

# Persistence of the inverse care law in maternal health service utilization: An examination of antenatal care and hospital delivery in Ghana

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## Abstract

The gap in maternal health outcomes, access and utilization between the haves and have-nots continues to be a challenge globally despite improvements over the past decade. Though Ghana has experienced steady gains in maternal health access and utilization over the years, maternal outcomes, on the other hand, remain poor. In this regard, it is essential to know how various groups in the population achieved improvements and whether some women continue to be disproportionately disadvantaged. The paper performs an analysis of cross-sectional data from the 2017 Ghana maternal health survey to examine the existence of the inverse care law in maternal health services in Ghana. Using descriptive techniques and multivariate logistic regression models the study reveals a pro-rich and pro-urban gradient in the use of hospital facilities for delivery and antenatal care attendance — also, regions known for their high levels of poverty feature significantly lower rates of hospital deliveries. The paper concludes by stressing that unless policies are changed to accommodate these groups, overall gains in maternal health will continue to be incremental.

## Introduction

Despite efforts aimed at improving maternal health outcomes, maternal mortality rates in African countries, including Ghana, remain high.<sup>1,2</sup> The maternal mortality rate in Ghana is currently estimated as 310 per 100,000 live births in 2017.<sup>3</sup> The nations' inability to improve the MMR has been linked to several factors, including but not limited to the access and utilization of maternal health services.<sup>4,5</sup>

In spite of the abysmal performance of the MMR, the country made significant gains in enhancing access to maternal health care through policies aimed at improving access and utilization of maternal health services.<sup>4,6,7</sup> For example, skilled

ANC coverage improved to 98% in 2017, an increase over the previous level of 96% in 2014 and 79% of births were delivered in a health facility a rise from 54% in 2014.<sup>3</sup> Additionally, the number of deliveries by a skilled provider increased from 55% in 2007 to 79% in 2017.<sup>3</sup>

The inverse care law purports that the people or populations that require good medical care are the ones least likely to utilize these services implying that for any given population, the utilization of proper healthcare and the need for it are inversely related.<sup>8</sup>

The socioeconomic status remains one of the most useful predictors of morbidity and mortality outcomes for populations.<sup>9-13</sup> The poor often lack the means to afford or access proper health care while the rich have more than enough means to access and afford proper health care. Various components of socioeconomic have been demonstrated to vary with health status, in that the richer or higher up members of the socioeconomic ladder enjoy better health than those further down the ladder.<sup>14</sup>

Ghana is a lower-middle-income country and records a high level of poverty, which varies by regions and rural areas record higher level than urban.<sup>15,16</sup> The distribution of poverty is a direct consequence of the uneven nature of economic development in the country. For example, some administrative regions in the country; the central, northern, upper west and upper east regions have been flagged for their underdevelopment and high levels of poverty.<sup>15,16</sup> Historically, poor people and more impoverished areas have smaller shares of health care.<sup>4,5,17,18</sup>

Studies in Ghana have examined at various levels factors that influence utilization of health services.<sup>19,20</sup> For example, evidence shows that wealth continues to have a significant influence on the adequate use of ANC in Ghana.<sup>21</sup>

The Ghana health service has as one of its objectives, the aim to eliminate inequalities in health to be achieved by increasing coverage and use of health services to the poor and most disadvantaged in society.<sup>22,23</sup> In the specific instance of maternal health, several strategies have been deployed to enhance equity; these include; expanding coverage of maternal health services, reducing the patient-doctor ratio, increasing access to maternal health and finally the elimination of user fees in maternal health services through the national health insurance scheme.<sup>23</sup>

Ghana's National Health Insurance Scheme (NHIS) established by an Act of Parliament (Act 650) in 2003 and passed into law as a legislative instrument, LI

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1809, in 2004 (Government of Ghana. National Health Insurance Regulations. Pub. L. No. L.I.1809. 2004). In 2008, the scheme was expanded to include free maternal care.<sup>24</sup> This change in policy aimed to help the country to achieve the national and global maternal health goal. Studies have shown that the health insurance scheme has increased the utilization of health care, including maternal health.<sup>7,25</sup> However, significant criticisms of the scheme include its failure to reach the most vulnerable groups in the country, including the poor, as a result of factors such as the costs of enrollment and an inability to identify the poor.<sup>25-29</sup>

The study addresses the question; why are maternal health outcomes underperforming despite increases in ANC coverage and delivery in hospitals? The hypothesis is that the persistence of the inverse care phenomenon in ANC use, and hospital deliveries lead to poor maternal health outcomes despite increased coverage, as levels of use in women of low socioeconomic status remain low.

