# Socioeconomic Inequalities in Access to Skilled Birth Attendants During Childbirth in Ghana: A Decomposition Analysis

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2 **Ghana: A decomposition analysis**

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24 **Abstract**

25 **Background:** 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 **Methods:** This study analyzed data from the 2014 Ghana Demographic and Health Survey

33 (GDHS). Concentration index (CI) and concentration curves (CC) were employed to measure

34 the magnitude of socioeconomic inequality in the use of skilled birth attendants during child

35 delivery. The concentration index was decomposed to identify the underlying factors driving

36 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

## Background

48

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 world[1].

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 that the global rate of 210 deaths per live

89    births [7]. Furthermore, the 2010 UNDP Report on maternal mortality indicated that nearly

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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, 96% of births were assisted by skilled birth attendants among

107  the rich, and only 49% were assisted for the poor [11]. These differences in the use of skilled

108  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   **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    **Study variable**

151    **Outcome variable**

152    The outcome variable for this study is whether women who had delivered in year preceding

153    the interview year had deliveries assisted by skilled birth attendants or not. The outcome

154    variable is a binary outcome; a value of "1" was given if the delivery was assisted by a skilled

155    birth attendant and "0" if the delivery was not. A skilled birth attendant in this study was

156    defined as a trained and licenced health professional that is a doctor, nurse/midwife or

157    community health officer who provides basic and emergency health care services to women

158    and their new-borns during pregnancy, delivery and immediate postpartum period that is the

159    first 48 hours after delivery. Information on delivery assisted or attended by a skilled birth

160    attendant was based on the question "*Who assisted in the delivery of (NAME OF CHILD)*" in the

161    women's qestionnaire?

162    **Predictor variables**

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

164    Socioeconomic status is the social standing or class of an individual or group. It is often

165    measured as a combination of education, income/wealth and occupation. Examinations of

166    socioeconomic status often reveal inequities in health [22].

167    **Household wealth index**

168    Household wealth index is a composite measure of the cumulative living standard of a

169    household and is used as a measure of economic status. The household wealth index is

170    considered a more reliable measure than income and consumption because it represents a

171    long-term standard of living of a household which allows for the identification of problems

172    particular to the poor, such as unequal access to health care, as well as those particular to the

173    wealthy, such as, in Africa [23]. The wealth index is calculated using a household's ownership

174    of selected items such a televisions and bicycles; materials used for housing construction; and

175    types of water access and sanitation facilities [24]. A technique known as the principal

176    component analysis was developed by Filmer and Pritchett to calculate the wealth index [25].

177    The wealth index as generated in the DHS separates all interviewed households into five

178    wealth quintiles making the difference between the poor and rich very evident [23]. For the

179    purposes of the study, wealth was grouped into 5 quintiles – poorest ($Q_1$), poorer ($Q_2$), Middle

180    ($Q_3$), richer ($Q_4$) and richest ($Q_5$).

181    **Educational Level**

182    Educational level is one of the most widely used indicators of socioeconomic status.

183    Educatonal has been considered to most basic component of socioeconomic status as a result

184    of its influence on skillset for acquiring jobs and potential earnings [26] which may eventually

185    affect health outcomes. In addition higher educational levels have been associated with

186    higher socioeconomic status hence improved health outcomes. For example, people with

187    higher educational level may have better economic conditions helps them afford better and

188    quality health care services as well as develop better information processing and abilities

189    required to make better informed decisions about their health [27]. One major reason why

190    educational level is used as a measure of socioeconomic status for adult is the reduction in

191    the likelihood of reverse causation as education is complete before health status delines [10].

192    For the purposes of theis study, education is self-reported and the Ghana Demographic and

193    Health Survey (GDHS) collects the highest level of education attained by both women and

194    their husbands/partners. This was grouped into three (3) no education, primary education,

195    and secondary + education.

196    **Occupation / Employment Status**

197    Occupation as a measure of socioeconomic status, encompasses both income and education

198    hence its influence on health. Occupational status reflects the educational attainment

199    required to obtain the job and income levels that vary with different jobs and within ranks of

200  occupations . This is used to measure the effect of socioeconomic status on health due to its

201  role in positiong individuals within the social structure [26]. There are various ways through

202  which education might influence health. For example, persons with employment are able to

203  seek health care in time since they can afford the services provided [27].

204  In this study, occupation will be measured using employment status which is categorized into

205  two groups: employed or unemployed.

