ORIGINAL ARTICLE

Do Infant Birth Outcomes Vary Among Mothers With and Without Health Insurance Coverage in Sub-Saharan Africa? Findings from the National Health Insurance and Cash and Carry Eras in Ghana, West Africa

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ABSTRACT

Background: Beginning in the late 1960's, and accelerating after 1985, a system known as "Cash and Carry" required the people of Ghana to pay for health services out-of-pocket before receiving them. In 2003, Ghana enacted a National Health Insurance Scheme (NHIS) (fully implemented by 2005) that allowed pregnant women to access antenatal care and hospital delivery services for low annual premiums tied to income. The objective of this study was to compare trends in low birth weight (LBW) among infants born under the NHIS with infants born during the Cash and Carry system when patients paid out-of-pocket for maternal and child health services.

Methods: Sampled birth records abstracted from birth folders at the Tamale Teaching Hospital (TTH) were examined. Chi-squared tests were performed to determine differences in the prevalence of LBW. A p-value of ≤ 0.05 was considered statistically significant. Analyses were conducted for selected variables in each year from 2000 to 2003 (Cash and Carry) and 2008 to 2011(NHIS).

Results: Higher birth weights were not observed for deliveries under NHIS compared to those under Cash and Carry. More than one-third of infants in both eras were born to first-time mothers, and they had a significantly higher prevalence of LBW compared to infants born to multiparous mothers.

Conclusion and Global Health Implications: Understanding the factors that affect the prevalence of LBW is crucial to public health policy makers in Ghana. LBW is a powerful predictor of infant survival, and therefore, an important factor in determining the country's progress toward meeting the United Nations Millennium Development Goal of reducing under-five child mortality rates (MDG4) by the end of 2015.

Keywords: Infant Birth Outcomes • Low Birth Weight • Sub-Saharan Africa • Ghana • National Health Insurance Scheme • Cash and Carry

Background

Prior to the nation's independence, the health care system in Ghana under colonial rule was organized primarily for the benefit of the elite few. The development of public health services in Ghana (formerly the Gold Coast) dates back to the 1880s, when the Gold Coast Medical Department was established to provide rudimentary services to European colonial government officials.[1] In the 20th century, a colonial health policy of prevention for the indigenous population was recognized through the establishment of the Sanitary Branch in 1909, and the Medical Research Institute in 1917, which trained paramedical personnel.[1] The colonial government provided free health services to civil servants, but those not in civil service and their families were left to secure their own health care at their own expense.

When Ghana attained independence under Kwame Nkrumah in 1957, a national health service (NHS) similar to that of Britain's was established to extend free care to the entire population at government health facilities. The NHS system remained in place until shortly after 1966, when the Nkrumah government was overthrown in a military coup.[2,3] A system for health service fees was introduced through the Hospital Fees Decree in 1969, later amended by the Hospital Fees Act in 1971, but the fees were never fully implemented. Fees were eventually imposed under the Hospital Fees Regulation of 1985, when economic growth slowed and rising inflation crippled Ghana's economy and forced the country to turn to the International Monetary Fund and the World Bank for financial assistance.[4,5]

As Ghana's economy worsened, government expenditures on health care, which averaged 2.3 percent of the gross domestic product in 1998-2002, declined to around 1.9 percent in 2003-2004.[4,6] Declining government expenditures on health care shifted the burden of health costs onto the Ghanaian population through health user fees (a system also known as "Cash and Carry") that required patients to pay money upfront to health facilities before services were provided. The Cash and Carry system created financial barriers to health services for the majority of the nation's poor who could not afford to pay for even basic health care, including reproductive health services. While the Cash and Carry system was in effect, disparities in health care access and health status between Ghana's rural and urban populations became more pronounced.[7] Even though some services, such as antenatal and postnatal care and immunizations, were to be exempted from health user fee payments, in practice they often were not, and the out-of-pocket costs had a negative impact on people's overall health, especially on birth outcomes among the most vulnerable. Many studies found that in Ghana and elsewhere, the number of patients treated at government health facilities dropped immediately following the introduction of health user fees. [1,7,8]