The paper aims to examine the existence of the inverse care hypothesis in relation to maternal health care utilization in Ghana by examining the relationship

between ANC coverage and delivery in hospital and critical socioeconomic and spatial variables in Ghana. Policymakers in health and providers of health in Ghana need to be made aware of the persistence of the inverse care law phenomenon within the health care delivery system in the country despite continued investments and policy changes aimed at achieving a more equitable system.

The paper is organized as follows; the next section of the paper presents the materials and methods, followed by the results, analysis and discussion and the conclusion.

## Materials and Methods

### Study Design

The paper conducts a quantitative cross-sectional analysis. The analysis combines both descriptive charts and table with an estimation of a binary regression models using the nationally representative 2017 Ghana maternal health survey data (Figure 1).

### Data Source

The National maternal health survey in Ghana was undertaken by the Ghana Statistical Service (GSS) and the Ghana Health Service (GHS) and is a nationally representative sample of households.<sup>3</sup> The survey targets women of reproductive age specifically; age 15 to 49 years in the sampled household.<sup>3</sup> A previous maternal health survey had been undertaken in 2007 making this the second in a decade. The survey is designed to provide data and monitor maternal health outcomes and utilization of maternal health services. The survey is representative at the subnational levels also provides reproductive health indicators and distribution of maternal health services.

The survey adopted a two-stage sample strategy leveraging an updated sampling frame from the 2010 Population and Housing Census. Out of the 27,000 households selected for sampling, interviews

were conducted in 26,324 arriving at a final household response rate of 99% disaggregated at 99.1% in urban areas and 99.6% in rural areas. The response rate for eligible women was also 99%.<sup>3</sup>

### Variables

The analysis examines two dichotomous variables; place of delivery coded as 1 for delivery in a hospital or clinic and 0 for otherwise, and ANC utilization variable is coded as - 1 reflecting 4 or more ANC visits and 0 - less than 4. These are selected based on theoretical and empirical evidence of their importance in ensuring positive pregnancy outcomes and improvement in their national coverage.<sup>3,30</sup> Explanatory and control variables examined include; the highest level of education attained, wealth quintiles, mother's level of education, region, and location of residence (rural or urban), age, total pregnancies and health insurance.

The maternal health survey similar to the Demographic Health Surveys does not provide income or expenditure data as measures of socioeconomic welfare. The survey therefore uses a relative asset index

to derive a wealth index as a measure for welfare.<sup>31</sup> This index is derived using Principal Component Analysis (PCA) (Filmer & Pritchett, 2001) technique on asset variables provided in the survey. This wealth index categories households within which women live into five, from the richest to the poorest. As already indicated poverty in Ghana varies by geospatial location, rural areas record higher levels of poverty as urban areas, and specific administrative regions are known for higher levels of poverty. Table 1 presents a summary of measures used.

### Statistical Analysis

Statistical analysis for the paper was conducted using Stata version 12.1 from StataCorp. To examine the relationship between socioeconomic variables and maternal health utilization we examine two dichotomous variables; place of delivery and use of ANC services as explained variables. Two binary logistic models are estimated as these are models of choice when the dependent variable of interest is discrete and binary variable.

