini unguja	NA	0.169818	45.45398
		28 mjini magharibi	54.74 (31.71, 75.91)	0.750424	45.45398
		29 kaskazini pemba	39.03 (22.58, 58.42)	0.546524	45.45398
		30 kusini pemba	38.95 (20.16, 61.72)	0.371845	45.45398
Zambia	2013	01 central	44.21 (35.39, 53.41)	8.190496	56.17617
		02 copperbelt	57.13 (47.93, 65.86)	16.14709	56.17617

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
		03 eastern	57.16 (48.28, 65.60)	11.88424	56.17617
		04 luapula	58.97 (51.43, 66.12)	8.030398	56.17617
		05 lusaka	64.21 (55.30, 72.23)	14.14885	56.17617
		06 muchinga	57.22 (48.95, 65.11)	6.334013	56.17617
		07 northern	46.76 (37.42, 56.33)	9.41377	56.17617
		08 north western	58.10 (49.01, 66.68)	4.767902	56.17617
		09 southern	57.28 (50.05, 64.20)	15.51533	56.17617
		10 western	54.41 (44.62, 63.87)	5.567904	56.17617
Zimbabwe	2014	01 Bulawayo	59.57 (45.01, 72.62)	4.061207	56.36424
		02 Manicaland	66.48 (58.91, 73.29)	14.25693	56.36424
		03 Mashonaland Central	57.93 (50.11, 65.36)	6.62444	56.36424
		04 Mashonaland East	58.70 (50.86, 66.13)	10.46592	56.36424
		05 Mashonaland West	53.68 (47.71, 59.55)	14.59176	56.36424

Country	Year	Subgroup	Estimate (95% CI)	Population	National Coverage
		06 Matabeleland North	56.43 (46.40, 65.96)	6.341551	56.36424
		07 Matabeleland South	72.91 (61.49, 81.94)	6.127159	56.36424
		08 Midlands	49.66 (41.98, 57.36)	13.00898	56.36424
		09 Masvingo	43.84 (37.00, 50.92)	15.12306	56.36424
		10 Harare	58.65 (50.48, 66.36)	9.398988	56.36424

Table 10

Sub-national regional inequality in ORT and continued feeding in the 35 low income, lower middle income and upper middle income SSA countries

Country	Year	Type and value of inequality measure with 95% CI			
		D	R	PAR	PAF
Ghana	2014	53.08 (25.42, 80.74)	3.44 (0.26, 6.63)	33.25 (17.22, 49.28)	80.12 (41.48, 118.75)
Algeria	2012	18.88 (2.86, 34.90)	1.58 (0.91, 2.24)	9.69 (-3.76, 23.16)	23.24 (-9.02, 55.50)
Angola	2015	51.34 (42.47, 60.21)	14.94 (-2.88, 32.77)	15.33 (1.30, 29.37)	38.64 (3.28, 74.00)
Benin	2014	27.24 (11.67, 42.81)	2.42 (0.92, 3.91)	13.86 (5.78, 21.94)	42.58 (17.76, 67.40)
Burundi	2016	32.31 (17.08, 47.54)	3.05 (1.22, 4.87)	13.09 (4.52, 21.66)	37.47 (12.95, 61.99)
Cameroon	2014	29.81 (9.46, 50.16)	1.90 (1.20, 2.60)	23.51 (20.56, 26.45)	59.84 (52.34, 67.33)
Chad	2014	25.50 (11.09, 39.92)	3.15 (0.71, 5.58)	8.48 (2.42, 14.54)	29.36 (8.38, 50.35)
Comoros	2012	8.48 (-8.63, 25.61)	1.17 (0.78, 1.56)	3.18 (-14.49, 20.87)	5.90 (-26.87, 38.69)
Congo	2014	24.43 (11.58, 37.27)	2.00 (1.17, 2.82)	6.57 (-4.09, 17.24)	15.56 (-9.70, 40.82)
Democratic Republic of the Congo	2013	25.99 (11.03, 40.94)	1.79 (1.17, 2.42)	18.61 (12.36, 24.85)	46.58 (30.95, 62.22)
Eswatini	2014	28.80 (13.38, 44.23)	1.86 (1.18, 2.55)	15.62 (6.93, 24.32)	33.70 (14.94, 52.46)
Ethiopia	2016	38.28 (22.44, 54.12)	2.86 (1.63, 4.09)	30.16 (2.41, 57.91)	105.26 (8.43, 202.09)
Gabon	2012	25.87 (-1.11, 52.86)	1.68 (0.54, 2.82)	11.67 (-28.90, 52.26)	22.49 (-55.69, 100.68)
Gambia	2013	17.04 (0.50, 33.58)	1.42 (0.93, 1.91)	6.42 (-3.30, 16.15)	12.63 (-6.50, 31.77)
Guinea	2016	45.96 (29.20, 62.71)	4.43 (1.94, 6.93)	15.14 (8.94, 21.34)	34.28 (20.24, 48.32)
Guinea-Bissau	2014	59.62 (45.91, 73.32)	4.84 (2.21, 7.47)	20.51 (13.88, 27.15)	37.57 (25.42, 49.71)

