Empirical Analysis of Equity in Maternal and Child Health Services Delivery and Access in Ghana: A Cross-Sectional Study

Samuel George Anarwat (✉ anarwat@gmail.com)

University for Development Studies

Mubarik Salifu

University for Development Studies

Margaret Atosina Akuriba

University for Development Studies

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and Access in Ghana: A Cross-Sectional Study**

Samuel George Anarwat, Ph.D. (Correspondent Author)

University for Development Studies, Tamale,

School of Public Health,

Department of Health Services Policy, Planning, Management and Economics (HSPPME)

E-mail: anarwat@gmail.com, ganarwat@uds.edu.gh

Mubarik Salifu, Mphil.

University for Development Studies, Tamale, Ghana

School of Applied Economics and Management Sciences,

Department of Economics

E-mail: smubarik@uds.edu.gh

Margaret Atosina Akuriba, Ph.D.

University for Development Studies, Tamale, Ghana

School of Applied Economics and Management Sciences,

Department of Applied Economics

E-mail: akumerg@gmail.com

Empirical Analysis of Equity in Maternal and Child Health Services

Delivery and Access in Ghana: A Cross-Sectional Study

Abstract

Background

Inequities in the distribution of and access to maternal and child health care services is pervasive in Ghana. Understanding the drivers of inequity in maternal and child health (MCH) is important to achieving the universal health coverage component of the sustainable development goals and poverty reduction in Ghana and other developing countries. However, there is increasing disparities in MCH services, especially in rural -urban and income quintiles. The study aimed to examine the disparities in maternal and child health care services in Ghana for policy intervention.

Methods

Data for this study was extracted from the nationally representative Ghana Statistical Service (GSS) Multiple Indicator Cluster Survey (MICS) round 4, 2011. Respondents of this survey were women of reproductive age 15-49 years with a sample size of 10,627 households. The models were estimated using multivariate regression analysis together with concentration index (CI) and risk ratio (RR) to assess the distribution of MCH indicator groups across the household wealth index.

Results

Higher educational attainment played an important role in MCH. Women with secondary school level and above were more likely to receive family planning, prenatal care, and delivery by a skilled health professional than those without formal education. Mothers with low level

of educational attainment were 87% more likely to have their first pregnancy before the age of 20 years, and 78% were more likely to have children with under-five mortality, and 45% more likely to have children who had diarrhoea. Teenage pregnancy, under five mortality, child underweight, reported diarrhoea, and suspected pneumonia were more concentrated in the poorer than in the richer households. The RR between the top and bottom quintiles ranged from 0.77 for child underweight to 0.82 for child wasting.

Conclusion

Geographic location, income status and formal education are key drivers of maternal and child health inequities in Ghana. Implementing health policies to address inequalities in MCH services through primary health care, and resource allocation skewed towards rural areas and the lower wealth quintile can bridge the inequality gaps and improve MCH outcomes in Ghana.

Keywords: Maternal and Child Health, Equity, Health Service Access and Delivery, Concentration Index, Risk Ratios, Ghana, Universal Health Coverage.

Background

Inequities in the distribution of health care services is gaining global attention in public health(1). Inequities in maternal and child health services are among the prominent reasons for high maternal and child morbidities and mortalities in Sub-Saharan Africa and the world at large(2). Like other Sub-Saharan countries, Ghana experiences unequal distribution in maternal and child health care services (3). Although Ghana's key health status indicators improved steadily over the MDG period and were praised as success, there are large inequalities in health coverage and strong overall performance masks significant disparities between income groups and regions (4). Much is still left to be accomplished in the areas of equity in maternal health and child health status among the lower wealth quintile of the population. The 2017/2018 Ghana Multiple Indicator Cluster Survey (MICS), round six report showed a reduction in infant mortality rate (IMR) from 49 per every 1,000 to 41 children per live birth, according to the Ghana Statistical Services data in 2018. This statistic is far from achieving the SDG Goal 3-Target 3.2 of "ending preventable deaths of new-borns and children under 5 years, with all countries aiming to reduce neonatal mortality. With these disparities in maternal and child health status between the urban -rural and poor-rich, Ghana risks not achieving the recommended set targets. Low or no education of mothers also hampers their maternal and child health status and well-being. In Ghana low education of mothers is still a problem, considering that as many as 79 maternal deaths were associated with mothers with no education while 53 deaths for mothers with at least secondary education (5).