206  **Other socio-economic variables**

207  Women autonomy is an important predictor variable [28]. Woman's autonomy was defined in

208  the GDHS as their ability to decide on their own health in the GDHS questionnaire and was

209  derived from the question: a *person who usually decides on mother's health care* from the

210  questionnaire. The response options are: (a) mother alone, (b) mother and husband/partner,

211  (c) husband/partner alone and (d) other (i.e. any other person besides the fore mentioned).

212  However, for this study, the responses were limited to three (3): (1) mother alone, (2) mother

213  and husband/partner, (3) husband/partner alone.

214  Other predictor variables of interest for this study include woman's age at birth,  woman's

215  marital status, household headship (sex), Region of residence, area/location of residence,

216  Health insurance coverage status, and mother's employment status. The selection of

217  predictor variables in this study was based on existing literature that reported a significant

218  association with different maternal health care services.

219  **STATISTICAL ANALYSIS**

220  **Data analysis**

221 Data is analysed using STATA 14 statistical software. Socio-economic inequalities in the use of

222 skilled birth attendants during delivery were calculated using concentration index and curves

223 to assess the magnitude of the relative inequalities and the concentration of the problem in

224 the selected population. The ADePTsoftware version 6 was used to derive the concentration

225 indices and curves and after decomposed to examine which factors contributed the most to

226 the observed socioeconomic inequality among the population.

227 **Measuring inequalities**

228 In this study, we esitimate and measure inequaliity in the health outcome using the

229 concentration indices (CI) and concentration curves (CC). Before inequity can be measured,

230 the following are essential:

231 • An indicator of the health outcome of interest (dependent variable) i.e. delivery by a

232 skilled health professional.

233 • a stratifying factor capturing the socio-economic status against which the distribution

234 is to be assessed which in this study is household asset index, and

235 • a measure of socio-economic inequality to quantify the degree of inequity in the

236 indicator variable of interest (dependent variable).

237 This study uses concentration curves and indices to measure socioeconomic status and

238 inequalities that are essential in understanding the risk, burden and impact of socioeconomic

239 factors in accessing skilled birth attendants in Ghana.  A concentration index (CI) is a relative

240 measure (-1 to +1) of the extent to which a health outcome is concentrated among the most

241 or least deprived groups. The larger the absolute value of the CI, the greater the inequality. A

242 concentration curve (CC) plots the aggregate percentage share of health in a population

243     against the aggregate percentage share of the population ranked according to their

244     socioeconomic status (wealth) from the lowest to highest [29,30]. The concentration curve

245     may fall above or below the perfect line of equality (45-degree line) defined as twice the area

246     between the line of equality (45-degree line) and the concentration curves C(p) and C(p*)

247     representing concentration among the poor and rich respectively. This is depicted in **figure 1.**

248     In this study, concentration indices (CI) are calculated to measure the magnitude of the

249     inequality in the socioeconomic factors. The concentration curve is defined as twice the area

250     between the concentration curve and the line of inequality (the 45-degrees line). This is

251     estimated as twice the covariance of the health care utilization and a person's relative rank in

252     terms of socioeconomic status, divided by the outcome mean [31]. This is presented in the

253     formula below as;

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

255     Where C is the concentration index; $h_i$ is the health variable index; $r_i$ is the fractional rank of

256     the individual $i$ in the distribution of socioeconomic position; µ is the mean of the health

257     variable and $cov$ denotes the covariance.

258     The value of the CI measures the severity of socio-economic inequality. The value of the CI

259     may vary between −1 to +1. A negative value implies that the health outcome is concentrated

260     among those with lower socioeconomic status (i.e. the poor) showing a concentration curve

261     above the line of equality. A positive value shows concentration among the higher

262     socioeconomic status (i.e. the rich) showing a concentration curve below the line of equality.

263     A CI value of zero implies no inequality. The larger the absolute value of CI, the greater the

264     disparity [32].

**Decomposing the concentration Index**

265

266 Understanding and explaining the extent to which an underlying factor contributes to

267 socioeconomic inequality has become of great interest to researchers and policymakers. The

268 concentration index is commonly used to examine socioeconomic inequality in health [33].

269 Wagstaff et al explained that, one important use of the concentration index is its ability to

270 measure into a linear combination of concentration indices of its potential causes [34].