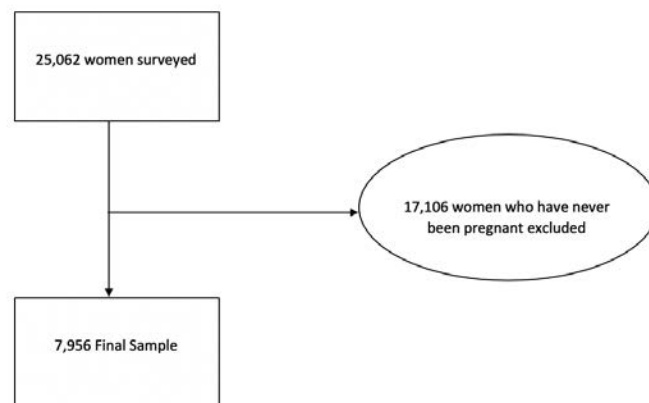


Figure 1. Inclusion criteria.

Table 1. Summary of variables /measures used in the analysis.

Name/ label of measure	Details	Range
ANC	Binary measure of ANC visits	0-1
Place of delivery	Binary measure for place of delivery	0-1
Age	Single continuous measure of the age of woman	15-49
Urban	Binary measure indicating if household of woman is in rural of urban area	0-1
Household Size	Single continuous measure of the number of persons living in the household	1-31
Health insurance	Binary measure reflecting if woman has a health insurance	0-1
Total pregnancies	Single continuous measure of the total number of pregnancies a women has had irrespective of pregnancy outcome	1-13
Education	Categorical measure of woman level of education	0-4
Wealth Index	Categorical measure of indicating wealth quintile	0-4

A summary of the selected variables are presented after which bivariate descriptions of the explained variable with selected measures of socioeconomic status are conducted and reported. Finally, a multivariate logistic model is fitted for the explained variables and explanatory variables. To account for sample design and obtain estimates of population parameters of interest survey settings and weights were applied for all analysis.

## Results

### Summary of Data

The final sample of women for the analysis after exclusion criteria is applied is 7956 women. Women who participated in this section of the survey were aged from 15 to 49 years old, with an average age of approximately 27 years. 13 % of women attended and ANC appointment by the first month of pregnancy, by the third month this had increased to 66%. The majority of women 31% received a first ANC check in the third month of pregnancy. 50% of women had at least seven ANC visits, the least number of visits was 1 and the most 20. On average, most women had two pregnancies. Approximately 17% of women had no education, 40% had attended junior high school, and another 17% having only primary or middle school education. About 26% of women had attended secondary school and beyond with only 8% reporting post-secondary school education. Although 86% of the sample of women were registered for the national health insurance scheme, meaning they had an insurance card only 60% had coverage at the time of the survey mainly due to non-payment of monthly premiums or annual reregistration fees.

### Bivariate analysis

#### Location and maternal health service use

Tables 2 and 3 present the results for bivariate analysis of the association between location variables, ANC use and hospital delivery. Table 2.0 it was noted that in all regions aside from the Northern, Upper West and Upper East Regions over 50% of deliveries took place in a hospital facility. The three areas and the central region are known for their high level of poverty and low level of social infrastructure. Antenatal care coverage is high and this was reflected in regional distribution of ANC use. The national average and the averages for all administrative regions were above the recommended minimum of 4 visits per pregnant woman. The Greater Accra and western regions had the highest levels of ANC use with a mean of 8 visits. The

Northern and upper West regions had the lowest average of 6.

Table 3 presents share of hospital deliveries and average ANC rural and urban areas. Given the rural nature of poverty in Ghana it is important to examine the rural urban differences. It was also observed that 72% of urban deliveries happened in hospitals compared to 44% of rural deliveries. The table also shows that average ANC use was higher in urban areas; the urban average of 8 is higher than the rural average of approximately 7.

#### Wealth and maternal health service use

The trend in hospital deliveries for wealth is highly salient dropping from 85.95% to 28.77% from the richest to the poorest respectively, results presented in Table 4. Table 4. indicates that ANC use has a pro-rich gradient. While all wealth categories record averages of above four the

two highest wealth categories have 50% of women in them achieving higher than the national average number of visits; eight and nine respectively.