Inequality creates serious obstacles to achieving the Sustainable Development Goals (SDGs), especially, overcoming poverty, achieving universal health coverage and reduced inequalities by the year 2030 (SDG1, 3 and 10). The widening and persistent inequality in the distribution of social services including maternal and child health care is harmful to countries as well as individuals as agreed by policy makers (6). Between 2016 and 2017, 82% of the

wealth generated went to the richest 1% of the global population, while the poorest half saw no increase((7). Over 800 women die each day from complications in pregnancy and childbirth due to the disparities in maternal and child health services utilization (5). For every woman who dies, approximately 20 others suffer serious injuries, infections or disabilities and almost all maternal deaths (99 per cent) occur in developing country regions (5). According to the Population Reference Bureau (8) the maternal mortality rates (MMR) for Africa and West Africa are 490 per 100,000 live births and 674 per 100,000 live births, respectively. These statistics are worrying since no woman should die giving birth. The survival of mothers has become very important since saving them implies saving the lives of the more than one million children who are left motherless.

Research shows that educated women are more likely to start antenatal care (ANC) visits earlier than less educated women(9), and utilisation of delivery care depends largely on the women's educational level (10). Most maternal health studies in Ghana.(11, 12), have focused mostly on the general population, and in some instances on some regions. Arthur (2012), for instance, identified wealth, age, education, number of children, transportation, and health insurance among women between 15 and 49 years to influence antenatal use in Ghana as contributory factors of maternal health care service utilisation. Other variables such as long travel distance and long waiting times affect the use of ANC within communities (13). We present in the next few paragraphs, previous literature on maternal health, family planning, and child health in Ghana.

Maternal Health

Ghana has made good progress in recent years in many social development indicators including health. Maternal and child health status are determined by several variables such as the conditions of the place of residence, school environment, and work environment, which determines their health risks and outcomes. Environmental and social variables such as, health

care and early health care seeking and treatment; educational attainment of households especially mothers, employment, social support and economic opportunities, family incomes, health insurance coverage, significantly influence maternal health care behaviors and health status (14). These variables that influence maternal health equally affect pregnancy outcomes and child health status (14).

Evidence suggests high unmet need for family planning among unmarried adolescents while modern use of family planning methods is higher among married than unmarried adolescents(3).Adolescent girls in rural areas and those among the poorest and less educated are at a higher risk of early childbearing in Ghana (3). Ample evidence indicates that 14% of adolescent women aged 15-19 are mothers or pregnant with their first child (3).

Family Planning

Family planning has been an integral component of government of Ghana's maternal health programs for decades. Family Planning is an important factor in the population management and national development outlined in many national development plans (15). Family planning aims to assist couples and individuals of reproductive age to achieve their reproductive aspirations. Despite the high premium placed on family planning programs in Ghana, funding remains a daunting challenge. Family planning intake is highest (69%) among women between 15-19 years and lowest (33%) among women within 45-49 years. The demand for family planning is also highest (59%) among women in rural areas. Those women with at least primary or high school education use more family planning services and women in the middle three quintiles (60-61%), (16).

Although there is a huge progress in family planning services intake, there is still about 50% unmet need for family planning services in Ghana, especially among young women within the 15-19 years (51%) and lowest among women aged 45-59 (14%). Also women in rural dwelling have slightly higher (31%) unmet needs of family planning than their counterparts in urban areas (29%) (16).

Delivery by skilled health personnel is another key indicator of maternal health. There has been progress in this indicator, about 68% of all births in the last two years preceding the MICS survey round 6 were delivered by skilled personnel. Education plays an important role in deliveries by skilled health personnel. Educated women were more likely to have assisted deliveries by a skilled health personnel. Assisted delivery by skilled health personnel for mothers with no formal education constituted only 44% of all deliveries compared to 95% for women with secondary or higher education. Also, poor women were less likely to deliver using skilled personnel (39%), compared to rich women (98%). Despite the progress made in delivery by skilled personnel, deliveries at home are still highly significant as 1 in 3 births take

place at home without a skilled health personnel (17). This needs to be addressed to reduce preventable maternal mortality which might emanate from complications or blood loss. Promoting and ensuring deliveries in health facilities can reduce the health risks to both the mother and the baby. Proper medical attention and hygienic conditions during delivery can also reduce the risks of complications and infection that can cause morbidity and mortality to either the mother or the baby (17).

Child Health

The health of children is a global concern. Over the years, many countries and institutions have worked towards improving the health of children to reduce infant mortality. Despite the significant investments and improvement in child health in the past few decades, many children still lose their lives to diseases before their 5th birthday globally, and inequity in health is still a huge challenge (18). Technical and medical solutions such as disease control and medical care of illnesses that cause the most deaths in children are critical in making fundamental improvements in health equity.