271 Decomposition estimations have mostly been used when the health outcome is a continuous

272 variable (numberical value that can be measured) using the Ordinary Least Square (OLS)

273 regression model. However, given a situation where the dependent variable is binary in nature

274 like the use of skilled birth attendance during delivery or not as used in this study, the

275 following need to be considered;

276     1. Regress the health outcome against its determinants using an appropriate model. This

277     helps in finding the coefficients of the predictor variables $(\beta_k)$ as seen in the equation

278     (2) below:

279 $$y = \alpha + \sum_k \beta_k x_k + \varepsilon. \tag{2}$$

280 Where *y* is the concentration index *(C)*, α is the y-intercept, β and χ are the predictor variable

281 of health care demand and ε is the error term. Since most health outcomes are binary in

282 nature, a number of studies have used different methods – probit analysis [30] and the logit

283 analysis [35]. Given the dichotomy nature of the dependent variable, the normalization

284 process to ensure that the CI is quantified in the range of-1 to 1 for any given health outcome

285 as suggested by Wagstaff [34] was applied.

286     2. Calculate the concentration indices of the health utilization outcome variable and the

287        determinants using the equation below:

288    $$C = \sum_k \left( \beta_\kappa \frac{\overline{x}_\kappa}{\mu} \right) C_k + \frac{GC_\varepsilon}{\mu} \tag{4}$$

289    Where $\mu$ is the mean of the outcome variable $y$ in equation 2 (i.e. mean of the deliveries by

290    SBA) $\overline{x}_k$ is the mean of $x_k$, $C_\kappa$ is the concentration index of determinant $x_k$ (defined

291    analogously to $C$) and $GC_\varepsilon$ is the generalised concentration index for the error term of $(\varepsilon)$.

292    This equation shows that $C$ is equal to the weighted sum of the concentration indices of the

293    $\kappa$ regressors, where the weight for $x_\kappa$ is the elasticity of $y$ with respect to

294    $x_\kappa \left( \eta_\kappa = \beta_\kappa \frac{x_k}{\mu} \right).$ The residual component as captured by the last term reflects the income-

295    related inequality in health that is not explained by systematic variation in the regressors,

296    which should approach zero for a well-specified model.

297    **ETHICAL CLEARANCE**

298    The GDHS 2014 sought ethical approval from the GHS Ethical Review Committee, Ghana and

299    ICF Macro International Review Board, Maryland, USA. Further, a written informed concent

300    from each participant before enrolment was sought. For this study, ethical approval was

301    received from the University of Cape Town Human Research Ethics Committee (HREC).

302    **RESULTS**

303    We included 1305 women in the analysis who had at least one birth in the past year preseeding

304    the survey. We considered women who accessed skilled birth attendants during childbirth in

305    their last pregnancy.

**Sociodemographic characteristics of respondents**

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

**Non-Utilization of Skilled Birth Attendants**

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

The use of skilled birth attendants differed according to the various socio-economic stratifiers used in the study. Major differences are observed with place of residence, household wealth index, mother's educational level, husband/partner's educational leve, health insurance cover and the region of residence. With regard to place of residence as seen from table 2 above, it is observed that the proportion of births unattended by skilled birth attendants are more in rural (39.6%) settlements compared to urban (10.6%) settlements. Among the household

328  wealth index, access to skilled birth delivery favors the richest households compared to the

329  poorest households as about 45% of births by the poorest household were unattended by

330  skilled birth attendants whereas only 1% of births by the richest households are unattended by

331  skilled birth attendants.

332  The lack of use of skilled birth attendants during childbirth were higher among the women

333  with no educational level (44.7%) compared to their highly educated counterpart (15%) that is

334  an education of secondary level and higher. Likewise, women whose husbands or partners

335  were not educated (45%) were less likely to use skilled birth attendants.  Based on the region

336  of residence, the results of the study showed that upper west region has the highest

337  percentage (62.2%) of women who gave birth without the assistance of a skilled birth

338  attendant. This was followed by Greater Accra region (36.4%), eastern region (31.7%) and

339  Brong Ahafo region (30.1%). Furthermore, the Central, Volta and Northern regions were

340  observed to be the regions with the highest number of women who used skilled birth during

341  delivery at 94.4%, 91.2% and 90% respectively. Considering health insurance coverage, the

342  study findings revealed that women who were not covered with health insurance did not use

343  skilled birth attendants during delivery (41.5%) compared to women who had insurance cover

344  (24.0%). It was also observed that working mothers (29%) were more likely to use skilled birth

345  attendants during delivery.