#### Mother's education and maternal health service use

Maternal education is the final socioeconomic variable examined results are presented in Table 5. Similar to the results of the wealth index women with higher levels of education use more hospital for delivery. The gap between the rates of use for women with post-secondary education those with none was wide. Rates of delivering in a hospital were above 50% for women who attained at least Junior High School Education, results are presented in Table 5.

Examining ANC visits by level of mother education, presented in Table 5, point to the importance of education in maternal health. Half of the women who

**Table 2. Proportion of hospital delivery in percent and average ANC visits by region.**

Regions/ Place of delivery	Hospital%	Average ANC(SD)
1. Western	55.2	8.11 (3.27)
2. Central	53.6	7.2 (2.83)
3. Greater Accra	76.44	8.53 (3.11)
4. Volta	46.55	6.73 (2.98)
5. Eastern	62.68	7.05 (2.75)
6. Ashanti	66.78	7.11 (2.63)
7. Brong Ahafo	53.66	6.87 (2.67)
8. Northern	38.25	6.27 (2.37)
9. Upper east	39.35	7.03 (2.25)
10. Upper west	47.84	6.26 (2.42)
Total	58.16	7.32 (2.91)

Source: Author's own computations from the Ghana Maternal Health Survey 2017 data.

**Table 3. Proportion of hospital delivery in percent and average ANC use by in Rural and Urban areas.**

Location	Hospital%	Average ANC(SD)
Rural	43.95	6.71(2.75)
Urban	72	7.91(2.94)
Total	58.16	7.32(2.91)

Source: Author's own computations from the Ghana Maternal Health Survey 2017 data.

**Table 4. Proportion of hospital delivery in percent and average ANC use by wealth quintiles.**

Wealth Index	Hospital%	Average ANC(SD)
Poorest	28.77	6.03 (2.54)
Poorer	46.44	6.6 (2.69)
Poor	58.43	7.21(2.84)
Wealthy	71.72	7.83 (2.81)
Wealthiest	85.95	8.91(2.80)
Total	58.16	7.32 (2.91)

Source: Author's own computations from the Ghana Maternal Health Survey 2017 data.



had higher than secondary education recorded ten ANC visits compared to six for women with no schooling.

### Multivariate analysis

Table 6 presents the results of multivariate logistic regressions for ANC visits and delivery in a hospital. The results reveal that the age of mother, number of pregnancies, location, wealth, education and use or attendance of ANC were significantly linked to the use of hospital for delivery services. Household size and health insurance coverage were significantly associated with hospital delivery.

The odds of giving birth in a hospital increased with the level of education of the woman from no school to post-secondary education. Using women with no education as a reference point the odds of giving birth in a hospital facility, if a woman had tertiary education, were [OR = 3.49, 95%CI: 2.23 – 5.57] compared to [OR= 1.62, 95%CI: 1.26-2.06] if a woman had attained only primary education.

The outcome of the multivariate regression suggested that older women are more likely to deliver at a health facility. The odds ratio of [OR= 1.05, 95%CI: 1.02-1.07] suggests that with each additional year of age a woman is more likely to use a health facility for delivery purposes. The use of ANC services increased the odds of delivery in a hospital [OR=1.62, 95%CI: 1.20-2.17], and women living in urban areas are more likely to deliver in hospital increases the odds of delivering in a hospital compared to those living in rural areas with an odds [OR= 1.49, 95%CI: 0.77-1.53].

The wealth quintile of the household which a woman belonged was significantly associated with delivering in a hospital. Women from the wealthiest household based on ownership of assets compared with the reference group of women from the poorest households are 5.22 times more likely to deliver in a hospital. The odds of delivery with wealth quintiles decreased as household become poorer based on assets index. Despite the fact the descriptive

analysis revealed a socioeconomic gradient in the number of ANC visits by women, multivariate logistic regression analysis showed that only household wealth status was significantly associated with having 4 or more ANC visits. This is mainly explained by the fact that ANC has improved considerably and average ANC for the total sample and all subgroups was above the stipulated levels. A noteworthy finding is the fact that while the more pregnancies for a woman decreased the odds of delivering in a health facility it significantly increased the odds of having 4 or more antenatal care visits.