Diarrhoea and pneumonia have been the most frequent childhood illnesses and causes of attendance at health services in low-income and middle-income countries (19). These diseases have been regarded as the “biggest child killers” in the last century (20). In 2011 for instance, diarrhoea and pneumonia caused about 700,000 and 1, 300,000 global deaths respectively in children under 5 years (19). The plan was necessitated by some alarming statistics that pneumonia and diarrhoea together accounted for 30% of all childhood deaths (21). The prevalence rate of diarrhoea in children under 5 years in Ghana is reported to be 13% in the 2011 MICS, with Oral Rehydration Treatment (ORT) being higher in urban areas (64%) than in rural areas (56%) (17). Childhood diarrhoea in Ghana is also said to show inequities that are to the disadvantage of the poorest (22). Thus, cases recorded in urban areas or in relatively rich homes are properly managed compared to those in rural and/or poor homes. In

2011, the incidence of suspected pneumonia in children under 5 years in Ghana was 3% (17). The main intervention in treating pneumonia is antibiotics. Of the 3% suspected pneumonia cases reported in Ghana, 41% of them were taken to an appropriate health provider and 56% received antibiotics. Children in rural areas and/or poor homes are disadvantaged in terms of care seeking behaviour (17).

WHO estimates that at least 10 million deaths were prevented between 2010 and 2015 globally due to vaccinations; and many lives were protected from suffering and disability associated with diseases such as pneumonia, diarrhoea, whooping cough, measles, and polio (20). However, in Ghana many children still suffer from nutrition deficiency illnesses and other preventable childhood diseases. For instance, children under five years suffered from stunting (18.8%) underweight (11.0%) and wasted (4.7%) (17). There are also significant variations in stunting, underweight, and wasting across wealth quintiles and geographic regions (23). According to the 2014 Ghana Demographic and Health Survey (GDHS), 19 percent of Ghanaian children are chronically malnourished, with stunting less than two standard deviations (SD) below the national average, and 5% are seriously stunted (below -3 SD). This represents a 17 percent decrease (improvement) since the MICS in 2011 and a 47 percent decrease (improvement) since the DHS in 2008 (23).

Stunting becomes more common as children get older, peaking at 28% among children aged 24-35 months. Stunting affects a significantly higher percentage of males (20%) than females (17%), and stunting is more prevalent in rural areas (22%) than in urban areas (15%). Stunting rates vary by area, ranging from 10% in Greater Accra to 33% in the Northern region. Education and income are inversely linked to stunting. For example, 25% of children in the lowest two wealth quintiles are stunted, while only 9% of children in the highest quintile are stunted (23)

Methods

Data Sources

Data for this study was extracted from the 2011 Ghana Statistical Service's Multiple Indicator Cluster Survey, round four (MICS4). The survey collected data on fertility, family planning, maternal and child health. The sample consists of women within the ages of 15–49 years with a live birth in the last five years preceding the survey. Of the 12,150 households sampled, 10,963 women aged 15–49 years were interviewed, producing a response rate of 97 per cent. Children under the age of 5 years constituted 7,626. Responses were obtained from their mothers or caregivers with a response rate of 99 percent. The male survey involved 3,511 men aged 15-59 years with a response rate of 95 percent. The questionnaire had questions on demographic indicators, health status, illness and visits to a doctor, health behaviour such as smoking, drinking alcohol, physical activity, and eating habits.

Measurement of inequities

We measured inequities in maternal and child health outcomes and access to health care interventions by three steps: i) Identification of the health outcome or intervention whose distribution is to be measured; ii) classification of the population into different strata by a selected equity stratifier; and iii) measuring the degree of inequality (22). Finally, we tried to understand the drivers of these inequities in MCH utilization. The variables of interest, maternal and child health outcomes and interventions are listed in Table 1. In the Multiple Indicator Cluster Survey, the socio-economic stratifier used is household wealth, which is derived from the household ownership of assets such as television, car etc. and dwelling characteristics such as flooring material and source of drinking water. In this study, we have used wealth quintiles that are provided in the MICS 4 report (17). Each asset was assigned a weight (factor score) generated through principal components analysis, and the resulting asset scores were standardised in relation to a normal distribution with a mean of zero and standard deviation of one. Each household was then assigned a score for each asset, and the scores were summed for each household; individuals were ranked according to the total score of the

household in which they resided. The sample was then divided into quintiles from one (lowest) to five (highest). A single asset index was developed for the whole sample; separate indices were not prepared for the urban and rural populations (23).

