

1 **Socio-economic Inequalities in access to Skilled Birth Attendants during Childbirth in**
2 **Ghana: A decomposition analysis**

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24 **Abstract**

25 **Introduction:** Equitable access to, and use of skilled birth attendance during delivery is vital
26 for the achievement of the Sustainable Development Goals (SDGs) in reducing global
27 maternal deaths to 70 deaths per 100, 000. Although several initiatives have been
28 implemented to reduce maternal mortality in Ghana, inequities in the use of skilled birth
29 attendance during delivery still exist among women of different socioeconomic groups. This
30 study assessed the socioeconomic inequalities related to the use of skilled birth attendants
31 during delivery in Ghana.

32 **Materials and methods:** This study analyzed data from the 2014 Ghana Demographic and
33 Health Survey (GDHS). Concentration index (CI) and concentration curves were employed to
34 measure the magnitude of socioeconomic inequality in the use of skilled birth attendants
35 during child delivery. The concentration index was decomposed to identify the underlying
36 factors driving the inequalities.

37 **Results:** Out of a total of the 1,305 women who gave birth in the year prior to the interview,
38 28% of the deliveries had no skilled birth attendants of which 60% lives in rural compared to
39 40% in urban. A concentration index of 0.147 showed a pro-rich utilization of skilled birth
40 attendance during delivery. The decomposition analysis revealed that wealth, education and
41 location of residence were the major contributors to socioeconomic inequalities in the use of
42 skilled birth attendants during child delivery among Ghanaian women.

43 **Conclusion:** This study suggests that factors such as wealth, area of residence and education
44 are worthy of increased attention and policy interventions because they are amenable to the
45 reduction of observed inequality.

46 **Keywords:** Inequity, Socioeconomic Inequality, Skilled Birth Attendants, Maternal Health Care
47 Utilization, Child Delivery, Access

48 INTRODUCTION

49 *“Having a health worker with midwifery skills (for example doctors, midwives or nurses) present*
50 *at childbirth especially in rural areas, supported by adequate equipment, supplies and drugs,*
51 *regulations that permit them to carry out necessary procedures and transport for referral in case*
52 *of emergency is required, is perhaps the most critical intervention for making motherhood*
53 *safer.” [1].*

54 Maternal health care services are critical inputs in addressing the problem of maternal
55 morbidities and mortalities, hence, remains a global priority. The Safe Motherhood Initiative
56 was a global collaborative effort to raise awareness for the scope of high maternal mortality
57 and to entreat the international community, countries and stakeholders to take steps to
58 address this public health concern. This was the beginning for a number of advocacy
59 conferences on reducing maternal mortality, with the most recent being the United Nations
60 Agenda 2030 on Sustainable Developments Goals (SDGs) to encourage developing countries
61 to prioritise skilled birth attendants during delivery to reduce maternal mortality [2]. The
62 proportion of births assisted by skilled birth attendants is a potential process indicator and
63 there is evidence of a strong positive association with the level of maternal mortality [3].
64 Although several international conferences have tried to tackle this problem by reducing
65 maternal mortality ratio, progress in most countries have proven slow and challenging due
66 to lack of equitable access and use of maternal health services as well as the absence of a
67 functioning health care system [4]. The firm resolve with which skilled birth attendance has
68 been promoted as a global priority indicates the urgent need to offer policymakers and key
69 stakeholders a feasible, comparatively discrete and intuitively effective intervention [5].

70 Equity in access to and use of skilled delivery services is critical in the attainment of the
71 Sustainable Development Goal (SDG) 3 in Ghana. Over the years, major strides have been
72 made towards reducing the number of women who die due to pregnancy and childbirth-
73 related complications. Yet, many women still die annually from these avoidable deaths. Most
74 of these deaths have been reported to occur mostly during delivery and the immediate
75 postpartum period (48 hours after birth).

76 Maternal mortality is unacceptably high in the least developed countries in the world¹.

77 A 2019 report by the World Health Organization on maternal mortality estimates a worldwide
78 number of 295,000 maternal deaths in 2017 due to pregnancy and childbirth-related
79 complications. In 2017, nearly 86% (254,000) of these deaths occurred in sub-Saharan Africa
80 and Southern Asia. Sub-saharan Africa accounted for over 66% (196,000) while Southern Asia
81 records 20% (58,000) of these deaths a year of the global total [6].

82 It has been confirmed that the majority of maternal deaths occur during childbirth with the
83 common causes being haemorrhage, infections, unsafe abortions, hypertensive disorders of
84 pregnancy and obstructed labour [1]. Estimates suggest that about 16% to 33% of these
85 complications can be prevented by the assistance of a skilled attendant at childbirth [5].

86 The key findings from the Ghana 2017 Maternal Health Survey showed that the pregnancy-
87 related mortality ratio (PRMR) for Ghana is 343 deaths per 100,000 live births for the seven-
88 year period before the survey which is still higher than the global rate of 210 deaths per live
89 births [7]. Furthermore, the 2010 UNDP Report on maternal mortality indicated that nearly

¹ For the purpose of categorization, MMR is considered to be low if it is less than 100, moderate if it is 100–299, high if it is 300–499, very high if it is 500–999 and extremely high if it is greater than or equal to 1000 maternal deaths per 100 000 live births.

90 2,700 women died from pregnancy and childbirth-related complications[8]. Out of this, 56.6%
91 of these deaths were as a result of direct causes such as haemorrhage, infection, unsafe
92 abortion, obstructed labour and hypertensive disorders during pregnancy. Haemorrhage
93 (39%) during childbirth was recorded as the most common cause of death followed by
94 hypertensive disorders (35%) as the second most common direct cause of maternal deaths
95 [9]. In view of this, Ghana initiated the Reproductive Health Strategic Plan to help improve
96 maternal health. The Reproductive Health Strategic Plan (RHSP) was developed with the main
97 objective of expanding women's access to skilled attendance at delivery, increasing the
98 availability of comprehensive essential obstetric care to treat pregnancy complications, and
99 ensuring an effective referral and transport system to cater for pregnant women with
100 complications in order to reduce pregnancy-related mortalities and morbidities. [10].

101 Data from the 2014 Ghana Demographic and Health Survey Report showed that a national
102 coverage of 74% of births that were delivered five years prior to the survey were assisted by
103 skilled attendants. However, this national coverage, though high may hide disparities among
104 socioeconomic groups in the country. The same report estimated that 90% of births by women
105 in urban settlements were assisted by skilled birth attendants compared to only 58% of birth
106 being assisted in rural areas. Yet again, 96% of births were assisted by skilled birth attendants
107 among the rich, and only 49% were assisted for the poor [11]. These differences in the use of
108 skilled birth attendants during childbirth may be due to the existence of some socioeconomic
109 inequalities that contribute to women's health, before, during and after pregnancy, that
110 prevents women from using available health services. These inequalities may be demand or
111 supply-side factors as explained by Levesque, Harris & Russell and Andersen [12,13] in their

112 conceptual framework of access and health care utilization of health services. Among these
113 factors are physical barriers of poor roads and long distances to health facilities, financial
114 barriers, lack of employment opportunities, low educational attainment, and low
115 socioeconomic status [14–16].

