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Is enrolment in the National Health Insurance Scheme in Ghana pro-poor? Evidence from the Ghana Living Standard Survey

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ABSTRACT

Objectives This article examines equity in enrolment in the Ghana National Health Insurance Scheme (NHIS) to inform policy decisions on progress towards realisation of universal health coverage (UHC).

Design Secondary analysis of data from the sixth round of the Ghana Living Standards Survey (GLSS 6).

Setting Household-based

Participants: A total of 16,774 household heads participated in the GLSS 6, which was conducted between 18 October 2012 and 17 October 2013.

Analysis Equity in enrolment was assessed using concentration curves and bivariate and multivariate analyses to determine associated factors.

Main outcome measure Equity in NHIS enrolment

Results Survey participants had a mean age of 46 years and mean household size of four persons. About 71% of households interviewed had at least one person enrolled in the NHIS. Households in the poorest wealth quintile (73%) had enrolled significantly (p<0.001) more than those in the richest quintile (67%). The concentration curves further showed that enrolment was slightly disproportionally concentrated among poor households, particularly those headed by males. However, multivariate logistic analyses showed that the likelihood of NHIS enrolment increased from poorer to richest quintile and from low to high level of education. Other factors including age, sex, household size, household setting, and geographic region were significantly associated with enrolment.

Conclusions From 2012–2013 enrolment in the NHIS was higher among poor households, particularly male-headed households, although multivariate analyses demonstrated that the likelihood of NHIS enrolment increased from poorer to richest quintile and from low to high level of education. Policy makers need to ensure equity within and across gender as they strive to achieve UHC.

Strengths and limitations of this study

- Our study is the first to use data from the Ghana Living Standards Survey (GLSS) to examine equity in enrolment in the National Health Insurance Scheme (NHIS).
- We applied concentration curves and multivariate logistic regression models to produce superior findings for informed decision-making.
- Unlike previous study, this study found that enrolment in the NHIS is slightly concentrated on the poor; however, the odds of enrolling increases with wealth quintile and level of education.
- As a secondary analysis, the data used for the study lack a number of important factors including trust in scheme management, perceived quality of care, ease of enrolment, etc., which are useful for better understanding NHIS enrolment.

Introduction

Many low and middle income countries are increasingly implementing prepayment schemes to provide financial risk protection and equitable access to healthcare services for their populations, particularly the poor. (1–3) Prepayment schemes such as social health insurance, if implemented effectively, can reduce out-of-pocket payments (OOP) and associated catastrophic effects on households. (4) The quest to ensure equity in access to healthcare services and to achieve Universal Health Coverage (UHC) has become more imperative, following adoption of the Sustainable Development Goals (SDGs) by member countries of the UN. Equity in prepayment schemes is also recognised by WHO as one of the fundamental elements of UHC. (5)

Ghana had a free healthcare system after independence in the 1950s, financed by general taxation. However, this system of healthcare changed when the economy started declining and user fees were partially introduced in the 1970s and 1980s to offset costs of healthcare services delivery. (6–8) Although the OOP helped public healthcare services providers to recover partial costs of essential medicines and other pharmaceutical products and to raise revenue and improve efficiency, the system created inequity in access to healthcare and in some cases led to avoidable deaths. (6,8,9) This situation resulted in the introduction of a National Health Insurance Scheme (NHIS) in 2003 to replace OOP and ensure equity in healthcare access. (10) An unpublished annual report of the NHIS shows that the scheme covered 37% (10.66 million) of the population in 2017 and had 159 district offices and a network of over 4,000 healthcare providers across the country. The NHIS is managed by the National Health Insurance Authority (NHIA), a body mandated by law to regulate both public and private health insurance schemes in the country. (11)