To date, various measures have been used in the measurement of inequities in health and health care. However, of the available measures only the slope index of inequality (SII), the relative index of inequality (RII) and the concentration index (CI) have been commonly used giving their desirable characteristics: (i) they reflect the socio-economic dimension of health inequalities; (ii) they reflect the experience of the entire population rather than only two groups such as wealth quintiles one and five and (iii) they are sensitive to changes in the distribution of the population across socio-economic groups (24).

The Concentration Index

In this study, inequities in maternal and child health are measured using the concentration index. The concentration index is defined with reference to the concentration curve, which is used to identify whether socioeconomic inequality in some health sector variable exists and whether it is more pronounced at one point in time than another or in one country than another. But a concentration curve does not give a measure of the magnitude of inequality that can be compared conveniently across many time periods, countries, regions, or whatever may be chosen for comparison. However, the concentration index quantifies the degree of socioeconomic related inequality in a health variable (25, 26). The CI has been used, for example, to measure and to compare the degree of socioeconomic-related inequality in child mortality (27), child malnutrition (28), health subsidies (29), and health care utilization (30). Formally, the concentration index is defined as:

$$C = 1 - 2 \int_0^1 L_h(p) dp. \dots\dots\dots(1)$$

245 The index is bounded between -1 and 1. For a discrete living standards variable, it can be
 246 written as:

$$247 \quad C = \frac{2}{N_\mu} \sum_{i=1}^n h_i r_i - 1 - \frac{1}{N} \dots\dots\dots(2)$$

248 where h_i is the health sector variable, μ is its mean, and $r_i = i/N$ is the fractional rank of
 249 individual i in the living standards distribution, with $i = 1$ for the poorest and $i = N$ for
 250 the richest. For computation, a more convenient formula for the concentration index defines it
 251 in terms of the covariance between the health variable and the fractional rank in the living
 252 standards distribution (25, 31, 32).

$$253 \quad C = \frac{2}{\mu} cov(h, r) \dots\dots\dots(3)$$

254 The sign of the concentration index indicates the direction of any relationship between the
 255 health variable and position in the living standards distribution, and its magnitude reflects both
 256 the strength of the relationship and the degree of variability in the health variable.

257

258 *Equity stratifies and measures*

259 Health equity is the absence of unjust, avoidable differences in health care access, quality, or
 260 outcomes. Measuring health inequalities allows us to identify differences that can be acted on
 261 and can be used to measure progress toward achieving health equity. Disaggregating health
 262 indicators using equity stratifiers can identify inequalities between subpopulations. An equity
 263 stratifier refers to a characteristic such as a demographic, social, economic, racial, or
 264 geographic descriptor that can identify population subgroups for the purpose of measuring
 265 differences in health and health care that may be considered unfair or unjust (33).

266 To assess wealth, the study used selected assets and durables in a sample household, because
 267 asset ownership tends to fluctuate less than individual income or expenditure. The assets

considered in houses were permanent floors, roofs, or walls; flush or pour-flush toilets; transportation - including bicycles, motorcycles, cars or trucks; and electrical equipment, including radios, televisions, line or mobile telephones, refrigerators and computers. Households with these assets were considered richer than those without. The study also used principal component analysis of all household samples to generate a wealth index for each household and use this as an equity stratifier. This was done by measuring final use of goods and services, and money payments to obtain them and measures asset ownership, housing and/or access to services. This was then used to construct asset indices using methods such as principal component analysis. Using the concentration standard method, the study summarized the distribution of each MCH indicator over a gradient of the wealth index by a concentration index (CI) and a concentration curve (CC). The CI, which ranges from -1.0 to $+1.0$, captures the extent to which health outcomes and service use were concentrated among different population groups: the richest and the poorest. A CI of zero means an equal distribution of a particular indicator throughout the economic gradients. A negative CI indicates a concentration among those who are poorer (i.e., the CC lies above the equality line of 45 degrees), and a positive CI reflects a concentration among those who are richer (i.e. the CC lies below the equality line).

The study also compared the prevalence of health outcomes and the coverage of the MCH interventions between the richest and the poorest subgroups using a risk ratio (RR). All households were ranked according to their wealth indices, which was divided equally into quintile (5) and decile (10) subgroups. Only the top (richest) and bottom (poorest) quintiles and deciles were selected for the RR calculation, to demonstrate any disparity between rich and poor urban and rural domiciles and educated and uneducated.