116 Studies have shown the existence of huge gaps in the use of skilled birth attendants during
117 delivery across different socioeconomic groups [17]. Studies conducted in low and middle-
118 income countries show wide gaps in skilled birth delivery. Findings from these studies had
119 shown that wealth, women and husband’s educational levels were significantly associated
120 with skilled birth delivery [18–20]. For example in Namibia, the concentration index and curve
121 showed that wealth-related inequities were statistically significant in skilled delivery to the
122 benefit of women from economically better-off households. After decomposing, it was
123 observed that the main drivers of inequities were household wealth and mother’s education
124 [21].

125 It is in this regard that the study seeks to examine the extent to which socioeconomic
126 inequalities contribute to the use of skilled birth attendants and the underlying factors that
127 contribute to these inequalities in the Ghanaian context.

128 **MATERIALS AND METHODS**

129 **Data source**

130 This study uses data from the 2014 Ghana Demographic and Health Survey (GDHS) of women
131 who gave birth in the past year prior to the survey. Information for this analysis was drawn
132 from the women’s questionnaire. The GDHS survey was designed to provide information to
133 monitor the population and health situation of Ghana. The survey uses a two-stage sampling

134 method. The first stage involves selecting 427 clusters. The second stage uses a systematic
135 sampling method to select 30 households from each cluster. A total of 12,831 households are
136 selected of which 11,835 households were successfully interviewed. Among the successfully
137 interviewed households, 9,656 women aged 15 – 49 years were eligible for an individual
138 interview. However, only 9,396 women were interviewed successfully at a response rate of
139 97 per cent. Apart from basic demographic information, the Women’s questionnaire collects
140 information from all eligible women on topics such as: birth history, child mortality,
141 knowledge and use of family planning methods, fertility preferences, antenatal, delivery, and
142 postnatal care, breastfeeding and infant feeding practices, vaccinations and childhood
143 illnesses, marriage and sexual activity, women’s work, husbands’ background characteristics,
144 knowledge, awareness, and behaviour regarding HIV/AIDS and other sexually transmitted
145 infections (STIs) among others. The survey offers the opportunity for analysing the
146 socioeconomic inequalities that impede women’s access to skilled birth attendants during
147 delivery. For the purpose of this study, 1,305 women between the ages of 15 – 49 years who
148 had delivered twelve months prior to the 2014 GDHS were analysed. The choice of twelve
149 months prior to the survey date was to avoid memory lapse from respondents.

150 **Outcome variable**

151 The outcome variable for this study is whether women who had delivered in year preceding
152 the interview year had deliveries assisted by skilled birth attendants or not. The outcome
153 variable is a binary outcome; a value of “1” was given if the delivery was assisted by a skilled
154 birth attendant and “0” if the delivery was not. A skilled birth attendant in this study was
155 defined as a trained and licenced health professional that is a doctor, nurse/midwife or

156 community health officer who provides basic and emergency health care services to women
157 and their new-borns during pregnancy, delivery and immediate postpartum period that is the
158 first 48 hours after delivery. Information on delivery assisted or attended by a skilled birth
159 attendant was based on the question “*Who assisted in the delivery of (NAME OF CHILD)*” in the
160 women’s questionnaire?

161 **Predictor variables**

162 **Socio-economic status (SES)**

163 Socioeconomic status is the social standing or class of an individual or group. It is often
164 measured as a combination of education, income/wealth and occupation. Examinations of
165 socioeconomic status often reveal inequities in health [22].

166 **Household wealth index**

167 Household wealth index is a composite measure of the cumulative living standard of a
168 household and is used as a measure of economic status. The household wealth index is
169 considered a more reliable measure than income and consumption because it represents a
170 long-term standard of living of a household which allows for the identification of problems
171 particular to the poor, such as unequal access to health care, as well as those particular to the
172 wealthy, such as, in Africa [23]. The wealth index is calculated using a household’s ownership
173 of selected items such a televisions and bicycles; materials used for housing construction; and
174 types of water access and sanitation facilities [24]. A technique known as the principal
175 component analysis was developed by Filmer and Pritchett to calculate the wealth index [25].
176 The wealth index as generated in the DHS separates all interviewed households into five
177 wealth quintiles making the difference between the poor and rich very evident [23]. For the

178 purposes of the study, wealth was grouped into 5 quintiles – poorest (Q₁), poorer (Q₂), Middle
179 (Q₃), richer (Q₄) and richest (Q₅).

180 **Educational Level**

181 Educational level is one of the most widely used indicators of socioeconomic status.
182 Educational has been considered to most basic component of socioeconomic status as a result
183 of its influence on skillset for acquiring jobs and potential earnings [26] which may eventually
184 affect health outcomes. In addition higher educational levels have been associated with
185 higher socioeconomic status hence improved health outcomes. For example, people with
186 higher educational level may have better economic conditions helps them afford better and
187 quality health care services as well as develop better information processing and abilities
188 required to make better informed decisions about their health [27]. One major reason why
189 educational level is used as a measure of socioeconomic status for adult is the reduction in
190 the likelihood of reverse causation as education is complete before health status delines [10].
191 For the purposes of this study, education is self-reported and the Ghana Demographic and
192 Health Survey (GDHS) collects the highest level of education attained by both women and
193 their husbands/partners. This was grouped into three (3) no education, primary education,
194 and secondary + education.

195 **Occupation / Employment Status**

196 Occupation as a measure of socioeconomic status, encompasses both income and education
197 hence its influence on health. Occupational status reflects the educational attainment
198 required to obtain the job and income levels that vary with different jobs and within ranks of
199 occupations . This is used to measure the effect of socioeconomic status on health due to its

200 role in positioning individuals within the social structure [26]. There are various ways through
201 which education might influence health. For example, persons with employment are able to
202 seek health care in time since they can afford the services provided [27].

203 In this study, occupation will be measured using employment status which is categorized into
204 two groups: employed or unemployed.

205 **Other socio-economic variables**

206 Women autonomy is an important predictor variable [28]. Woman's autonomy was defined in
207 the GDHS as their ability to decide on their own health in the GDHS questionnaire and was
208 derived from the question: *a person who usually decides on mother's health care* from the
209 questionnaire. The response options are: (a) mother alone, (b) mother and husband/partner,
210 (c) husband/partner alone and (d) other (i.e. any other person besides the fore mentioned).
211 However, for this study, the responses were limited to three (3): (1) mother alone, (2) mother
212 and husband/partner, (3) husband/partner alone.