Country	Year	Type and value of inequality measure with 95% CI			
		D	R	PAR	PAF
Kenya	2014	40.92 (27.23, 54.61)	2.30 (1.49, 3.10)	27.22 (13.88, 40.56)	60.31 (30.76, 89.86)
Lesotho	2014	NA	NA	NA	PAR
Liberia	2013	14.01 (5.12, 22.90)	1.35 (1.10, 1.61)	6.52 (-1.61, 14.67)	14.06 (-3.48, 31.60)
Malawi	2015	14.78 (6.36, 23.20)	1.34 (1.08, 1.59)	1.48 (-3.55, 6.53)	2.62 (-6.27, 11.53)
Mali	2015	28.85 (20.09, 37.60)	2.50 (1.74, 3.26)	19.30 (16.53, 22.07)	67.25 (57.60, 76.90)
Mauritania	2015	29.27 (16.31, 42.23)	2.24 (1.29, 3.19)	18.27 (11.78, 24.70)	52.94 (34.15, 71.73)
Mozambique	2015	NA	NA	NA	NA
Namibia	2013	NA	NA	NA	NA
Niger	2012	21.97 97.48, 36.45)	1.64 (1.12, 2.17)	12.97 (8.57, 17.36)	30.19 (19.96, 40.42)
Nigeria	2013	21.16 (12.84, 29.48)	1.91 (1.46, 2.36)	15.06 (12.94, 17.18)	51.52 (44.28, 58.77)
Rwanda	2014	5.12 (-3.40, 13.65)	1.29 (0.73, 1.86)	2.80 (-1.72, 7.32)	14.38 (-8.84, 37.61)
Sao Tome and Principe	2014	3.95 (-8.54, 16.44)	1.06 (0.85, 1.28)	2.93 (-1.00, 6.88)	4.81 (-1.64, 11.27)
Senegal	2014	29.52 (20.15, 38.89)	1.83 (1.46, 2.20)	16.12 (8.96, 23.20)	33.18 (18.44, 47.92)
Sierra Leone	2013	5.58 (-6.04, 17.22)	1.10 (0.88, 1.31)	3.76 (-1.86, 9.39)	6.54 (-3.23, 16.32)
Togo	2013	28.04 (17.35, 38.73)	3.08 (1.29, 4.88)	8.05 (2.30, 13.80)	24.09 (6.88, 41.30)
Uganda	2016	34.62 (22.52, 46.72)	2.64 (1.93, 3.35)	18.27 (13.49, 23.05)	48.89 (36.10, 61.67)
United Republic of Tanzania	2015	NA	NA	NA	NA
Zambia	2013	19.99 (7.53, 32.45)	1.45 (1.09, 1.80)	8.03 (0.75, 15.31)	14.30 (1.34, 27.26)
Zimbabwe	2014	29.07 (16.62, 41.51)	1.66 (1.30, 2.01)	16.55 (10.61, 22.48)	29.36 (18.83, 39.89)

Discussion

In this article, we brought to the forefront the situation in 35 SSA countries of disparity in ORT and continued feeding among under-five children with diarrhea. Our study has been motivated by the SDG's call for disaggregated data on important health indicators like ORT in order to accelerate attainment of the global goals of ensuring universal health coverage in reproductive, maternal, newborn, and child health in 2030 (4). The SDG underscores policy implications of disaggregating health care indicators by dimensions of inequality such as wealth and place of residence. To this end, findings presented in this paper could contribute to the design of equity interventions in order to minimize the observed disparity in one of the most imperative child health care indicators, ORT and continued feeding.