Multiple regression models were then used to assess the drivers of inequity in the MCH outcomes using CI and RR as dependent variables. Data was analysed using STATA 13

293 statistical software.

294

RESULTS

Disparities among the poor and the rich in MCH

Table 1, 2 and 3 summarizes equity measures for all MCH indicators in terms of CI and RR between the richest and poorest quintiles and deciles.

Economic disparities in health outcomes

We discovered substantial differences between income classes and geographic areas, suggesting that household wealth has a significant impact on child survival and that the poor have a higher risk of child mortality. Teenage pregnancy, low birth weight, infant malnutrition, and child disease all showed economic inequalities in MCH. The poorer subgroups were more likely to have negative health effects (as shown by the negative CIs in Table 2 and 3). The poor had the highest concentration, which was statistically important for child underweight. The CI for stunting and wasting in children was negative, but this had no statistical significance. In terms of magnitude of concentration, teen pregnancy was ranked third among the poor. Children under the age of 5 years old with suspected pneumonia and diarrhoea were also more prevalent among the poor (Table 2 and 3). The RRs were compatible with the computed CI when comparing MCH outcomes between the top and bottom income quintiles. Teenage pregnancy, under-five mortality, underweight children, and confirmed diarrhoea and suspected pneumonia were all more common in poorer households than in wealthier ones. The RR between the upper and bottom quintiles ranged from 0.77 for underweight children to 0.82 for wasting children (Table 3). Low birth weight was less clearly associated with economic disparities. The negative CI represented the fact that it was concentrated in relatively poor families, but it had no statistical significance.

Economic Disparities in Service Coverage

The results indicate that the primary MCH interventions were spread more evenly across economic strata than the health outcomes (Table 2). Prenatal service by a professional health worker was statistically significant and concentrated among the poor, while delivery care in a health facility was also statistically significant and concentrated among the wealthy. The magnitude of the CI, on the other hand, was high, and the RR between the wealthiest and poorest groups was not close to one, suggesting a large disparity between the wealthy and the poor. The poorest quintile had the highest coverage of oral rehydration salts/oral rehydration therapy for diarrhoea. The wealthiest quintile and decile, on the other hand, had the highest coverage of adequate health-care services for suspected pneumonia. Table 3 shows that the CIs of the four vaccine types for childhood immunization coverage ranged from 0.054 to 0.069, and the CI for family planning (at 0.076) is all statistically different from zero. As a result, since all the indicators were clustered around the richest quintiles and deciles, there were inequalities in service coverage for these indicators. The RR for these indicators had mixed results (Tables 1 and 2); both had more than one for comparisons between the first and fifth quintiles, as well as between the first and tenth deciles.

Table 1: Concentration index and ratio of richest to poorest quintile or decile for maternal health indicator of maternal and child health

MCH indicator	CI	RR (quintile5: quintile1) ^a	RR (decile 10: decile 1) ^b
1. Maternal health			
Outcome indicator			
I. Teenage pregnancy	-0.133***	0.679**	1.064
Coverage indicator			
II. Family planning	0.076***	1.408***	1.448**
III. Prenatal care by skilled health worker	-0.124***	0.713***	0.526***
IV. Delivery care by skilled health worker	0.026	1.195	1.031
V. Delivery care in health facility	0.287***	3.104	1.161***

* $P < 0.1$; ** $P < 0.05$; *** $P < 0.01$

CI, concentration index; RR, risk ratio.

^a Quintile 5 is the richest; quintile 1 is the poorest.

^b Decile 10 is the richest; decile 1 is the poorest.

Table 2: Concentration index and ratio of richest to poorest quintile or decile for child health indicator of maternal and child health

MCH indicator		CI	RR (quintile5: quintile1)	RR (decile 10: decile 1)
2. Child health				
Outcome indicator				
VI.	Low birth weight	-0.021	0.861	0.815
VII.	Under five mortality	-0.247***	0.426***	0.350***
VIII. Child malnourishment				
	Underweight	-0.055***	0.772**	0.837
	Stunting	-0.029	0.738**	0.740**
	Wasting	-0.003	0.822**	0.791**
IX. Child illness				
	Diarrhoea	-0.145***	0.392***	0.386***
	Suspected pneumonia	-0.002	1.002	0.927
Coverage indicator				
X.	ORS/ORT for diarrhoea			
XI.	Appropriate provider for	-0.221***	0.344***	0.485
	pneumonia	0.111***	1.704***	1.715*
XII. Child immunization				
	BCG	0.060**	1.598***	1.658***
	MMR	0.054**	1.583***	1.589***
	DPT	0.064**	1.640***	1.684***
	Yellow fever	0.069***	1.673***	1.682***

* $P < 0.1$; ** $P < 0.05$; *** $P < 0.01$

BCG, Bacille Calmette–Guerin; CI, concentration index; DPT, diphtheria, pertussis (whooping cough) and tetanus; MMR, measles, mumps and rubella; ORS/ORT, oral rehydration salts/oral rehydration therapy; RR, risk ratio.