213 Other predictor variables of interest for this study include woman's age at birth, woman's
214 marital status, household headship (sex), Region of residence, area/location of residence,
215 Health insurance coverage status, and mother's employment status. The selection of
216 predictor variables in this study was based on existing literature that reported a significant
217 association with different maternal health care services.

218 **STATISTICAL ANALYSIS**

219 **Data analysis**

220 Data is analysed using STATA 14 statistical software. Socio-economic inequalities in the use of
221 skilled birth attendants during delivery were calculated using concentration index and curves

222 to assess the magnitude of the relative inequalities and the concentration of the problem in
223 the selected population. The ADePTsoftware version 6 was used to derive the concentration
224 indices and curves and after decomposed to examine which factors contributed the most to
225 the observed socioeconomic inequality among the population.

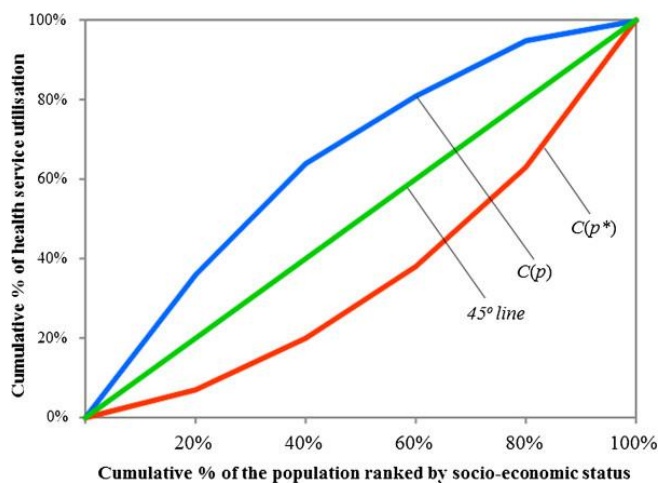
226 **Measuring inequalities**

227 In this study, we estimate and measure inequality in the health outcome using the
228 concentration indices (CCI) and concentration curves (CC). Before inequity can be measured,
229 the following are essential:

- 230 • An indicator of the health outcome of interest (dependent variable) i.e. delivery by a
231 skilled health professional.
- 232 • a stratifying factor capturing the socio-economic status against which the distribution
233 is to be assessed which in this study is household asset index, and
- 234 • a measure of socio-economic inequality to quantify the degree of inequity in the
235 indicator variable of interest (dependent variable).

236 This study uses concentration curves and indices to measure socioeconomic status and
237 inequalities that are essential in understanding the risk, burden and impact of socioeconomic
238 factors in accessing skilled birth attendants in Ghana. A concentration index (CI) is a relative
239 measure (-1 to +1) of the extent to which a health outcome is concentrated among the most
240 or least deprived groups. The larger the absolute value of the CI, the greater the inequality. A
241 concentration curve (CC) plots the aggregate percentage share of health in a population
242 against the aggregate percentage share of the population ranked according to their
243 socioeconomic status (wealth) from the lowest to highest [29,30]. The concentration curve

244 may fall above or below the perfect line of equality (45-degree line) defined as twice the area
 245 between the line of equality (45-degree line) and the concentration curves $C(p)$ and $C(p^*)$
 246 representing concentration among the poor and rich respectively as depicted in the diagram
 247 below.



248
 249 **Figure 1: Concentration curve for health care utilization**

250 In this study, concentration indices (CI) are calculated to measure the magnitude of the
 251 inequality in the socioeconomic factors. The concentration curve is defined as twice the area
 252 between the concentration curve and the line of inequality (the 45-degrees line). This is
 253 estimated as twice the covariance of the health care utilization and a person’s relative rank in
 254 terms of socioeconomic status, divided by the outcome mean [31]. This is presented in the
 255 formula below as;

$$256 \quad C = \frac{2}{\mu} cov(h_i, r_i) \tag{1}$$

257 Where C is the concentration index; h_i is the health variable index; r_i is the fractional rank of
 258 the individual i in the distribution of socioeconomic position; μ is the mean of the health
 259 variable and cov denotes the covariance.

260 The value of the CI measures the severity of socio-economic inequality. The value of the CI
261 may vary between -1 to +1. A negative value implies that the health outcome is concentrated
262 among those with lower socioeconomic status (i.e. the poor) showing a concentration curve
263 above the line of equality. A positive value shows concentration among the higher
264 socioeconomic status (i.e. the rich) showing a concentration curve below the line of equality.
265 A CI value of zero implies no inequality. The larger the absolute value of CI, the greater the
266 disparity [32].

267 **Decomposing the concentration Index**

268 Understanding and explaining the extent to which an underlying factor contributes to
269 socioeconomic inequality has become of great interest to researchers and policymakers. The
270 concentration index is commonly used to examine socioeconomic inequality in health [33].

271 Wagstaff et al explained that, one important use of the concentration index is its ability to
272 measure into a linear combination of concentration indices of its potential causes [34].

273 Decomposition estimations have mostly been used when the health outcome is a continuous
274 variable (numerical value that can be measured) using the Ordinary Least Square (OLS)
275 regression model. However, given a situation where the dependent variable is binary in nature
276 like the use of skilled birth attendance during delivery or not as used in this study, the
277 following need to be considered;

- 278 1. Regress the health outcome against its determinants using an appropriate model. This
279 helps in finding the coefficients of the predictor variables (β_k) as seen in the equation
280 (2) below:

$$281 \quad y = \alpha + \sum_k \beta_k x_k + \varepsilon. \quad (2)$$

282 Where y is the concentration index (C), α is the y-intercept, β and χ are the predictor variable
 283 of health care demand and ε is the error term. Since most health outcomes are binary in
 284 nature, a number of studies have used different methods – probit analysis [30] and the logit
 285 analysis [35]. Given the dichotomy nature of the dependent variable, the normalization
 286 process to ensure that the CI is quantified in the range of -1 to 1 for any given health outcome
 287 as suggested by Wagstaff [34] was applied.

288 2. Calculate the concentration indices of the health utilization outcome variable and the
 289 determinants using the equation below:

$$290 \quad C = \sum_k \left(\beta_k \frac{\bar{X}_k}{\mu} \right) C_k + \frac{GC_\varepsilon}{\mu} \quad (4)$$

291 Where μ is the mean of the outcome variable y in equation 2 (i.e. mean of the deliveries by
 292 SBA) \bar{X}_k is the mean of X_k , C_k is the concentration index of determinant X_k (defined
 293 analogously to C) and GC_ε is the generalised concentration index for the error term of (ε).

294 This equation shows that C is equal to the weighted sum of the concentration indices of the
 295 κ regressors, where the weight for X_k is the elasticity of y with respect to
 296 X_k ($\eta_k = \beta_k \frac{x_k}{\mu}$). The residual component as captured by the last term reflects the income-
 297 related inequality in health that is not explained by systematic variation in the regressors,
 298 which should approach zero for a well-specified model.