The majority of poor people in Northern Ghana faced the biggest barrier to health care due to high out-of-pocket costs.[8,9] Eliminating the financial barriers to health care for the majority poor in Ghana, especially those in Northern Ghana, was the government's primary public health goal when it introduced the national health insurance scheme (NHIS) after passage of the National Health Insurance Act (NHIA) by Ghana's Parliament in 2003.[10]

Access to health services through programs such as the national health insurance scheme in Ghana allows pregnant women the opportunity to visit health facilities for antenatal and delivery services that they could not otherwise afford. The NHIS, which started in 2003 on a limited basis in four of Ghana's ten regions, was fully implemented nationwide by 2005. The program requires all adults in Ghana aged 18 and older to enroll in the NHIS and pay premiums that range from the equivalent of $2.50 up to $50.00 annually, depending on each enrollee's financial and employment status.[11,12] The scheme provides coverage for children 17 years and younger without premium payments, provided the child's parents are fully registered in the program. Pregnant women with low incomes are also provided free coverage under the NHIS to enable them to access antenatal services and skilled care at delivery. [13] Although membership in the NHIS had declined in some of Ghana's districts, there was a 118 percent increase in membership among the indigent population in Northern Ghana between 2007 and 2008. Overall, NHIS participants in Northern Ghana increased from 143,460 to 863,099 users between

2005 and 2008, a 502 percent increase in just three years.[14] The increase in enrollment among the poor in Northern Ghana ensured that a majority of pregnant women would be able to access skilled care at the hospital rather than deliver at home.

The NHIS has been operational in Ghana for a decade now, supporting increased access to skilled care at health facilities for the majority of indigent pregnant women in Northern Ghana. However, research has not adequately tracked the program's utilization, particularly service utilization and birth outcomes among the poor in Northern Ghana. Most studies of the NHIS have focused on enrollment and access; very few address birth outcomes. Particularly absent are studies that compare birth outcomes under the Cash and Carry system with those under national health insurance in sub-Saharan Africa, especially in Ghana.[15]

Methods

This study used sampled birth records abstracted from birth registry folders at the Tamale Teaching Hospital (TTH), the primary referral hospital for the entire northern sector of Ghana. Tamale, the regional capital of the Northern Region, is the fourth largest city in Ghana. It has a population of a little less than 380,000, of which 51 percent are female and 49 percent male. The annual population growth rate of Tamale is about 3 percent.[16]

Birth outcome data at TTH are recorded in the labor and maternity ward's delivery folders at the time of birth. The validity of these records is ensured through cross-checking by a head nurse and the supervising obstetrician. For this research, the delivery folders for the years 2000-2003 (when Cash and Carry was in effect) and 2008-2011 (after full implementation of NHIS) were arranged chronologically, and selected in a systematic sampling method that examined and abstracted birth records of each day's deliveries. Days with fewer or no birth records were accommodated by over-sampling records from the day before or after. Sampling ensured representation of Northern Ghana's dry and wet climatic seasons. The sampled birth records were analyzed using STATA, Version 11.2 (Stata Corp, College Station, TX).

The primary aim of this study was to examine trends in LBW among infants delivered under the Cash and Carry system, compared to the NHIS. Chi-squared tests were used to determine changes in prevalence (and significance) of LBW. Analyses were performed for each of the selected variables in both periods 2000-2003 and 2008-2011. Analyses with a p-value $\leq$ 0.05 were considered statistically significant. The dependent variable – birth weight (in grams) of live births – which is a continuous variable, was coded as a dichotomous variable so that LBW (< 2,500g) and normal birth weights ($\geq$ 2,500g) yielded the desired outcomes in repeated measurements. The independent variables — maternal age, parity (number of times a woman has given birth), maternal hemorrhage (blood loss), miscarriage (including induced abortion), type of birth (vaginal or Caesarian section), fetal heart rate, and gender — were selected because they have been documented in previous research to be associated with birth weight. Deliveries during the Cash and Carry period were used as a proxy for lack of access to insurance and professional antenatal care prior to childbirth, while deliveries under NHIS represented access to health insurance and at least four antenatal care visits prior to childbirth at TTH. It had already been established that in Ghana more than 98 percent of pregnant women receive antennal services under the NHIS; the majority of women (85% or more) receive at least the four antenatal visits recommended by the World Health Organization prior to delivery.[13,17,18]

The Administration at Tamale Teaching Hospital in Ghana granted permission for the abstraction of the birth records from the hospital's labor and maternity ward. Morgan State University's Institutional Review Board (IRB) also approved this research.