^a Quintile 5 is the richest; quintile 1 is the poorest.

^b Decile 10 is the richest; decile 1 is the poorest.

Geographic Inequity of MCH

Health outcome prevalence's were as follows: teenage pregnancy among all mothers, 7.93%; low birth weight, 16.73%; and child stunting, 16.56% (Table 4). Service coverage was less equitable; for example, on average, less than 26% of respondents had prenatal care delivered either by skilled health workers or in health facilities, and less than 15% of children had received all vaccinations.

Table 3 and 4 also summarizes the urban–rural and educational disparities in MCH, as reflected by the RR. The four vaccines (BCG, MMR, DPT and yellow fever) and the coverage indicator appropriate provider for pneumonia were all concentrated in the urban areas than rural areas (thus, by 47%, 52%, 53% and 56% respectively) while low birth, under five mortality, underweight, stunting, wasting, child illness (diarrhoea and suspected pneumonia) and coverage indicator ORS/ORT for diarrhoea were more concentrated in rural than in urban areas. The most profound health gap was under-five mortality, which was 33% more prevalent in rural than in urban areas. Low birth weight and suspected pneumonia were equitably distributed between rural and urban areas.

The urban–rural gap for MCH service coverage was quite large. For instance, women living in rural areas were 30% less likely than those in urban areas to receive prenatal and delivery care from a skilled health worker. Although family planning was concentrated in the urban areas than rural, this was not statistically significant. Again, teenagers in urban areas were 73% less risky in getting expose to teenage issues compared to their counterparts in the rural areas. Also, there was a sharp gap between urban and rural women usage of print/electronic media and technology, thus women in urban areas were 4.9-78% more likely to use newspapers, radio, television, computer, and internet than their counterparts in the rural areas.

Educational Inequity and MCH Disparity

Mothers' or caregivers' formal schooling is a significant determinant of MCH inequity. Our findings show that more educated mothers or caregivers did better on all outcome indicators. The disparity was most noticeable when it came to teenage pregnancy. Women with less than a secondary school education were 87% more likely than those with a secondary school education to have their first pregnancy before the age of 20. Mothers or caregivers with no formal education were more likely (78 percent and 45 percent, respectively) to have under-five mortality and children with diarrhoea than those with a secondary education. Although there was little educational disparity among mothers of children with low birth weight and wasting, these indicators were still more common in the subgroup of mothers or caregivers who were uneducated (See Table 3).

Women with education beyond secondary school were 30–46% more likely than those without any formal education to receive family planning, maternal care, and delivery by a professional health worker or in a health facility. Higher educational attainment was also associated with a consistent improvement in maternal care coverage, with a large difference (RR: 1.304–1.457; $P < 0.01$). Surprisingly, children born to mothers or cared for by someone with a post-secondary education were 57–66 percent more likely than those who were not in this subgroup to receive all forms of vaccination before the age of one year.

Table 3: Prevalence and risk ratio with respect to urban–rural areas and educational attainment for maternal health indicator of MCH

MCH indicator		Average prevalence	Urban Vs. Rural		Higher Educ ^a . Vs. Lower Educ.	
		(%)	RR	p-value	RR	p-value
3. Maternal health						
Outcome indicator						
XIII.	Teenage pregnancy	7.93	0.731***	0.000	1.129***	0.000
Coverage indicator						
XIV.	Family planning	24.80	1.029	0.549	1.419***	0.000
XV.	Prenatal care by skilled health worker	26.02	0.701***	0.000	1.457***	0.000
XVI.	Delivery care by skilled health worker	15.72	0.983	0.797	1.304***	0.000
XVII.	Delivery care in a public health facility	13.52	1.001	0.992	1.365*	0.050
XVIII.	Delivery Care in a private health facility	1.53	1.129	0.555	1.474***	0.000

* $P < 0.1$; ** $P < 0.05$; *** $P < 0.01$

^aHigher education refers to schooling beyond the secondary (High School) level.