299 **ETHICAL CLEARANCE**

300 The study employed secondary household survey data therefore, no ethical issues was
 301 needed. However, permission for access to the Demographic and Health Survey dataset was

302 sought from the DHS program expert by registering on the website and submitting an online
 303 research project form for approval (www.dhsprogram.com).

304 **RESULTS**

305 **Sociodemographic characteristics of respondents**

306 **Table 1: Distribution of respondents by selected background characteristics**

Characteristics	Number	Percent (%)
Mother's age at birth		
15-24	376	28.81
25-34	636	48.74
35-49	293	22.45
Marital status		
Married	1145	87.74
Single	160	12.26
Place of residence		
Rural	786	60.23
Urban	519	39.77
Region		
Ashanti	132	10.11
Brong Ahafo	123	9.43
Central	89	6.82
Eastern	104	7.97
Greater Accra	118	9.04
Northern	130	9.96
Upper East	144	11.03
Upper West	209	16.02
Volta	137	10.50
Western	119	9.12

Wealth quintile		
Poorest (Q1)	434	33.26
Poorer (Q2)	274	21.00
Middle (Q3)	245	18.77
Richer (Q4)	200	15.33
Richest (Q5)	152	11.65
Mother's educational level		
No education	436	33.41
Primary	261	20
Secondary+	608	46.59
Husband/partner's educational level		
No Education	349	26.74
Primary	137	10.50
Secondary+	684	52.41
Mother's employment status		
No	384	29.43
Yes	921	70.57
Sex of Household Head		
Female	291	22.30
Male	1014	77.70
Health Insurance Coverage		
No	301	23.07
Yes	1004	76.93
Woman's autonomy		
Mother alone	233	20.53
Mother and husband/partner	605	53.30
Husband/partner	297	26.17

308 **Table 1** presents selected sociodemographics of respondents. Out of 1305 women that gave
 309 birth in the previous 12 months, 636 (49%) of the women who gave birth were between the
 310 ages of 25 – 34 years. More than three quarters (88%) of the women were married. One-third
 311 (33%) of the respondents were from the poorest quintiles and 11% from the richest quintile.
 312 Majority (47%) of the mothers had secondary education but one-third (33%) had no formal
 313 education. Considering partner’s educational level, 52% had secondary education or higher
 314 however, 27% had no education. Majority (71%) of the mothers were employed with only a few
 315 (29%) unemployed. Most (78%) of the households were headed by males and only 22% were
 316 headed by females. Approximately 77% of the respondents had health insurance coverage but
 317 23% had none. For women autonomy, more than half (53%) of the mothers decided on
 318 healthcare together with their husbands/patners.

319 **Non-Utilization of Skilled Birth Attendants**

320 **Table 2: Non-utilization of skilled birth attendants during delivery by selected socio-**
 321 **economic stratifiers.**

Characteristics	Number (N)		Total Number	Delivery by a non skilled birth attendants (%)
	No	Yes		
Place of residence				
Rural	311	475	786	39.57
Urban	55	464	519	10.60
Region				
Ashanti	35	97	132	26.52
Brong Ahafo	37	86	123	30.08
Central	5	84	89	5.62
Eastern	33	71	104	31.73
Greater Accra	43	75	118	36.44

Northern	13	117	130	10.00
Upper East	29	115	144	20.14
Upper West	130	79	209	62.20
Volta	12	125	137	8.76
Western	29	90	119	24.37
Wealth quintile				
Poorest (Q1)	194	240	434	44.70
Poorer (Q2)	102	172	274	37.23
Middle (Q3)	60	185	245	24.49
Richer (Q4)	8	192	200	4.00
Richest (Q5)	2	150	152	1.32
Mother's educational level				
No education	195	241	436	44.72
Primary	80	181	261	30.65
Secondary+	91	517	608	14.97
Husband/partner's educational level				
No education	157	192	349	44.99
Primary	36	101	137	26.28
Secondary+	142	542	684	20.76
Mother's employment status				
No	111	273	384	28.91
Yes	255	666	921	27.69
Health Insurance Coverage				
No	125	176	301	41.53
Yes	241	763	1004	24.00

322

323 From a total of 1,305 women who had live birth in the year prior to the interview, 28% of the
324 deliveries were unassisted by skilled birth attendants. A breakdown by various socioeconomic
325 stratifiers is provided in **Table 2**.

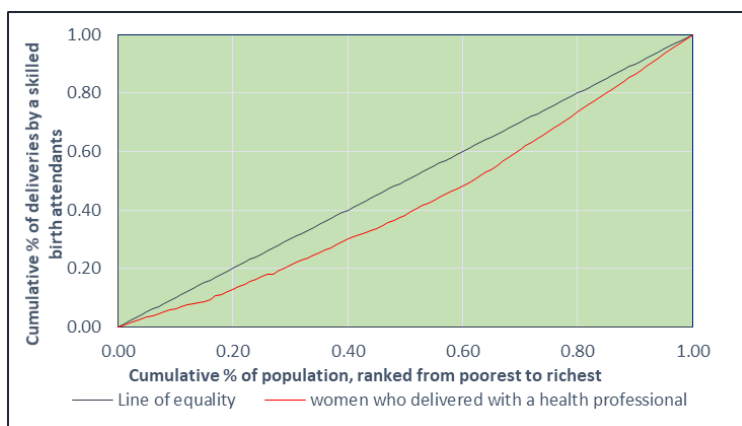
326 The use of skilled birth attendants differed according to the various socio-economic stratifiers
327 used in the study. Major differences are observed with place of residence, household wealth
328 index, mother's educational level, husband/partner's educational level, health insurance cover
329 and the region of residence. With regard to place of residence as seen from table 2 above, it
330 is observed that the proportion of births unattended by skilled birth attendants are more in
331 rural (39.6%) settlements compared to urban (10.6%) settlements. Among the household
332 wealth index, access to skilled birth delivery favors the richest households compared to the
333 poorest households as about 45% of births by the poorest household were unattended by
334 skilled birth attendants whereas only 1% of births by the richest households are unattended by
335 skilled birth attendants.

336 The lack of use of skilled birth attendants during childbirth were higher among the women
337 with no educational level (44.7%) compared to their highly educated counterpart (15%) that is
338 an education of secondary level and higher. Likewise, women whose husbands or partners
339 were not educated (45%) were less likely to use skilled birth attendants. Based on the region
340 of residence, the results of the study showed that upper west region has the highest
341 percentage (62.2%) of women who gave birth without the assistance of a skilled birth
342 attendant. This was followed by Greater Accra region (36.4%), eastern region (31.7%) and
343 Brong Ahafo region (30.1%). Furthermore, the Central, Volta and Northern regions were
344 observed to be the regions with the highest number of women who used skilled birth during
345 delivery at 94.4%, 91.2% and 90% respectively. Considering health insurance coverage, the
346 study findings revealed that women who were not covered with health insurance did not use
347 skilled birth attendants during delivery (41.5%) compared to women who had insurance cover

348 (24.0%). It was also observed that working mothers (29%) were more likely to use skilled birth
349 attendants during delivery.