### Discussion

The analysis revealed a clear association between ANC and delivery in a hospital and select socioeconomic conditions.

Two variables on location were examined, administrative region of residence and whether or not the woman lives in a rural or an urban. This is because developing countries tend to exhibit wide inequities in the distribution of health facility and resources. With regards to administrative regions the pattern of use that is in line with the poverty profile of the country. The regions; Northern, Upper East and Upper West historically known for low levels of socioeconomic development exhibited lower levels of use compared to other regions. Consistently the region that host the national capital, Greater Accra region had high levels of use for both ANC and hospital deliveries. It is informative that there was over all high coverage of ANC use and all regions recorded average levels of use above the globally recommend-

**Table 5. Proportion of hospital delivery in percent and average ANC use by Mother's education.**

Highest Education	Hospital%	Average ANC(SD)
No School	33.98	6.53 (2.67)
Primary or Middle	48.78	6.84 (2.92)
Junior High School	59.81	7.23 (2.85)
Secondary	74.25	7.76 (2.83)
Post-Secondary	88.23	9.47 (2.64)
Total	58.16	7.32 (2.91)

Source: Author's own computations from the Ghana Maternal Health Survey 2017 data.

**Table 6. Logistic output for hospital deliveries and antenatal care use with and socioeconomic characteristics.**

	Hospital Deliveries			Antenatal		
	Odds Ratio	[95% Conf. Interval]		Odds Ratio	[95% Conf. Interval]	
Age	1.05***	1.03	1.07	1.07***	1.04	1.11
Urban	1.49***	1.23	1.80	1.08	0.77	1.53
Household size	1.00	0.97	1.02	0.99	0.95	1.02
Health Insurance	1.13	0.96	1.32	1.14	0.88	1.49
Total pregnancies	0.86***	0.80	0.92	1.03***	0.93	1.15
Education Attained						
Primary or Middle	1.62***	1.26	2.06	0.94	0.65	1.38
Junior High School	2.00***	1.61	2.50	1.38*	0.94	2.02
Secondary	2.48***	1.86	3.30	1.59*	0.95	2.67
Post-Secondary	3.49***	2.23	5.47	1.43	0.57	3.61
Wealth Index						
Poorer	1.63***	1.30	2.04	1.41	0.99	2.03
Poor	2.19***	1.70	2.83	1.64*	1.04	2.58
Wealthy	3.20***	2.40	4.28	3.37***	1.93	5.86
Wealthiest	5.22***	3.61	7.56	5.75***	2.88	11.46
ANC Coverage	1.62**	1.20	2.17	n/a	n/a	n/a
Constant	0.08	0.05	0.14	1.28	0.61	2.69

\*p<.05; \*\*p<.01; \*\*\*p<.001. Source: Author's own computations from the Ghana Maternal Health Survey 2017 data.

ed level of four.

The association of location; examined as rural or urban areas was more telling, patterns of use of both ANC and hospital delivery was higher in urban areas than rural. This is confirmed by the multivariate regression analysis which shows significantly higher odds of delivering in a hospital if you resided in an urban area. The patterns of use of hospitals for delivery is also explained by the distribution of health facilities in the country, out of a total of 395 hospitals in the country the Ashanti and Greater Accra region record the largest numbers of 119 and 76 respectively.<sup>17</sup> This pattern is maintained when clinics and polyclinics facilities are examined where greater Accra has a total 289, Western region 145 and Ashanti 116 out of the total national number of 1014.<sup>17</sup> The regions known for their high levels of poverty record low numbers of both hospitals and clinics, for example hospital distribution stands at 12, 1 and 6 for Northern, Upper East and Upper West respectively.<sup>17</sup> This pattern stands when examining clinics and poly clinics with figures of 61, 48 and 20 for Northern, Upper East and Upper West respectively.<sup>17</sup>

A number of studies in developing countries,<sup>32-35</sup> including Ghana have previously documented the urban bias with regards to access to maternal health services. Often, in rural areas, health facilities are few and far between. Also, rural facilities are more likely to be without qualified staff such as doctors or nurses. The high level of poverty and low educational attainment in the rural areas also mean the economic impact of using a health facility is harder on rural women than their urban counterparts.