Membership in the NHIS is broadly categorised into exempt and non-exempt groups. (11) The exempt groups are members who are exempted from paying premiums to the scheme and they include persons below 18 years old, pregnant women, indigent (extreme poor), formal sector workers who contribute to Social Security and National Insurance Trust (SSNIT), and beneficiaries of the Livelihood Empowerment Against Poverty (LEAP) programme. The non-exempt group includes members who pay premiums to the scheme and these are workers in the informal sector of the economy. The NHIS is tax-funded through the National Health Insurance Fund (NHIF) which is based on 2.5% levy on selected goods and services. Other sources of funding are a 2.5% deduction from formal sector workers' SSNIT contributions, premiums from informal sector workers, funds allocated by Parliament, interest from investments, and donor funds and gifts. (11) Evidence shows that the NHIS has made progress in population coverage and contributed to utilization of healthcare services and to expansion of healthcare facilities in its short period of existence. (12)

There are few equity-oriented studies of the NHIS in Ghana. A mixed-method study that evaluated equity in NHIS enrolment in two regions (Central and Eastern) found that more males registered than females and households in the richest quintile were significantly more likely to enrol than those in the poorest quintile. (1) The study also found that old age, higher education, female-headed households, and perceived NHIS benefits were significantly associated with NHIS enrolment. Another mixed-method study examining why the NHIS is not reaching the poor used the same two regions and found less of the poor to be covered due to poverty and policy makers' and implementers' lack of commitment to pursue NHIS's

equity goal. (13) Kusi et al, (14) in examining affordability of NHIS contribution, used three districts from the southern, middle and northern ecological zones of Ghana and also found that significantly more of the rich were enrolled in the NHIS than the poor. These three studies were conducted in 2008 and 2011 and employed bivariate and logistic regression analyses to examine enrolment equity. Other studies that also examined equity in NHIS enrolment, using data from the 2008 Ghana Demographic Health Survey (GDHS), employed concentration curves and logistic regression and focused on gender (19), finding that coverage was highest among the educated, households in the richest quintile, and urban residents. (15,16)

This study employed data from the 2012—2013 Ghana Living Standards Survey (GLSS) round six, a nationally representative sample, and examined equity in enrolment by concertation curves and logistic regression analysis. It is necessary now to study equity to assess major NHIS policy reforms instituted in recent years to make the scheme more attractive to the general public. One such policy is the intersectoral collaboration with state-owned social protection institutions, for example, Ministry of Gender and Social Protection, Ministry of Education, LEAP Secretariat, and Savannah Accelerated Development Authority (SADA), to increase the population of the poor and vulnerable in the NHIS; to improve equity. Findings from this study can inform policy making on UHC attainment and contribute to the body of knowledge on equity in NHIS enrolment.

Methods

Study design and setting

This study analyses secondary data from the sixth round of the Ghana Living Standards Survey conducted between 18 October 2012 and 17 October 2013. The survey covered a representative sample of 18,000 households in 1,200 enumeration areas across the 10 administrative regions of the country. (17) Survey participants had an average age of 43·8 years and 48·0 years for male and females, respectively. In the 2010 Population and Housing Census (PHC), Ghana had a population of 24,658,823, with 51·2% being females. The majority of the population resided in the Ashanti (19·4%) and Greater Accra (16·3%) regions, the two most urbanised regions (18) of the country. These two regions also have the lowest poverty rates, whilst those in the northern savannah ecological zones (Northern, Upper East, Upper West, Brong-Ahafo, Volta) have the highest poverty rates. (19) Appendices 1 and 2 provide more details on the population distribution and poverty profile of Ghana.

Data collection and analysis

Data were sourced from the Ghana Statistical Service. Bivariate analyses examined unadjusted relationships between socio-demographic factors and wealth quintiles. Equity in enrolment was assessed using concentration curves and indices and multivariate logistic regression models to determine factors associated with enrolment. (1,15,20,21) The unit of analysis was the household and we examined cumulative proportion of enrolment by wealth quintiles, decomposed by sex, within and across male-headed and female-headed households. A multivariate logistic regression model (enrolled or not enrolled) was employed to assess whether lower wealth groups were more likely to enrol in the NHIS than higher wealth groups, holding the other socio-demographic variables constant. Socio-demographic variables included age, sex, household size, education, employment, wealth quintile,

household setting, and geographic region. Microsoft Excel 2016 and STATA version 13 were used for all analyses.

Patient and public involvement

Patients were not involved in this study.