350 **Inequality Associated Skilled Birth Attendant**

351 **Figure 2** below depicts the concentration curve of accessing skilled birth delivery during
352 delivery according to socioeconomic status. The figure shows the existence of wealth-related
353 inequality in accessing skilled birth attendant during delivery. The black diagonal line is the
354 equality line. The red curve below the black line represents the Concentration curve (CC). The
355 farther the CC is below the equality line, the more concentrated the health outcome is among
356 the rich. Therefore, concentration curve shows that accessing skilled birth attendants during
357 child delivery is concentrated among the rich. This indicates that women from rich household
358 are more likely to access skilled birth attendants compared to women from poor households.
359 This is further confirmed by a positive concentration index of 0.147 suggesting a pro-rich
360 inequality.



361
362 *Figure 2: Concentration curve (CC) showing access to skilled birth attendants during delivery according to socioeconomic status.*

363 **Decomposition of underlying factors**

364 **Table 3: Decomposing the socioeconomic inequalities in the utilization of skilled birth**
 365 **attendants during delivery in Ghana**

366

Variables	Elasticities	CI	Contribution to CI	Contribution to CI (%)
Health Insurance Coverage	0.1009	0.0441	0.00445	0.4%
Location of residence	0.0671	0.4311	0.02893	2.9%
Woman's educational level				
No education	-0.0106	-0.4825	0.0051	0.5%
Primary	0.0000	0.0000	0.0000	0.0%
Secondary+	0.0595	0.3013	0.0179	1.8%
Husband's educational level				
No education	-0.0219	-0.5563	0.0122	1.2%
Primary	-0.0025	-0.3136	0.0008	0.1%
Secondary	-0.0542	0.1732	-0.0094	-0.9%
Higher	0.0000	0.0000	0.0000	0.0%
Household wealth index				
Poorest	0.0000	0.0000	0.0000	0.0%
Poorer	0.0165	-0.3369	-0.0056	-0.6%
Middle	0.0304	0.0389	0.0012	0.1%
Richer	0.0794	0.4207	0.0334	3.3%
Richest	0.0595	0.811	0.0483	4.8%
Region of residence				
Ashanti	-0.0460	0.1219	-0.0056	-0.1%
Brong Ahafo	-0.0641	0.0922	-0.0059	-0.6%
Central	-0.0484	0.5632	-0.0273	-2.7%
Eastern	-0.0375	-0.125	0.0047	0.5%
Greater Accra	-0.0544	-0.0105	0.0006	0.1%
Northern	-0.0692	0.3392	-0.0235	-2.3%
Upper East	-0.0305	-0.1418	0.0043	0.4%
Upper West	-0.1001	-0.6405	0.0641	6.4%

Volta	0.0000	0.0000	0.0000	0.0%
Western	-0.0085	-0.5068	0.0043	0.4%
Residual (unexplained) = 0.0004				

367

368 **Table 3** presents the results of the decomposition analysis that clarifies the degree to which
 369 each observed determinant of delivery by a skilled birth attendant contributes to wealth-
 370 related inequality in the utilization of skilled birth attendants during delivery. The contribution
 371 of each determinant depends on two factors. 1) Its impact on the delivery by a skilled birth
 372 attendants (elasticity). And 2) how unequally distributed over wealth the determinant is
 373 (concentration index).

374 The results of decomposition analysis are shown in Table 3. The concentration index for
 375 delivery in the presence of a skilled birth attendant showed that the estimated value of the
 376 relative contribution to the concentration index was negative in some socioeconomic factors
 377 such as woman’s employment status (-0.01), mother’s educational level (no education=-0.48),
 378 husband’s educational level (no education=-0.56, primary=-0.31), household wealth index
 379 (poorer=-0.34) and the region of residence (Eastern=-0.12, Greater Accra=-0.01, Upper East=-
 380 0.14, Upper West=-0.64, Western=-0.51). This therefore implied that, individuals who were
 381 worse off in socioeconomic status were more disadvantaged in accessing skilled birth
 382 attendants during delivery. The negative concentration indices is associated with poorer
 383 households.

384 A pro-rich utilization of skilled birth delivery during child birth among Ghanaian women
 385 between the age of 15-49 years old was seen among women who had health insurance
 386 coverage, urban settlers, women who had had some form of education, husband’s with

387 secondary and higher educational level, middle and rich households, women who were
388 located in the Ashanti, Brong Ahafo, Central and Northern regions.

389 **DISCUSSION**

390 The study has attempted to assess inequities in accessing skilled birth attendants among
391 women during delivery in Ghana using the 2014 Ghana Demographic and Health Survey. The
392 findings reveals a pro-rich inequality (i.e. positive CI), suggesting that access to skilled birth
393 attendants was concentrated among women with higher socioeconomic status. The finding
394 are consistent with results of other studies [21,36,37].

395 Place of residence, mother's educational level, husband's educational level, health insurance
396 coverage, household wealth and women's autonomy were the main factors associated with
397 the use of non-skilled birth attendance during delivery. Presentation of the discussion will
398 follow this sequence.

399 Rural residence in this finding of the study was a hindering factor to the non-use of skilled
400 birth attendants during delivery in Ghana. This finding is consistent with previous studies
401 conducted in India, Sudan and Tanzania [16,19,38] which reported greater use of skilled birth
402 attendants during delivery among urban mothers than rural mothers. This may be due to the
403 fact that women in the rural settlement may not access skilled birth attendants due to lack of
404 health facilities. In the rural areas only few health facilities for skilled delivery exist and
405 pregnant women may need to walk a long distance to access such a facility because
406 transportation difficulties. On the other hand, women in urban areas could easily access
407 skilled birth because there are many such facilities in the urban areas compared to rural areas.

408 In urban areas, transportation may not be a problem and the mother does not need to walk a
409 long distance to seek skilled birth attendants during child delivery.

410 According to the findings of this study, mothers with no educational level had the highest non-
411 utilization rate of skilled birth attendants than women who had secondary or higher
412 education. This is in agreement with other studies that revealed that better educated mothers
413 utilized skilled birth attendants during child delivery than mothers with no education[39,40].
414 Studies have showed that education is one of the strongest factors in skilled birth utilization
415 as it increases literacy rate thereby women get to be aware of skilled delivery services
416 available at health facilities and accept modern medical practices [39,41,42]. Similarly,
417 mothers whose partners had no formal education had the highest non utilization rate of
418 skilled birth attendants at child birth compared to mothers with partners with secondary or
419 higher education. A study in northern Ghana indicated that women with partners with higher
420 education were more likely to use skilled birth attendants during delivery [43]. This low use of
421 skilled birth attendants may be as a result of low male partner involvement in maternal health
422 care.