Both the maternal health survey and the demographic and health survey reports indicate that the three most important reasons people did not deliver at hospitals as the cost involved in delivery, access to transportation to reach hospital and finally that people felt it was not necessary; 30% of rural residents felt it was not necessary to deliver at a hospital as against 20% of urban residents.<sup>3,18</sup>

Measures of welfare such as incomes, expenditures and wealth are another set of socioeconomic variables that are associated with the use of maternal health services.<sup>36,37</sup> In the absence of an income variable the relationship between; relative wealth, ANC use and hospital delivery which was telling. The extensive cost of using a health facility for delivery means that poor households will be less likely to use a health facility for delivery. These costs include direct ones such as; facility fees, medication and supplies, unofficial provider fees, transportation to health facil-

ity and indirect ones like; opportunity costs of travel time and waiting time lost from productive activities.<sup>38</sup> Studies using DHS data and other household level data sources have all pointed to the importance of measure of wealth, incomes and expenditures to the use of formal delivery services.<sup>35,38-42</sup>

This finding on maternal education is in line with the theoretical proposition that individuals of lower socioeconomic status used less formal health services, and is further consistent with the literature which shows that the use of formal delivery facilities is related to the level of education and individuals with higher levels of education are more likely to make use hospital facilities.<sup>19,20,33,34,43</sup> Mothers with formal education tended to deliver in health facilities while uneducated mothers and those without formal education mainly delivered at home.<sup>35,44-47</sup>

The literature suggests this is due to the fact that older women anticipate more complicated births than their younger counterparts.<sup>19,33,48</sup> The study revealed that ANC was positively and significantly related to place of delivery, indicating that women who had ANC had higher likelihood of giving birth in a medical facility. An important strategy in ensuring safe deliveries and improved maternal health outcome in the area of pregnancies and delivery is to improve and ensure the uptake of ANC as this improves delivery outcomes through ensuring that potential complications are caught early and will increase the odds using the hospital for delivery. However, Gabrysch and Campbell note that the relationship between ANC use and the use of hospital delivery services may not be so straightforward.<sup>30</sup> In Uganda,<sup>47</sup> mothers-to-be attended ANC to ensure that pregnancy was safe and thus did not need to deliver in a health facility. The inability to control the actual timing of delivery, unlike ANC attendance also meant that not all mothers who attended ANC could take advantage of hospital delivery services.<sup>39</sup>

## Conclusions

The study establishes that despite sustained improvement coverage of essential maternal health services, the use of ANC and hospital for delivery vary significantly by location, wealth, education level of to-be-mothers and age. The evidence shows that in Ghana, the women most in need of quality maternal health care are the least likely to access it. This outcome highlights that ANC and skilled delivery services present an example of the inverse care law where the lowest socio-economic groups

who have the greatest need for these services exhibit the lowest utilization levels.

Though other studies<sup>19,20,49,50</sup> in the past have shown similar results it is of critical importance that despite continued investments in the health sector to improve access of services to all segments of the population this pattern of utilization continues to persist. It is equally important to note that the situation exists not only in Ghana but in other developing countries where significant studies<sup>40-42,44,51</sup> have illustrated the importance of many socioeconomic factors to the utilization of maternal health services in general and formal delivery services in particular. The critical disadvantages in this situation tend to be low educational attainment, rural residence and wealth. If maternal health outcomes are to improve, it is crucial to ensure proper identification of the poor and the vulnerable so that they can take advantage of existing national policies and programs. An example is the free maternal health care under the National Health Insurance Scheme (NHIS) whose uptake has been constrained due to; cost of enrollment and renewal and inability to identify the poor.<sup>25,28,29</sup>

This study relies on data from the Ghana maternal health survey to highlight the existence of the inverse care hypothesis in selected maternal health care services. The nature of the data however, means that we are only able to explore the socioeconomic factors associated with ANC use and hospital delivery as a way of illustrating the existence of the inverse care hypothesis in maternal health utilization.

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