Table 4: Prevalence and risk ratio with respect to urban–rural areas and educational attainment for child health indicator of MCH

MCH indicator	Average prevalence	Urban Vs. Rural		Higher Educ ^a . Vs. Lower Educ.	
	(%)	RR	p-value	RR	p-value
4.Child health					
Outcome indicator					
Low birth weight	16.73	1.001	0.994	0.894***	0.000
Under five mortality	24.85	0.671***	0.000	0.224***	0.000
Underweight	16.13	0.911	0.262	0.849***	0.000
Stunting	16.56	0.976	0.756	0.860***	0.000
Wasting	16.76	0.902**	0.043	0.875**	0.049
Child Illness: Diarrhoea	14.77	0.729***	0.001	0.552***	0.000
Child Illness: Suspected pneumonia	21.92	1.006	0.929	1.056	0.507
Coverage indicator					
Child Treatment: ORS/ORT for diarrhoea	2.83	0.860	0.522	0.776	0.360
Child Treatment: Appropriate provider for pneumonia	7.61	1.331**	0.014	1.602***	0.000
Child Immunization: BCG	15.11	1.465***	0.000	1.568***	0.000
Child Immunization: MMR	14.37	1.518***	0.000	1.574***	0.000
Child Immunization: DPT	13.35	1.525***	0.000	1.662***	0.000
Child Immunization: Yellow Fever	13.06	1.556***	0.000	1.631***	0.000

* $P < 0.1$; ** $P < 0.05$; *** $P < 0.01$

BCG, Bacille Calmette–Guerin; CI, concentration index; DPT, diphtheria, pertussis (whooping cough) and tetanus; MMR, measles, mumps, and rubella; ORS/ORT, oral rehydration salts/oral rehydration therapy.

^a Higher education refers to schooling beyond the secondary level.

Discussion

The study analysed data from the Ghana Statistical Service's (GSS) Multiple Indicator Cluster Survey (MICS 4, 2011) to unearth inequities in maternal and child health services delivery and access in Ghana. The results are expected to help inform policy planning to improve maternal and child health services, especially in the disadvantage areas and populations subgroups.

Ghana has embarked on several interventions and efforts aimed at preventing and reducing maternal and infant mortality. These interventions span enhancing utilisation of health care through the National Health Insurance Scheme (NHIS), Free Maternal Care programme, launched in 2007 for pregnant women to enhance their utilisation of delivery care services, Healthcare Network (CHN)-On-The-Go, Kangaroo Baby Care, Mobile Technology for Community Health (MOTECHE), and Millennium Development Goal Acceleration Framework (MAF), and Expanded Program on Immunization, among others. It is expected that the NHIS will improve provision of basic health care services to persons resident in the country. The Free Maternal Care Policy allows pregnant women to walk into any health facility of their choice for antenatal care from conception and post-natal care up to three months after delivery. The free maternal care service to pregnant women is, however, dependent on their membership to the NHIS.

In 2016, Ghana's MMR was 319 per 100,000 live births (34). This demonstrates that MDG 5 (5), which aimed to reduce maternal mortality by three-quarters (190 deaths per 100,000 live births) by 2015, was not met. This means that if Ghana is to meet the Sustainable Development Goal (SDG) three (3), it will need to make more thoughtful and pragmatic efforts. Addressing and closing the disparities between rich and poor, educated, and uneducated, and social gradients in general are important first steps toward improving the well-being of mothers, infants, and children. Mothers' and children's health and socioeconomic well-being will have an impact on future generations' health and make predicting future public health challenges for

families, societies, and the health-care system easier. Much has been accomplished in terms of necessary child immunization, but ANC still has much room for improvement (23). The sharp drop in ANC threatens to undo the country's advances in maternal health care. With regional, location, mothers' education, and wealth quintile inequalities, ANC coverage has dropped from 93.08 percent in 2012 to 81.3 percent in 2017. (35).

Major differences in MCH care measures were discovered in the literature across many geographical areas, maternal, economic, and socio-demographic factors in many developing countries. What is unknown are the factors that contribute to inequities in MCH service access and distribution.

Government health expenditure has a less progressive effect on inequality in Ghana than in many other nations, accounting for just one-third of the reduction in Gini Co-efficient (4). Again, the government's annual allocation to the health sector has fluctuated and remains below the Abuja Declaration target of 15% (ISSER, 2018), implying that less money is going into Maternal and Child Health services, further widening the country's health disparities.