423 Furthermore, low health insurance coverage was associated with a reduced skilled birth
424 attendant during delivery. The study finding was in line with prior studies in Burkina Faso and
425 Ghana which showed that high health insurance coverage contributes greatly to the
426 utilization of mothers to skilled birth attendants(attendance) during delivery[44-46]. High
427 health insurance coverages does not only enable women initiate access to skilled birth
428 attendants but also insures them from high cost of delivery care. However, in Ghana, although
429 maternal health services are free for insured clients, there is low enrollment on the national

430 health insurance scheme [47]. This is as a result of the lack of trust patients have in the
431 insurance scheme as a result of the long waiting time while using the health insurance, delay
432 in paying claims by the health insurance authority to health facilities as well as patients still
433 paying for some services which are free to an insured patient [47].

434 Household wealth was found to significantly influence the utilization of skilled birth
435 attendants during delivery. The findings of this study shows that household poverty is
436 significantly associated with low utilization of skilled birth attendants during delivery. This is
437 consistent with previous studies in Nigeria, Vanuatu, and Namibia [21,39,48]. This may be due
438 to high financial burden such as the cost of transportation, inpatient cost as well as delivery
439 cost. Rich mothers may use skilled birth delivery because they could access the financial cost
440 associated with skilled birth delivery than the poor mothers. For instance in the case of
441 caesarean section the poor mother may find it difficult to pay for such service so the family
442 may feel hesitant to access the service even though they may be aware of its necessity.

443 Woman's autonomy influenced the use of skilled birth attendants during delivery. The study
444 results indicated that situations where only the mother's partner decided the means of health
445 care accessibility for the mother, mothers are less likely to use skilled birth attendants during
446 delivery compared to the mother who decides on her own health care. This is consistent with
447 studies in Ethiopia, Kenya and Nepal which revealed that women who decided on their own
448 health care were more likely to get skilled assistance during delivery[28,49,50]. This could be
449 seen from the cultural point of view where the man is the head of the family. This enables men
450 to decide on everything concerning the family including their healthcare accessibility.

451 **CONCLUSION**

452 This study looked at the extent to which socioeconomic inequalities affected the use of skilled
453 birth attendants during child delivery among Ghanaian women. The study used the 2014
454 Ghana Demographic and Health Survey (GDHS) data and applied the decomposition analysis
455 to analyse the socioeconomic inequalities in the use of skilled birth attendants during delivery.
456 The study revealed the existence of inequalities in the use of skilled birth attendants during
457 delivery in Ghana. Women from rural areas, women with no education, male partners with no
458 formal education, women with no health insurance cover and partners who decide on the
459 means of health care accessibility of their partners were observed to contribute to low
460 utilization of skilled birth attendants during delivery. This calls for the attention of the
461 government of Ghana through the Ministry of Health, Ghana Health Service, as well as other
462 stakeholders interested in the reduction of maternal mortality in addressing the observed
463 gaps relating to the utilization of skilled delivery services among women. Furthermore, male
464 partner involvement in maternal health care should be encouraged on the need for skilled
465 birth delivery services for their partners. In addition, there is the need for more health facilities
466 with skilled birth attendants like midwives to be situated in rural areas. Community-based
467 Health Planning and Services (CHPS) should be strengthened to improve maternal healthcare
468 services and utilization to those in the rural communities.

469 In conclusion, reducing these observed inequities in access to skilled birth attendants would
470 contribute greatly to the achievement of the SDG goal 3 target of a maximum of 70 maternal
471 deaths per 100,000 live births by the year 2030.

472 **DECLARATIONS**

473 **Ethics Approval and Consent to Participation**

474 The study employed secondary household survey data and so no ethical issues was needed.
475 Therefore, in order to have access to the Demographic and Health Survey datasets,
476 permission was sought from the DHS program expert by registering on the website and
477 submitting an online research project form for dataset access approval. For this study, ethical
478 approval was received from the University of Cape Town Human Research Ethics Committee
479 (HREC).

480 **Consent for Publication**

481 Not Applicable

482 **Availability of Data and Materials**

483 This study used secondary data from the 2014 Ghana Demographic and Health Survey (GDHS)
484 of women who gave birth in the past year prior to the survey. The dataset for this study can
485 be accessed on the Demographic and Health Survey website at www.dhsprogram.org.

486 **Competing of interests**

487 The authors declare that there are no competing interests.

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489 There was no funding for this study.

490 **Authors' Contributions**

491 AK and EB analysed and interpreted the data. JHA and OA substantively revised the
492 manuscript. And all authours read and approved the final draft of the manuscript.

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497 **REFERENCE**

498 1. Starrs A [editor]. The safe motherhood action agenda : priorities for the next decade.

499 1997;1–107. Available from:

500 [http://documents.worldbank.org/curated/en/1997/10/442078/safe-motherhood-action-
501 agenda-priorities-next-decade](http://documents.worldbank.org/curated/en/1997/10/442078/safe-motherhood-action-
501 agenda-priorities-next-decade)

502 2. United Nations. Transforming our world: The 2030 agenda for sustainable development

503 [Internet]. 2015. Available from:

504 [https://sustainabledevelopment.un.org/content/documents/7891Transforming Our World.
505 pdf](https://sustainabledevelopment.un.org/content/documents/7891Transforming%20Our%20World.pdf)

506 3. AbouZahr C, Wardlaw T. Maternal mortality at the end of a decade: signs of progress? Bull.

507 World Health Organ. [Internet]. 2001;79:561–8. Available from:

508 [http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=med4&AN=11
509 436479](http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=med4&AN=11
509 436479)

510 [http://sfx.scholarsportal.info/uhn?sid=OVID:medline&id=pmid:11436479&id=doi:&issn=0042-
511 9686&isbn=&volume=79&issue=6&spage=561&pages=561-
512 8&date=2001&title=Bulletin+of+the](http://sfx.scholarsportal.info/uhn?sid=OVID:medline&id=pmid:11436479&id=doi:&issn=0042-
511 9686&isbn=&volume=79&issue=6&spage=561&pages=561-
512 8&date=2001&title=Bulletin+of+the)

513

514 4. WHO, UNICEF, UNFPA, World_Bank_Group, UNPD. Trends in maternal mortality: 1990 to