We recorded substantial wealth-related disparity in 20 countries. The disparity was highest and more pronounced in few countries such as Angola, Guinea, Cameroon and Mali. Based on the PAF measure, we showed that the coverage for ORT and continued feeding in 2013 in Nigeria would have been increased, on average, by a staggering nearly 62% if the country had avoided the poor-rich disparity of the service. This translates to a rise of the coverage from 29–47%. In other words, the coverage gap would have dropped from 71 pp to 53 pp. Such big rise in the coverage would significantly have helped the country attain the global goal of universal coverage in maternal and child health care service. Angola, Guinea, and Cameroon each had average wealth related disparity between 24%-52%, and as is the case discussed for Nigeria above, their respective national coverage for ORT and continued feeding would have considerably risen if they were able to avoid the observed disparity. Although income disparity in SSA has received greater attention by the SDG (4), there are income disparities that persist still today in the region. In fact, SSA is one of the most unequal regions in the world in terms of income distribution between people (5). Thus, since income is the basis for living, accelerated reduction of poverty in the region could be translated into attaining the other SDGs (5). However, extent of income variations differed by countries in the region. Nigeria is one of the most unequal countries in the region (15), and the disparity continues to cause disparities in health care use like ORT and continued feeding. When there is economic disparity in a nation, already wealthier people are likely to benefit more from the economic growth whereas poor people are left behind with little gains (15). An economic growth would benefit wider public including the poor when countries are of more equal (15). Policies need to focus on correcting the stark income inequality between peoples to rescue poverty related health loss. Due to the fact that income and health have a well-known close nexuses, equitable economic policy must be regarded as health policy (16), in order to confront the steady economic gradient in health. The mechanisms by which income can exert its influence on health and health cares have been studied (17). One of the possible mechanism through which income affects health and health care is that it increases people's chance of being covered under insurance, and for low-income people, this scheme enhances their means of accessing medical care (17). In 2018, an estimated 27.9 million people were not under insurance coverage in America (18). Since larger share of uninsured people are disproportionately low income families (19), economic policy targeted towards economically lagging households should consider expanding coverage of insurance service.

We also showed educational inequality in ORT and continued feeding in eleven countries: Angola, Benin, Burundi, Cameroon, Chad, Guinea, Guinea Bissau, Kenya, Mali, Mozambique and Nigeria. While the disparity in all these countries requires more work to eliminate the inequality, some countries such as Chad, Guinea, Cameroon, Nigeria and Mozambique had the highest average inequality. Had these countries avoided the absolute educational disparity in the use of ORT and continued feeding, then the national coverage of the health service in these countries would have been climbed by, on average, 10 to nearly 18 pp, and the rise in the national coverage would have been increased even more if they had avoided the relative disparity on average by between 26 and 41 percent. Secondary school participation has been most challenging in SSA and South Asia (20). In Chad for instance, more than 6 for every 10 adolescents do not join secondary school. More worse is that, there is striking gaps in level of secondary school participation between income groups, where only less than 50% of children from poor family are able to attend secondary school in contrast to 80% of adolescents from the richest household (20). Increasing the proportion of girls who graduated secondary education would greatly contribute to the fight against educated driven inequality in use of ORT and continued feeding in these countries. SSA is required to increase the total enrollments by more than 3 times than the current level if the aim is to attain universal coverage for pre-primary, primary and secondary education by 2030 (21). As an important component of socioeconomic status, education has long been known to influence health disparities directly (22), but education is largely recognized as a legitimate domain of public health action, and is an influential method to disrupt the vicious cycle of poverty. Moreover, education is an essential component of public health interventions that can be used to stimulate health equity and help overcome health disparities (23). Given the current low educational status in most SSA countries, integrating education into public health policies could lead to widespread benefit with respect to challenging health care disparities in the sub-region.