Results

The total number of birth records examined for this study was 7,895. This included 3,686 Cash and Carry and 4,209 NHIS live birth records. The mean maternal age was 27 (SD=6), with a range of 14 to 50 years. The mean birth weight was 2,875grams (SD=576). Table 1 presents a descriptive outcome of total delivery records of live births analyzed in this study.

Table 1. **Characteristics of all live births under Cash and Carry and NHIS systems at Tamale Teaching Hospital in Northern Ghana**

Variables	Cash and Carry				NHIS			
	2000 (N=336) n (%)	2001 (N=1134) n (%)	2002 (N=1137) n (%)	2003 (N=1079) n (%)	2008 (N=1057) n (%)	2009 (N=1080) n (%)	2010 (N=998) n (%)	2011 (N=1074) n (%)
Maternal Age								
< 18	2 (1)	13 (1)	17 (2)	13 (1)	14 (1)	10 (1)	10 (1)	6 (1)
18-24	114 (34)	378 (33)	398 (35)	352 (32)	317 (30)	338 (31)	279 (28)	314 (29)
25-34	173 (51)	589 (52)	549 (48)	571 (53)	580 (55)	561 (52)	579 (58)	611 (57)
35 >	47 (14)	154 (14)	173 (15)	150 (14)	146 (14)	171 (16)	130 (13)	143 (13)
Parity								
Zero	115 (38)	385 (35)	435 (38)	379 (35)	371 (35)	355 (33)	329 (33)	368 (34)
One	61 (20)	232 (21)	214 (19)	228 (21)	215 (21)	216 (20)	213 (22)	217 (20)
Two	48 (16)	170 (15)	162 (14)	166 (15)	181 (17)	186 (17)	169 (17)	189 (18)
Three	26 (9)	139 (12)	126 (11)	129 (12)	128 (12)	118 (11)	114 (12)	146 (14)
Four-plus	50 (17)	185 (17)	199 (18)	177 (17)	161 (15)	204 (19)	157 (16)	147 (14)
Maternal Hemorrhage (ml)								
<200	262 (95)	153 (17)	133 (14)	109 (13)	202 (36)	203 (30)	298 (45)	335 (50)
200-250	12 (4)	313 (34)	559 (60)	547 (64)	294 (53)	430 (63)	290 (44)	269 (40)
>250	2 (1)	451 (49)	238 (26)	197 (23)	62 (11)	47 (7)	74 (11)	64 (10)
Miscarriage								
Zero	324 (96)	1076 (95)	1093 (96)	1009 (93)	1001 (95)	1027 (95)	941 (94)	985 (92)
One	5 (2)	46 (4)	27 (3)	51 (5)	40 (4)	32 (3)	47 (5)	73 (7)
Two or More	7 (2)	12 (1)	17 (1)	26 (2)	16 (1)	21 (2)	10 (1)	16 (1)
Type of Delivery								
Caesarean	35 (11)	132 (12)	149 (13)	180 (17)	186 (18)	195 (18)	206 (21)	240 (22)
Vaginal	300 (89)	1,001 (88)	988 (87)	906 (83)	837 (79)	843 (78)	784 (78)	830 (77)
Other	1 (0)	1 (0)	0 (0)	0 (0)	34 (3)	42 (4)	8 (1)	4 (1)
Fetal Heart Rate (bpm)								
<130	8 (3)	45 (5)	123 (13)	143 (15)	110 (13)	134 (15)	77 (9)	69 (8)
130-140	215 (87)	748 (86)	708 (77)	714 (74)	709 (81)	610 (70)	706 (86)	691 (79)
>140	25 (10)	81 (9)	95 (10)	107 (11)	51 (6)	128 (15)	43 (5)	112 (13)
Infant's Gender								
Female	146 (43)	512 (45)	540 (47)	499 (46)	501 (47)	524 (49)	462 (46)	536 (50)
Male	190 (57)	622 (55)	597 (53)	587 (54)	556 (53)	556 (51)	536 (56)	538 (50)

Note. NHIS = National Health Insurance Scheme; LBW = low birth weight; ml = milliliters; bpm = beats per minute.