515 2015. [Internet]. Geneva, Switzerland; 2015. Available from:

http://apps.who.int/iris/bitstream/10665/194254/1/9789241565141_eng.pdf

- 516 5. Graham WJ, Bell JS, Bullough CHW. Can skilled attendance at delivery reduce maternal
517 mortality in developing countries? *Stud. HSO&P.* 2001;17:97–129.
- 518 6. WHO. Trends in maternal mortality 2000 to 2017: estimates by WHO, UNICEF, UNFPA,
519 World Bank Group and the United Nations Population Division. [Internet]. Geneva World
520 Heal. Organ. 2019. Available from: <https://apps.who.int/iris/handle/10665/327596>
- 521 7. GSS, GHS, ICF. 2017 Ghana Maternal Health Survey Key Findings [Internet]. Rockville,
522 Maryland, USA; 2017. Available from: <https://dhsprogram.com/pubs/pdf/SR251/SR251.pdf>
- 523 8. WHO, UNICEF, UNFPA, World Bank Group, UNPD. Maternal mortality in 1990-2015
524 [Internet]. 2015. Available from: www.who.int/gho/maternal_health/countries/gha.pdf
- 525 9. Ghana Health Service. Family Health Division Annual Report [Internet]. Accra; 2016.
526 Available from: [http://jknterengganu.moh.gov.my/index.php/muat-turun/category/19-free-](http://jknterengganu.moh.gov.my/index.php/muat-turun/category/19-free-paper-oral?download=53:01-final-teenage-pregnancy-conference)
527 [paper-oral?download=53:01-final-teenage-pregnancy-conference](http://jknterengganu.moh.gov.my/index.php/muat-turun/category/19-free-paper-oral?download=53:01-final-teenage-pregnancy-conference)
- 528 10. Ghana Health Service. Reproductive health strategies plan: 2007-2011 [Internet]. Ghana
529 Heal. Serv. 2007. Available from:
530 http://www.wpro.who.int/health_topics/reproductive_health/general_info.htm
- 531 11. Ghana Statistical Service (GSS), Ghana Health Service (GHS) II. Ghana Demographic and
532 Health Survey. Key Indicators. Ghana Demographic Heal. Servey. Rockville, Maryland; 2014.
- 533 12. Levesque J-F, Harris MF, Russell G. Patient-centred access to health care: conceptualising
534 access at the interface of health systems and populations. *Int. J. Equity Health* [Internet].
535 *International Journal for Equity in Health*; 2013;12:18. Available from:
536 <http://www.equityhealthj.com/content/12/1/18>
- 537 13. Andersen RM. Andersen and Newman Framework of Health Services Utilization. *J. Health*

538 Soc. Behav. [Internet]. 1995;36:1–10. Available from:
539 <http://www.ncbi.nlm.nih.gov/pubmed/7738325>

540 14. Gage AJ. Barriers to the utilization of maternal health care in rural Mali. Soc. Sci. Med.
541 2007;65:1666–82.

542 15. De Allegri M, Ridde V, Louis VR, Sarker M, Tiendrebéogo J, Yé M, et al. Determinants of
543 utilisation of maternal care services after the reduction of user fees: A case study from rural
544 Burkina Faso. Health Policy (New York). [Internet]. Elsevier Ireland Ltd; 2011;99:210–8.
545 Available from: <http://dx.doi.org/10.1016/j.healthpol.2010.10.010>

546 16. Mugo NS, Agho KE, Dibley MJ. Risk Factors for Non-use of Skilled Birth Attendants:
547 Analysis of South Sudan Household Survey, 2010. Matern. Child Health J. 2016;20:1266–79.

548 17. Stanton C, Blanc AK, Croft T, Choi Y. Skilled Care At Birth in the Developing World:
549 Progress To Date and Strategies for Expanding Coverage. J. Biosoc. Sci. [Internet]. UCT
550 University of Cape Town Libraries; 2007;39:109. Available from:
551 http://www.journals.cambridge.org/abstract_S0021932006001271

552 18. Liu X, Gao W, Yan H. Measuring and decomposing the inequality of maternal health
553 services utilization in Western Rural China. BMC Health Serv. Res. [Internet]. BMC Health
554 Services Research; 2014;14:102. Available from: BMC Health Services Research

555 19. Prusty RK, Gouda J, Pradhan MR. Inequality in the Utilization of Maternal Healthcare
556 Services in Odisha, India. Int. J. Popul. Res. [Internet]. 2015;2015:e531485. Available from:
557 [http://www.hindawi.com/journals/ijpr/2015/531485/abs/%5Cnhttp://downloads.hindawi.com/j](http://www.hindawi.com/journals/ijpr/2015/531485/abs/%5Cnhttp://downloads.hindawi.com/journals/ijpr/2015/531485.pdf%5Cnhttp://www.hindawi.com/journals/ijpr/2015/531485/)
558 [ournals/ijpr/2015/531485.pdf%5Cnhttp://www.hindawi.com/journals/ijpr/2015/531485/](http://www.hindawi.com/journals/ijpr/2015/531485/)

559 20. Pulok MH, Sabah MN-U, Uddin J, Enemark U. Progress in the utilization of antenatal and

560 delivery care services in Bangladesh: where does the equity gap lie? BMC Pregnancy
561 Childbirth [Internet]. BMC Pregnancy and Childbirth; 2016;16:200. Available from:
562 <http://bmcpregnancychildbirth.biomedcentral.com/articles/10.1186/s12884-016-0970-4>
563 21. Zere E, Oluwole D, Kirigia JM, Mwikisa CN, Mbeeli T. Inequities in skilled attendance at
564 birth in Namibia: a decomposition analysis. BMC Pregnancy Childbirth [Internet]. 2011;11:34.
565 Available from: [http://www.scopus.com/inward/record.url?eid=2-s2.0-
566 79955866940&partnerID=tZOtx3y1](http://www.scopus.com/inward/record.url?eid=2-s2.0-79955866940&partnerID=tZOtx3y1)
567 22. American Psychological Association TF on SS. Socioeconomic status [Internet].
568 Washington, DC; 2007. Available from:
569 <https://www.apa.org/pi/ses/resources/publications/task-force-2006.pdf>
570 23. Rutstein SO, Johnson K. The DHS Wealth Index. DHS Comp. Reports No. 6. 2004;1–71.
571 24. Pirani E. Wealth Index. In: Michalos AC, editor. *Encycl. Qual. Life Well-Being Res.*
572 [Internet]. Dordrecht: Springer Netherlands; 2014. p. 7017–8. Available from:
573 https://doi.org/10.1007/978-94-007-0753-5_3202
574 25. Filmer D, Pritchett LH. Estimating Wealth Effects Without Expenditure Data - or Tears.
575 *Demography*. 2001;38:115–32.
576 26. Shavers VL. Measurement of socioeconomic status in health disparities research. *J. Natl.*
577 *Med. Assoc.* 2007;99:1013–23.
578 27. Adler NE, Newman K. Socioeconomic disparities in health: Pathways and policies. *Health*
579 *Aff.* 2002;21:60–76.
580 28. Adhikari R. Effect of Women’s autonomy on maternal health service utilization in Nepal:
581 A cross sectional study. *BMC Womens. Health* [Internet]. BMC Women’s Health; 2016;16:1–7.