346  **Inequality Associated Skilled Birth Attendant**

347  **Figure 2** depicts the concentration curve of accessing skilled birth delivery during delivery

348  according to socioeconomic status. The figure shows the existence of wealth-related

349  inequality in accessing skilled birth attendant during delivery. The black diagonal line is the

350   equality line. The red curve below the black line represents the Concentration curve (CC). The

351   farther the CC is below the equality line, the more concentrated the health outcome is among

352   the rich. Therefore,  concentration curve shows that accessing skilled birth attendants during

353   child delivery is concentrated among the rich. This indicates that women from rich household

354   are more likely to access skilled birth attendants compared to women from poor housholds.

355   This is further confirmed by a positive concentration index of 0.147 suggesting a pro-rich

356   inequality.

357   **Decomposition of underlying factors**

358   **Table 3** presents the results of the decomposition analysis that clarifies the degree to which

359   each observed determinant of delivery by a skilled birth attendant contributes to wealth-

360   related inequality in the utilization of skilled birth attendants during delivery. The contribution

361   of each determinant depends on two factors. 1) Its impact on the delivery by a skilled birth

362   attendants (elasticity). And 2) how unequally distributed over wealth the determinant is

363   (concentration index).

364   The results of decomposition analysis are shown in **Table 3**. The concentration index for

365   delivery in the presence of a skilled birth attendant showed that the estimated value of the

366   relative contribution to the concentration index was negative in some socioeconomic factors

367   such as woman's employment status (-0.01), mother's educational level (no education=-0.48),

368   husband's educational level (no education=-0.56, primary=-0.31), household wealth index

369   (poorer=-0.34) and the region of residence (Eastern=-0.12, Greater Accra=-0.01, Upper East=-

370   0.14, Upper West=-0.64, Western=-0.51). This therefore implied that, individuals who were

371   worse off in socioeconomic status were more disadvantaged in accessing skilled birth

372 attendants during delivery. The negative concentration indices is associated with poorer

373 households.

374 A pro-rich utilization of skilled birth delivery during child birth among Ghanaian women

375 between the age of 15-49 years old was seen among women who had health insurance

376 coverage, urban settlers, women who had had some form of education, husband's with

377 secondary and higher educational level, middle and rich households, women who were

378 located in the Ashanti, Brong Ahafo, Central and Northern regions.

379 **DISCUSSION**

380 The study has attempted to assess inequities in accessing skilled birth attendants among

381 women during delivery in Ghana using the 2014 Ghana Demographic and Health Survey. The

382 findings reveals a pro-rich inequality (i.e. positive CI), suggesting that access to skilled birth

383 attendants was concentrated among women with higher socioeconomic status. The finding

384 are consistent with results of other studies [21,36,37].

385 Place of residence, mother's educational level, husband's educational level, health insurance

386 coverage, household wealth and women's autonomy were the main factors associated with

387 the use of non-skilled birth attendance during delivery. Presentation of the discussion will

388 follow this sequence.

389 Rural residence in this finding of the study was a hindering factor to the non-use of skilled

390 birth attendants during delivery in Ghana. This finding is consistent with previous studies

391 conducted in India, Sudan and Tanzania [16,19,38] which reported greater use of skilled birth

392 attendants during delivery among urban mothers than rural mothers. This may be due to the

393 fact that women in the rural settlement may not access skilled birth attendants due to lack of

394   health facilities. In the rural areas only few health facilities for skilled delivery exist and

395   pregnant women may need to walk a long distance to access such a facility because

396   transportation difficulties. On the other hand, women in urban areas could easily access

397   skilled birth because there are many such facilities in the urban areas compared to rural areas.

398   In urban areas, transportation may not be a problem and the mother does not need to walk a

399   long distance to seek skilled birth attendants during child delivery.

400   According to the findings of this study, mothers with no educational level had the highest non-

401   utilization rate of skilled birth attendants than women who had secondary or higher

402   education. This is in agreement with other studies that revealed that better educated mothers

403   utilized skilled birth attendants during child delivery than mothers with no education[39,40].

404   Studies have showed that education is one of the strongest factors in skilled birth utilization

405   as it increases literacy rate thereby women get to be aware of skilled delivery services

406   available at health facilities  and accept modern medical practices [39,41,42]. Similarly,

407   mothers whose partners had no formal education had the highest non utilization rate of

408   skilled birth attendants at child birth compared to mothers with partners with secondary or

409   higher education. A study in northern Ghana indicated that women with partners with higher

410   education were more likely to use skilled birth attendants during delivery [43]. This low use of

411   skilled birth attendants may be as a result of low male partner involvement in maternal health

412   care.