Trends in the prevalence of LBW among all infants born in 2000-2003 and 2008-2011 are presented in Table 2. A higher prevalence of LBW was observed among young mothers (aged 18-24) compared to mothers aged 25 and older. The prevalence of LBW among younger mothers ranged from 17.5 percent

Table 2. **Prevalence of LBW in live birth infants during the Cash and Carry and NHIS systems of care, and by selected maternal and other variables in Northern Ghana**

	Cash and Carry				NHIS			
	2000	2001	2002	2003	2008	2009	2010	2011
Variables	% (n)	% (n)	% (n)	% (n)	% (n)	% (n)	% (n)	% (n)
Maternal Age								
< 18	50 (1)	30.8 (4)	17.6 (3)	15 (2)	28.6 (4)	30 (3)	20 (2)	33 (2)
18-24	36.8 (42)†††	17.5 (66)†††	24 (96)†	19.6 (69)†††	16 (52)	18.6 (63)	20.8 (58)	22 (69)
25-34	19.7 (34)†	13.4 (79)†	13.7 (75)	14 (80)	12.6 (73)	16 (91)	16 (93)	20.6 (126)†
35 >	12.8 (6)	15.6 (24)	15 (26)	14.7 (22)	14 (21)	15 (26)	11.5 (15)	19.6 (28)
Parity								
Zero	35.8 (54)†††	17 (70)†††	20 (89)	20.5 (79)†††	17.5 (65)	17 (61)	20 (69)	21.9 (82)
One	23.7 (23)†	14.5 (37)†	15 (33)	13 (31)†	12 (26)	15 (33)	15.7 (36)	23 (52)†
Two	19 (16)	13.5 (26)	13.9 (21)	13 (23)	9 (17)††	20.9 (39)††	15.7 (29)	18 (36)
Three	16 (10)	16 (26)	13 (17)	8.8 (12)	17 (22)	16 (19)	21.5 (28)	25.5 (39)
Four-plus	18.6 (16)	16 (34)	20 (40)	15 (28)	12 (20)	15 (31)	15 (26)	20.8 (32)
Maternal Hemorrhage (ml)								
<200	24 (78)††	16 (59)††	21.5 (73)	21 (72)	13.7 (96)†	17.9 (108)†	16.6 (105)	20.7 (153)
200-250	26 (19)†	14.9 (79)†	15.8 (121)	16.9 (132)†	14 (112)†	17.8 (148)†	18 (113)	21.9 (148)
>250	15.5 (14)	14.8 (99)	18 (82)	16.5 (71)	13 (74)††	20 (91)††	19.5 (80)	25 (118)†
Miscarriage								
Zero	25 (82)†††	15 (162)†††	17.5 (191)	15.5 (156)	14 (142)	17 (176)	17 (160)	21.5 (212)†
One	0 (0)	17 (8)	14.8 (4)	19.6 (10)	15 (6)	18.8 (6)	17 (8)	12 (9)
Two or More	14 (1)	25 (3)	29 (5)	26.9 (7)	12.5 (2)	4.8 (1)	0 (0)	25 (4)
Type of Delivery								
Caesarean	14 (5)	12.9 (17)	20 (30)	19 (35)	15 (28)†	23.6 (46)†	19.9 (41)	27 (65)
Vaginal	26 (78)†††	15.6 (156)†††	17 (170)	15 (138)†††	14 (118)	16 (136)	16 (127)	19 (160)
Fetal Heart Rate (bpm)								
<130	26 (25)	17 (52)	25.8 (86)††	17 (45)	15.8 (47)	20 (70)	26.5 (66)	36.9 (100)†
130-140	25 (76)†††	15 (155)†††	16.9 (155)	15.6 (130)††	15 (136)	16.8 (137)	16 (141)	20.8 (186)†
>140	26.6 (30)†	17 (58)†	21.9 (67)	14.7 (22)	17 (41)	20.8 (70)	23.7 (51)	34 (107)†
Infant's Gender								
Female	28 (41)†	18.6 (95)†	19 (104)	16.8 (84)††	16.6 (83)	16.6 (87)	19.7 (91)	20 (109)
Male	22 (42)††	12.5 (78)††	16 (96)	15 (89)†	12 (67)†	17 (96)†	14 (77)	21.6 (116)††