The other interesting finding of this study is that, the largest number of countries in the study did not see sex related disparity around ORT and continued feeding. In 2030, all countries globally are going to ensure gender equality with respect to health care, and participation in politics as well as economic sectors (4). Our study confirms that most SSA countries are likely to attain that goal with respect to this child health care intervention if they do maintain the current momentum. However, there are a handful of countries with slight sex disparity: Niger, Kenya, Guinea-Bissau, and Senegal. In the no sex disparity scenario, Niger would have elevated the coverage of ORT and continued feeding by, on average, 2.3 pp, and female children had a slight advantage over males in use of the service. In Kenya and Guinea-Bissau, on the other hand, male children had on average 6.4 and 11.3 pp respectively more chance of getting the service than female children. Similarly, male children had little but statistically significant advantage over female counterparts in Senegal with regard to receiving ORT and continued feeding. Governments of these countries may consider revising existing interventions in order to make the interventions more gender sensitive and responsive.

No urban-rural inequality was found in 12 of the studied African countries: Ghana, Benin, Burundi, Algeria, Eswatini, Gabon, Gambia, Namibia, Sao Tome, Sierra Leone, Togo and Senegal. In terms of subnational regions, five countries (Comoros, Gabon, Rwanda, Sao Tome and Sierra Leone) managed to distribute the

service fairly between different regions while the remaining countries had gaps in ORT and continued feeding between different regions. Rural settings and certain geographical areas tend to host rather few children with diarrhea that receive ORT and continued feeding. This further implies that the residence related and subnational regional variations could obstruct SSA countries from attaining of the SDG. To curb the predictable threat of the within country disparities, such countries need to revise existing child health interventions and promote more equitable interventions that target rural areas, poor and illiterate households, and certain geographical areas to accelerate elimination of unacceptable gap in ORT and continued feeding and in so doing could help countries attain the global goal of universal child health care (that is, ORT and continued feeding).

The study has some strength. Findings are produced following transparent and scientifically sound equity analysis technique recommended by the WHO, making the results more reliable for use for decision making. Also, since different summary measures were used in the study, we are hopeful that the disparity was captured from different perspectives. This approach, the approach of adopting 'method-mix', could contribute to not conclude absence of disparity while there is in fact disparity and in doing so could lead to prevention of unsupported decisions. Finally, measuring disparity in ORT and continued feeding through five dimensions of inequality has huge advantage of recognizing population subgroups that suffer lower coverage of the service; policy interventions will then be formulated that favors such groups. The limitation of the study is that, it just highlighted on the disparity of the service across different equity stratifiers. However, to better fight against the disparity, it is important to understand the reasons that underlie the observed disparity. In this regard, we recommend future studies to answer this important research question using a decomposition analysis to examine independent contributions of factors that work behind the disparity in ORT and continued feeding.

Conclusions

In SSA, socioeconomic, urban-rural and geographical inequalities around ORT and continued feeding were substantial. Fortunately, except in a handful of countries, we did not record sex-related inequality in the use of the child health care in the studied countries. Countries need to intensify pro-disadvantaged interventions that target the poor, illiterate, rural residents and some living places in order to challenge the unfair distribution of the service and subsequently markedly decrease the unnecessary diarrheal deaths. Also, the SSA region may benefit more from widespread equitable economic and education policies as income and education have been shown to underlie health care disparities. This could eventually translate into attainment of the global goal of universal coverage for ORT and continued feeding by 2030.

Abbreviations

D
Difference
DHS
Demographic and Health Survey

EA
Enumeration Area
HEAT
Health Equity Assessment Toolkit
ICF
Inner City Fund
ORS
Oral Rehydration Salt/Solution
ORT
Oral Rehydration Therapy
PAF
Population Attributable Fraction
PAR
Population Attributable Risk
PCA
Principal Component Analyses
PSUs
Primary Sampling Units
R
Ratio
SSA
Sub-Saharan Africa
SDG
Sustainable Development Goal
UI
Uncertainty Interval
USAID
United States Agency for International Development
WHO
World Health Organization

Declarations

Ethics approval and consent to participate

Ethics approval was not required since the data is available to the public domain.

Consent for publication

Not applicable

Availability of data and materials

The datasets generated and/or analyzed during the current study are available in the WHO's HEAT version 3.1 [https://www.who.int/gho/health_equity/assessment_toolkit/en/].

Competing interests

The authors declare no competing interests.

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Authors' contribution

BZ conceived the study, wrote the result and method; GS contributed to the design and method, wrote the introduction and discussion, and reviewed the manuscript critically for its intellectual content. Both authors approved the final version.

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