Assessing these inequalities' drivers is critical for making evidence-based decisions and allocating scarce public resources to those who are most in need. The existence of health-care inequities that disadvantage the poor, rural dwellers, and women with low education makes achieving the relevant health-related SDG targets difficult. This study sends a strong policy message: universal access to health care is critical to achieving the objective of health equity or reducing inequalities between sub-groups such as the poor and the wealthy, rural and urban dwellers, and those who have completed secondary school and those who have not completed secondary school.

In Ghana, child immunization was given to all mothers or caregivers regardless of their economic status. Surprisingly, immunization coverage was marginally higher in urban areas and among children whose mothers or caregivers had completed secondary school than in rural

476 areas and among those who had not completed secondary school. These results indicate that
477 urban areas have higher service coverage than rural areas.

478 Government's low commitment to investment in health infrastructure and expansion of health
479 insurance coverage over the past decades can explain Ghana's relatively unequal distribution
480 of MCH service coverage – between the wealthy and the poor, urban and rural populations (7).
481 Over the last few decades, the regional reach of district hospitals and sub-district health centers
482 has tended to increase in favor of the urban and wealthy. District health systems, which include
483 hospitals and health centers, are leading the way in offering a wide variety of curative,
484 preventative, and health-promotion programs, including MCH.

485 In Ghana, there is still some difference in child health results between the rich and the poor, as
486 well as between urban and rural areas. The country's CIs for diarrhoea, malnutrition,
487 underweight, and stunting, for example, are equivalent to the MICS for developing countries.
488 One of the most significant social determinants of health inequity is education. The education
489 disparities for measures of teenage pregnancy and child malnutrition were far greater than the
490 urban–rural differential, according to this report. As the mother's or caregiver's formal
491 education level increased, the prevalence of adolescent pregnancy and infant malnutrition
492 decreased. Teenage pregnancy was found to be much less common among those who had
493 completed high school. This and other studies (13) show that maternal education is an
494 important component of MCH policies.

495 In Ghana, access to MCH services is inequitable in the form of universal health coverage.
496 Inequity in health outcomes is a problem, and social determinants (such as poverty, maternal
497 education, and other structural social inequities) are significant, even though they are often
498 beyond the health sector's mandate. In this study, 16.13 percent of children were underweight,
499 16.56 percent were stunted, and 16.76 percent of children were wasting. Wasting in children
500 suggests acute malnutrition, whereas stunting indicates chronic malnutrition, which is usually

caused by long-term poverty in the home. Policies should tackle inequity from birth; for example, they should address problems including low birth weight, teen pregnancy, and infant malnutrition, for which the World Health Organization recommends multi-sectoral interventions. Inequity at birth has long-term consequences; undernutrition, for example, is linked to a loss of human capital (i.e., the skills and knowledge that enable people to work and thus produce economic value).

Conclusion

Major challenges remain in inequity in health outcomes, particularly in the areas of child mortality, teenage pregnancy, child malnourishment. The gaps between rich and poor and between urban and rural areas reveal a similar pattern. Mothers' education is the main determinant of health inequity. Key policy leverage and multi-sectoral actions are needed to close these gaps. Inequities in most of the maternal and child health interventions in Ghana are widespread among sub-groups (rich-poor, urban-rural and high educated-less educated) to the detriment of poor, rural dwellers, and less-educated. Thus, tackling inequalities in resource allocation through primary health care services is key to fighting the extreme geographical and wealth inequality in Ghana. For instance, upping maternal and child health education and promotion, and improving the quality of primary health care clinics in the most disadvantage rural districts resource allocation using equity formulas can improve quality and equity of maternal and child health care in Ghana. Further research, especially qualitative research is needed to unravel the social dimensions of the inequalities and the congruent factors responsible for the MCH inequalities.

524 **Declarations**

525 **Ethical Considerations:**

526 Since, this study was an empirical analysis of an existing data, it did not require ethical
527 clearance.

528 **Availability of data for the study**

529 The data that support the findings of this study are available from Ghana Statistical Service
530 but restrictions apply to the availability of these data, which were used under license for the
531 current study, and so are not publicly available. Data are however available from **Mubarik**
532 **Salifu**, (*our author who managed the data*) upon reasonable request and with permission of
533 Ghana Statistical Service.

534 **Competing Interests**

535 We the authors for this research declare that we have no competing interests.

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539 **Authors' Contributions**

540 SGA, MS, and MA contributed to the conception of the study and design. MS managed data
541 analysis, while all authors contributed to the methodological design, interpretation of results,
542 discussions and findings, conclusion, and the intellectual content including, writing, editing
543 and proof reading for accuracy.

544 **Consent to Publish.**

545 All the authors have approved the final manuscript and have provided their consent to publish
546 the article.

547

548

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