Note. † p<0.05; †† p<0.01; ††† p<0.001

to 36.8 percent [p<0.001] under Cash and Carry, compared to 16 percent and 22 percent [p>0.05] under NHIS.

First-time mothers (parity = none) under Cash and Carry were also significantly more likely to deliver low birth weight infants, with prevalence ranging from 17% to 35.8% [p<0.001], compared to the LBW prevalence among first-time mothers under NHIS of 17% to 21.9%, [p>0.05]. There were no significant changes observed in trends for LBW among mothers with prior childbirth experience (parity = one or more) under either Cash and Carry or NHIS.

In 2000-2003 (Cash and Carry), Caesarean deliveries comprised 11 to 17 percent of total deliveries, compared to 2008-2011 (NHIS) when they accounted for 18 to 22 percent. The prevalence of LBW among Caesarean deliveries under Cash and Carry went from 14 percent in 2000 to 19 percent in 2003, compared to 15 percent in 2008 and 27 percent in 2011 under NHIS. However, vaginal deliveries showed mixed results for the prevalence of LBW in both periods. In 2000, the LBW prevalence for vaginal births was 26 percent; it decreased significantly to 15 percent [p<0.001] by 2003. In 2008, the LBW rate was 14 percent; this increased to 19 percent by 2011, but the change was not statistically significant.

Trends in LBW among infants with normal fetal heart rates of 130-140 beats per minute prior to birth significantly decreased from 25 percent [p<0.001] in 2000 to 15.6 percent [p<0.01] in 2003; LBW in this category increased from 15 percent [p>0.05] in 2008 to 20.8 percent [p<0.05] in 2011, which was not statistically significant.

Discussion

This study examined trends in LBW among infants born during the Cash and Carry period compared to infants born under the NHIS. Associations between LBW and factors such as maternal age, parity, Caesarean delivery, and infant's gender have all been well documented in other research.[19,20] The majority of infants in this study – approximately 85 percent – were delivered by mothers 18 to 34 years old. Mothers aged 18 to 24 in both the Cash and Carry and NHIS systems were more prone to

deliver LBW infants compared to older mothers. This suggests that regardless of the mother's insurance status at delivery, her age was a factor in her infant's birth weight. This finding is consistent with similar findings from Tanzania.[21]

The current study showed that more than one-third of infants were born to first-time mothers, who experienced significantly higher prevalence of LBW in both the Cash and Carry and NHIS periods. However, there were no substantial differences in the prevalence of LBW among infants born to mothers with prior birth experience (parity = one or more) in 2001-2003 (Cash & Carry) compared to infants born in 2009-2011 (NHIS) by mothers with similar parity. This suggests that delivery under NHIS, which guaranteed access to antenatal care, did not translate into a reduction in LBW births among multiparous mothers. This is also confirmed by research on multiparous women and LBW conducted in other African countries and the US.[22,23]

More than 90 percent of all infants from the Cash and Carry and the NHIS periods were born to mothers with no history of miscarriages or prior experience of induced abortion. Year-to-year trends showed that during the Cash and Carry period, mothers with no history of miscarriage gave birth to infants with a significantly higher prevalence of LBW in 2000, which decreased by as much as 38 percent by 2003. Under the NHIS, there was a lower prevalence of LBW in 2008, which increased by about 50 percent by 2011. This indicates that access to health services under NHIS had little impact on infants' birth weight for mothers with no history of miscarriage. The improvement in birth weights among mothers with no history of fetal loss during Cash and Carry is consistent with similar findings observed among African-born Black women in the US.[23]