413   Furthermore, low health insurance coverage was associated with a reduced skilled birth

414   attendant during delivery. The study finding was in line with prior studies in Burkina Faso and

415   Ghana which showed that high health insurance coverage contributes greatly to the

416     utilization of mothers to skilled birth attendants(attendance) during delivery[44–46]. High

417     health insurance coverages does not only enable women initiate access to skilled birth

418     attendants but also insures them from high cost of delivery care. However, in Ghana, although

419     maternal health services are free for insured clients, there is low enrollment on the national

420     health insurance scheme [47]. This is as a result of the lack of trust patients have in the

421     insurance scheme as a result of the long waiting time while using the health insurance, delay

422     in paying claims by the health insurance authority to health facilities as well as patients still

423     paying for some services which are free to an insured patient [47].

424     Household wealth was found to significantly influence the utilization of skilled birth

425     attendants during delivery. The findings of this study shows that household poverty is

426     significantly associated with low utilization of skilled birth attendants during delivery. This is

427     consistent with previous studies in Nigeria, Vanuatu, and Namibia [21,39,48]. This may be due

428     to high financial burden such as the cost of transportation, inpatient cost as well as delivery

429     cost. Rich mothers may use skilled birth delivery because they could access the financial cost

430     associated with skilled birth delivery than the poor mothers. For instance in the case of

431     caesarean section the poor mother may find it difficult to pay for such service so the family

432     may feel hesitant to access the service even though they may be aware of its necessity.

433     Woman's autonomy influenced the use of skilled birth attendants during delivery. The study

434     results indicated that situations where only the mother's partner decided the means of health

435     care accessibility for the mother, mothers are less likely to use skilled birth attendants during

436     delivery compared to the mother who decides on her own health care. This is consistent with

437     studies  in Ethiopia, Kenya and Nepal which revealed that women who decided on their own

438    health care were more likely to get skilled assistance during delivery[28,49,50]. This could be

439    seen from the cultural point of view where the man is the head of the family. This enables men

440    to decide on everything concerning the family including their healthcare accessibility.

441    **CONCLUSION**

442    This study looked at the extent to which socioeconomic inequalities affected the use of skilled

443    birth attendants during child delivery among Ghanaian women. The study used the 2014

444    Ghana Demographic and Health Survey (GDHS) data and applied the decomposition analysis

445    to analyse the socioeconomic inequalities in the use of skilled birth attendants during delivery.

446    The study revealed the existence of inequalities in the use of skilled birth attendants during

447    delivery in Ghana. Women from rural areas, women with no education, male partners with no

448    formal education, women with no health insurance cover and partners who decide on the

449    means of health care accessibility of their partners were observed to contribute to low

450    utilization of skilled birth attendants during delivery. This calls for the attention of the

451    government of Ghana through the Ministry of Health, Ghana Health Service, as well as other

452    stakeholders interested in the reduction of maternal mortality in addressing the observed

453    gaps relating to the utilization of skilled delivery services among women. Furthermore, male

454    partner involvement in maternal health care should be encouraged on the need for skilled

455    birth delivery services for their partners. In addition, there is the need for more health facilities

456    with skilled birth attendants like midwives to be situated in rural areas. Community-based

457    Health Planning and Services (CHPS) should be strengthened to improve maternal healthcare

458    services and utilization to those in the rural communities.

459    In conclusion, reducing these observed inequities in access to skilled birth attendants would

460    contribute greatly to the achievement of the SDG goal 3 target of a maximum of 70 maternal

461    deaths per 100,000 live births by the year 2030.