Results

Characteristics of study participants

A total of 16,772 household heads with an average age of 46 years and household size of 4 persons responded to questions on NHIS in the survey (Table 1). Out of the total, 72% were females; 51% had no formal education; 90% were employed; 24% were in the richest quintile; 56% lived in urban areas; and 12% were in the Ashanti region. About 71% of households had at least one person enrolled in the NHIS.

Equity in enrolment

Results of the concentration curve analyses demonstrate that enrolment was slightly more concentrated among poor households (Figure 1). Enrolment by sex also showed that enrolment was more concentrated among households headed by males compared to those headed by females. The concentration indices further revealed that among study participants, equity was more pronounced in the insured than the uninsured and within male-headed households than female-headed households (Table 2).

Relationship between household characteristics and wealth quintiles

There were significant differences in all household characteristics, except employment status, by wealth quintiles (Table 3). The poorest households (73%) enrolled in the NHIS more than the richest households (67%). Interestingly, the richer households had the second highest enrolment (72.4%) in the scheme. The majority of the poorest households (80.1%) had no formal education compared to about 25% of the richest households with tertiary level education. Similarly, the majority of the poorest households (91%) were more employed as were the richest households (89%), and there were more females (79%) in the poorest quintile than in the richest quintile (67%). There were also significantly more household heads aged 46 years or more in the poorest quintile (51%) than those in the richest quintile (35%), and more households in the poorest quintile (86%) living in urban settings than households in the richest quintiles (30%).

Results of the multivariate logistic regression showed that the likelihood of enrolling in the NHIS increases from poorer to richest quintile and from low to high level of education (Table 4). Females (OR: 1·44; 95% CI: 1·32–1·57); individuals aged 46 years or more (OR: 2·12; 95% CI: 1·86–2·19); and those living in the Upper East (OR: 5·84; 95% CI: 4·79–7·10), Upper West (OR: 5·00; 95% CI: 4·11–6·08), Brong-Ahafo (OR: 3·02; 95% CI: 2·56–3·57), Volta (OR: 2·04; 95% CI:1·74–2·39), and Northern (OR: 1·42; 95% CI: 1·22–1·65) regions were significantly more likely to enrol in the NHIS than their respective reference categories. Surprisingly, the employed were less likely (OR=0·9; 95% CI 0·83–1·06) to enrol in the NHIS although not significantly so. The unadjusted odds ratios (OR) showed similar associations except for wealth quintile, the explanatory variable of interest, which showed a decreased likelihood of enrolling in the NHIS from poorer to richest.

Discussion

This study examined equity in NHIS enrolment employing data from the Ghana Living Standards Survey (round six), which was conducted between October 2012 and October 2013. The findings show inequity in enrolment and significant associations between socio-demographic factors and NHIS enrolment. Among households surveyed, enrolment is disproportionally concentrated among poor households especially those headed by males. One possible explanation relates to policy changes made over the last few years to increase enrolment in the scheme. One such policy is the deliberate attempt to increase numbers of the poor and vulnerable in the scheme through enrolment of LEAP beneficiaries, students in secondary and tertiary institutions in Ghana, prisoners, and individuals living in less developed geographic regions, particularly those in the northern savannah ecological zone, where there is high prevalence of poverty. The disproportionate concentration of enrolment among poor households contradicts previous studies on the NHIS, (1,13–15,22,23) due possibly to the years in which those studies were conducted (2008 and 2011), as well as the limited regional scope (three administrative regions except the 2008 Demographic Health Survey that covered the entire country). This present study employs a nationally representative survey.