Fewer mothers had Caesarean deliveries during Cash and Carry compared to NHIS. Caesarean deliveries in the former period generally constituted less than 15 percent of total births (except 17% in 2003), which the WHO recommends should be the upper limit for Caesarean deliveries compared to all births.[24] Under NHIS, more deliveries occurred by Caesarean, which increased from 18 percent

in 2008 to 22 percent by 2011. The increased use of Caesarean sections may have resulted from several factors including the availability of insurance coverage, which provided an incentive for compromised pregnancies to be surgically delivered. The observed increased use of Caesarean deliveries under the Ghanaian insurance program was similar to that seen in a large East African hospital.[25] These results highlight the possibility that when patients pay for care out-of-pocket, fewer opt for the more expensive Caesarean procedure. The significant increase in the prevalence of LBW among Caesarean-sectioned infants observed under NHIS could be explained by the availability of NHIS making it possible for more mothers with compromised pregnancies (and therefore prone to having LBW infants) taking advantage of Caesarean delivery to prevent adverse pregnancy outcomes.

Infants with normal fetal heart rates of 130-140 bpm were generally born at higher birth weights than infants who had abnormal fetal heart rates. The observed association between normal pre-delivery fetal heart rates and higher birth weights in this study is consistent with the results of other research.[26]

More than half of all infants born under Cash and Carry and NHIS were male. Access to the NHIS had no impact on the sex ratio of new babies.

Conclusion

Even though this study revealed mixed trends on birth weights related to selected variables under the Cash and Carry and NHIS periods, the large sample size and the comparability of the birth records increased the robustness of the study. However, there are some significant limitations in this research, including the fact that hospital-based data in sub-Saharan Africa generally exclude those women who choose to deliver at home. At-home delivery is still a common practice in Northern Ghana and elsewhere in Africa despite the availability of insurance and skilled care.[18,27] Data on mothers who opted for the services of traditional birth attendants (TBA) even after accessing antenatal care services at the hospital were not included in this research. Other important variables that have been shown to affect birth weight, such as gestational age and mother's weight gain

during pregnancy, were not available and therefore not included in this analysis.[28,29] The absence of socioeconomic information about the mothers was also a major limitation. Though the delivery folders generally capture a range of birth outcome data at the time of delivery, information such as mother's income, educational level, employment status, marital status, and religion are not recorded in the delivery folders. These factors might have provided important additional information about trends in birth weights during the Cash and Carry and NHIS periods.

Despite its limitations, the hospital-based delivery data set showed that overall trends in birth weight outcomes were not significantly impacted by the introduction of NHIS compared to Cash and Carry. However, younger and first-time mothers delivered more LBW babies under Cash and Carry compared to NHIS, and more LBW babies were delivered by Caesarian under NHIS. Although Northern Ghana is an economically deprived part of the country, it is also possible that women with higher socioeconomic status self-selected to deliver at the hospital during Cash and Carry.

This research reveals important information about the birth weights of infants born at Northern Ghana's major hospital. However, the limitations discussed earlier make a strong argument for further research on birth outcomes, especially birth weights. Future research should incorporate the key factors that limited this study, including: mothers' socioeconomic status; gestational age; maternal weight gain during pregnancy; and the number of antenatal care visits for each mother prior to delivery. If available, data from at-home births should also be included to help clarify causation and increase the generalizability of the research.

Global Health Implications

There is a consensus in public health research that insurance coverage, which reduces the financial barriers to health care services, improves general health outcomes. Understanding the differences in the prevalence of low birth weight between the Cash and Carry and NHIS systems in Northern Ghana is important for public health policy makers

there, especially as the country hopes to meet the United Nations Millennium Development Goals (MDG) by the end of 2015. Since birth weight is an important predictor of infants surviving their first year of life, the variables revealed by this research to be related to LBW under NHIS should help guide maternal and child health policies, particularly as they relate to health facilities, TBAs, antenatal services, and nutritional guidelines to improve birth outcomes. The mortality rate for children under five years remains high in Ghana, especially in the Northern Region. By understanding the factors that affect LBW, the country can focus its resources and efforts to ensure that infants are born at normal birth weights, which is a well documented indicator for their survival. [30]

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