462    **Abbreviations**

463    CC              Concentration Curve

464    CI              Concentration Index

465    CHPS            Community-based Halth Planning and Services

466    DHS             Demographic and Health Survey

467    GDHS            Ghana Demographic and Health Survey

468    GHS             Ghana Health Service

469    HIV/AIDS        Human Immunodeficiency Virus/ Acquired Immune Deficiency Syndrome

470    HREC            Human Research Ethics Committee

471    PRMR            Pregnancy-Related Mortality Ratio

472    RHSP            Reproductive Health Strategic Plan

473    SBA(s)          Skilled Birth Attendant(s)

474    SDGs            Sustainable Development Goals

475    SES             Socioeconomic Status

476    STI             Sexually Transmitted Infections

477    UNDP            United Nations Development Programme

478    WHO             World Health Organization

479    **Declarations**

480    **Ethics Approval and Consent to Participation**

481 We did a secondary analysis of the publicly available data of Ghana Demographic and Health

482 Survey from measure DGS website. The GDHS 2014 had obtained ethical approval from the

483 GHS Ethical Review Committee, Ghana and the ethical review board of ICF Macro

484 International, Maryland, USA. A written informed consent had also been obtained from each

485 participant before enrolment for the survey. For this study, ethical approval was received

486 from the University of Cape Town Human Research Ethics Committee (HREC).

487 **Consent for Publication**

488 Not Applicable

489 **Availability of Data and Materials**

490 Data can be accessed through the website of the DHS Program ([www.dhsprogram.org](www.dhsprogram.org))

491 **Competing of interests**

492 The authors declare that they have no competing interests.

493 **Funding**

494 There was no funding received for this study.

495 **Authors' Contributions**

496 OA and AK conceptualised the study. AK and EB performed statistical analysis and

497 interpretation of the data. AK drafted the manuscript. JHA and OA edited, revised and

498 finalised the manuscript. All authours read and approved the final draft of the manuscript.

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502 Health Survey data for this study.

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**Figures, tables and additional files**

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



659 Cumulative % of the population ranked by socio-economic status
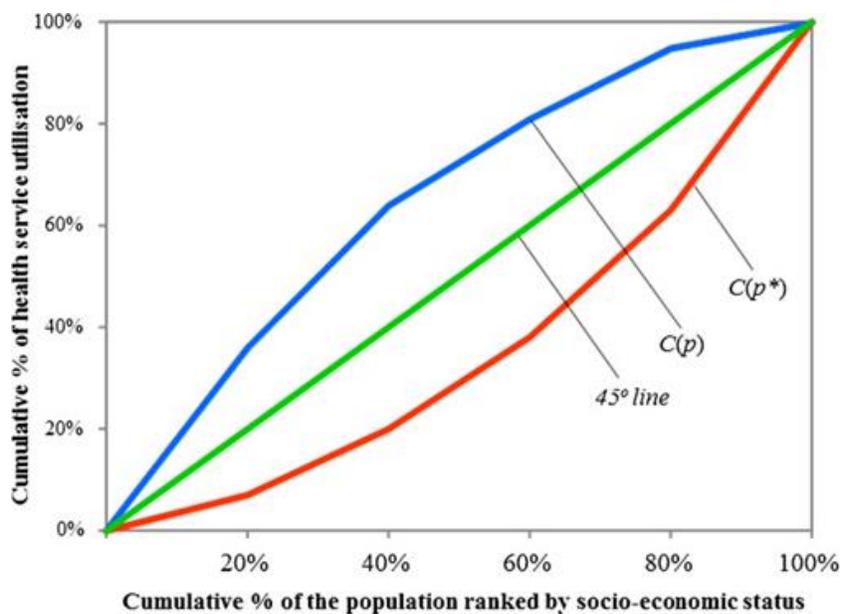
660 **Table 1: Distribution of respondents by selected background characteristics**

| 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 |

661

662 **Table 2: Non-utilization of skilled birth attendants during delivery by selected socio-economic**

663 **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 |

664

665 **Figure 2: Concentration curve (CC) showing access to skilled birth attendants during delivery**

666 **according to socioeconomic status.**
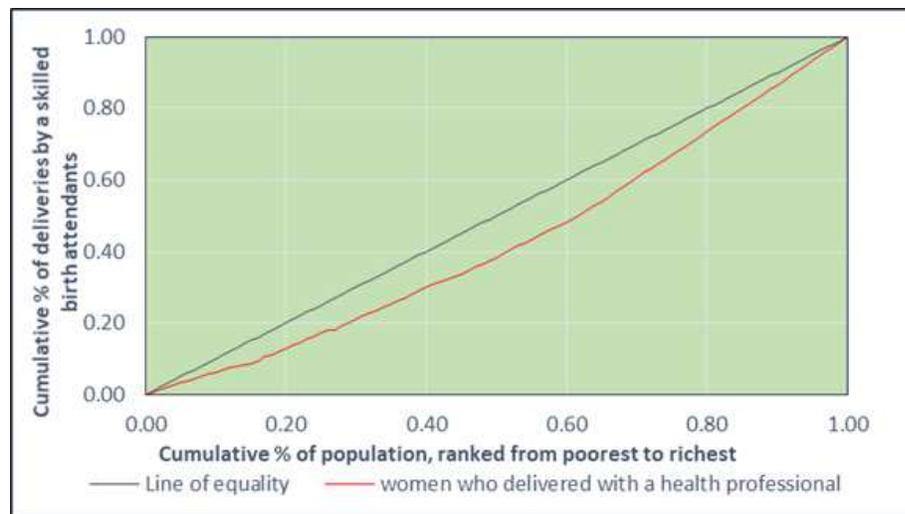