582 Available from: <http://dx.doi.org/10.1186/s12905-016-0305-7>

583 29. Kakwani N, Wagstaff A, van Doorslaer E. Socioeconomic inequalities in health:
584 Measurement, computation, and statistical inference. *J. Econom.* [Internet]. 1997;77:87–103.
585 Available from: <http://linkinghub.elsevier.com/retrieve/pii/S0304407696018076>

586 30. van Doorslaer E, Koolman X, Jones AM. Explaining income-related inequalities in doctor
587 utilisation in Europe. *Health Econ.* 2004;13:629–47.

588 31. O’Donnell O, van Doorslaer E, Wagstaff A, Lindelow M. The Concentration Index. *Anal.*
589 *Heal. Equity Using Househ. Surv. Data.* 2007;95–108.

590 32. The World Bank. Measuring and Explaining Inequity in Health Service Delivery. *J.*
591 *Econom.* 2000. p. 177–86.

592 33. Heckley G, Gerdtham UG, Kjellsson G. A general method for decomposing the causes of
593 socioeconomic inequality in health. *J. Health Econ.* [Internet]. Elsevier B.V.; 2016;48:89–106.
594 Available from: <http://dx.doi.org/10.1016/j.jhealeco.2016.03.006>

595 34. Wagstaff A, van Doorslaer E, Eddy O’Donnell O, Lindelow M. Explaining Socioeconomic-
596 Related Health Inequality: Decomposition of the Concentration Index. *Anal. Heal. Equity*
597 *Using Househ. Surv. Data* [Internet]. 2003;159–64. Available from:
598 [http://www.worldbank.org/en/topic/health/publication/analyzing-health-equity-using-](http://www.worldbank.org/en/topic/health/publication/analyzing-health-equity-using-household-survey-data)
599 [household-survey-data](http://www.worldbank.org/en/topic/health/publication/analyzing-health-equity-using-household-survey-data)

600 35. Hosseinpoor AR, Van Doorslaer E, Speybroeck N, Naghavi M, Mohammad K, Majdzadeh
601 R, et al. Decomposing socioeconomic inequality in infant mortality in Iran. *Int. J. Epidemiol.*
602 2006;35:1211–9.

603 36. Adeyanju O, Tubeuf S, Ensor T. Socio-economic inequalities in access to maternal and

604 child healthcare in Nigeria: changes over time and decomposition analysis. *Health Policy*
605 *Plan*. [Internet]. 2017; Available from: [https://academic.oup.com/heapol/article-](https://academic.oup.com/heapol/article-lookup/doi/10.1093/heapol/czx049)
606 [lookup/doi/10.1093/heapol/czx049](https://academic.oup.com/heapol/article-lookup/doi/10.1093/heapol/czx049)

607 37. Kamal SMM, Hassan CH, Kabir MA. Inequality of the use of skilled birth assistance among
608 rural women in Bangladesh: facts and factors. *Asia. Pac. J. Public Health*. 2015;27:NP1321-32.

609 38. Mpembeni RN, Killewo JZ, Leshabari MT, Massawe SN, Jahn A, Mushi D, et al. Use
610 pattern of maternal health services and determinants of skilled care during delivery in
611 Southern Tanzania: implications for achievement of MDG-5 targets. *BMC Pregnancy*
612 *Childbirth* [Internet]. 2007;7:29. Available from:
613 <http://bmcpregnancychildbirth.biomedcentral.com/articles/10.1186/1471-2393-7-29>

614 39. Obiyan MO, Kumar a. Socioeconomic Inequalities in the Use of Maternal Health Care
615 Services in Nigeria: Trends Between 1990 and 2008. *SAGE Open*. 2015;5.

616 40. Kanini CM, Kimani H, Mwaniki P. Utilisation of skilled birth attendants among women of
617 reproductive age in Central District, Kitui County, Kenya. *African J. Midwifery Women's Heal.*
618 [Internet]. 2013;7:80–6. Available from:
619 [http://search.ebscohost.com/login.aspx?direct=true&db=cin20&AN=108010945&site=ehost-](http://search.ebscohost.com/login.aspx?direct=true&db=cin20&AN=108010945&site=ehost-live)
620 [live](http://search.ebscohost.com/login.aspx?direct=true&db=cin20&AN=108010945&site=ehost-live)

621 41. Raghupathy S. Education and the use of maternal health care in Thailand. *Soc. Sci. Med.*
622 1996;43:459–71.

623 42. Gitimu A, Herr C, Oruko H, Karijo E, Gichuki R, Ofware P, et al. Determinants of use of
624 skilled birth attendant at delivery in Makueni, Kenya: a cross sectional study. *BMC Pregnancy*
625 *Childbirth* [Internet]. 2015;15:1–7. Available from: <http://www.biomedcentral.com/1471->

626 2393/15/9

627 43. Dickson KS, Amu H. Determinants of Skilled Birth Attendance in the Northern Parts of
628 Ghana. 2017;2017.

629 44. Gnawali DP, Pokhrel S, Sié A, Sanon M, De Allegri M, Souares A, et al. The effect of
630 community-based health insurance on the utilization of modern health care services:
631 Evidence from Burkina Faso. *Health Policy (New. York)*. 2009;90:214–22.

632 45. Browne JL, Kayode GA, Arhinful D, Fidder SAJ, Grobbee DE, Klipstein-Grobusch K. Health
633 insurance determines antenatal , delivery and postnatal care utilisation : evidence from the
634 Ghana Demographic and Health Surveillance data. *BMJ Open [Internet]*. 2016;6:e008175.

635 Available from:

636 [http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=4800135&tool=pmcentrez&rend](http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=4800135&tool=pmcentrez&rendertype=abstract)
637 [ertype=abstract](http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=4800135&tool=pmcentrez&rendertype=abstract)

638 46. Wang W, Temsah G, Mallick L. Health Insurance Coverage and its Impact on Maternal
639 Health Care Utilization in Low- And Middle-Income Countries. *DHS Anal. Stud. No.45*.
640 Rockville, Maryland; 2014.

641 47. NHIA. National Health Insurance Scheme, Annual Report 2010. *J. Infect. Dis.* 2010;

642 48. Rahman M, Haque SE, Mostofa G, Tarivonda L, Shuaib M. Wealth inequality and
643 utilization of reproductive health services in the Republic of Vanuatu : insights from the
644 multiple indicator cluster survey , 2007. 2011;

645 49. Asweto CO 1,3. OJO. *AJR. Women Empowerment and Skilled Attendance/Facility Delivery*
646 *in a Rural Community of Western Kenya*\n. *IOSR J. Nurs. Heal. Sci. [Internet]*. 2014;3:48–53.

647 Available from: <http://www.iosrjournals.org/iosr-jnhs/papers/vol3-issue2/Version->

648 2/103224853.pdf

649 50. Tiruneh FN, Chuang KY, Chuang YC. Women's autonomy and maternal healthcare service
650 utilization in Ethiopia. BMC Health Serv. Res. BMC Health Services Research; 2017;17:1–12.

651