667

668 **Table 3: Decomposing the socioeconomic inequalities in the utilization of skilled birth attendants**

669 **during delivery in Ghana**

| 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** | | | | |

670

# Figures
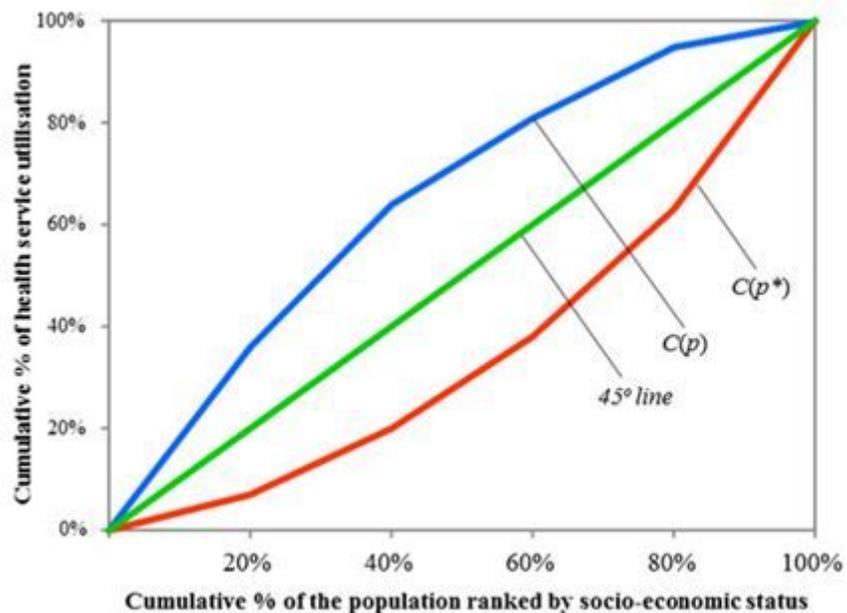


## Figure 1

Concentration curve for health care utilization
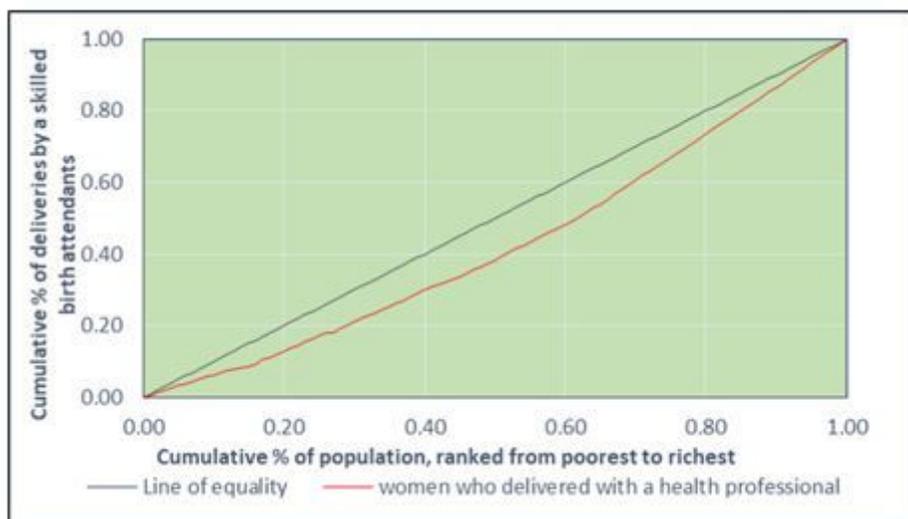


## Figure 2

Concentration curve (CC) showing access to skilled birth attendants during delivery according to socioeconomic status.

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- RevisedJournalManuscriptAseyeKpodotsi.pdf