This study also shows that a number of socio-demographic factors are significantly associated with NHIS enrolment. Although unadjusted findings illustrate that enrolment is concentrated among poor households, multivariate findings illustrate that the odds of enrolling in the scheme increases with wealth quintiles, that is, the rich are more likely to enrol than the poor. This may be attributed to evidence that the rich are more able to afford the cost of enrolling in the health insurance programme than the poor. (1,13,24,25) Individuals with higher levels of education are more likely to enrol in the NHIS compared to those with no formal education; females are more likely to enrol than males; and adults are more likely to enrol than the young, consistent with previous studies. (1,15,23–26) The employed are less likely to enrol compared to the unemployed. A possible explanation is that the employed may be able to afford OOP for healthcare services because they are more economically resourced than the unemployed. This result runs counter to a number of studies. (14,26)

Findings from this study also reveal that individuals residing in rural settings are significantly less likely to enrol in the NHIS compared to those living in urban areas, consistent with previous studies, (23,26) but contradicting a study by Jehu-Appiah et al, (1) One reason may be due to poverty; (13,22,25,27–29) prior studies showed that the majority of rural dwellers are unable to afford the NHIS premium, which ranges from GHS7·20 (US$1·51) to GHS48.00 (US$10·13), and processing fee of GHS8·00 (US$1·68) or renewal fee of GHS5·00 (US$1·05). This study's findings also show that the odds of enrolling in the NHIS increases with household size, consistent with other studies, (15,24,25) because larger households may be risk averse and thus would enrol in the NHIS to seek financial risk protection against healthcare costs and to avoid catastrophic OOP. Our findings also reveal that individuals residing in less developed regions of the country are significantly more likely to enrol in the scheme compared to those in developed regions. Again, this may be attributed to policy reforms focused on enrolling individuals living in deprived regions, particularly those in the northern savannah ecological zones, comprising the Northern, Upper East, Upper West, and some parts of Brong-Ahafo and Volta regions, (17) consistent with some studies (15,16) and contradicting others. (26)

Our study's primary limitation is that the data lack a number of important factors (such as trust in scheme management, perceived quality of care, ease of enrolment, etc.), which would be useful for better understanding NHIS enrolment. Nonetheless, the variables used in the multivariate logistic regression modelling did not significantly affect model robustness.

Conclusion

The study reveals that from 2012–2013, enrolment in the NHIS was higher among poor households, particularly male-headed households, although multivariate analyses demonstrated that the likelihood of NHIS enrolment increased from poorer to richest quintile and from low to high level of education. Whilst the NHIS strives to achieve its pro-poor goal of providing financial risk protection for the poor and vulnerable in society, equity must be addressed within and across the entire population. Adequate funds are also required to cover the anticipated increase in medical claims costs because as more poor and vulnerable groups enrol in the scheme, the claims cost is likely to escalate and threaten the scheme's sustainability. Thus, policy decisions to ensure equity in enrolment must also ensure commensurate funding to avoid financial uncertainty and collapse. Further research on equity in healthcare services utilization, expenditures, and accreditation of healthcare providers is needed to provide a fuller picture of equity assessment in the NHIS.

Ethics approval

This study is a secondary analysis of the Ghana Living Standard Survey (round 6) data, however formal approval was obtained from the Ghana Statistical Service to use the data.

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None

Competing interests

ENB is an employee of the National Health Insurance Authority, however his affiliation did not influence findings of this study. JPR and JN declare no competing interests.

Contributors

ENB, JPR and JN conceived and designed the study. JN retrieved the data and ENB analysed the data and drafted the manuscript. JPR and JN provided substantial intellectual contributions to develop and critically revise the manuscript. All the authors read and approved the manuscript for publication.

Patient consent

Not applicable

Data sharing statement

No additional data available

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Table 1: Individual and household characteristics

Variable	% (n=16,772)
NHIS status	
Covered	70·5
Not covered	29·5
Highest Education	
None	50·7
Primary	30·5
Secondary	8·5
Tertiary	10·3
Employment status	
Employed	89·5
Unemployed	10·5
Wealth quintile	
Poorest	20·1
Poorer	17·6
Middle	17·9
Richer	20·1
Richest	24·3
Sex	
Female	71·8
Male	28·2
Age (*M*=45.84; *SD*=15.89)	
<46	57·1
46+	42·9
Household size (*M*=4.26; *SD*=2.78)	
<4	58·8
4+	41·2
Household setting	
Rural	44·4
Urban	55·6
Geographic region	
Western	10·2
Central	9·6
Greater Accra	11·5
Volta	9·4
Eastern	10·8
Ashanti	11·8
Brong Ahafo	9·7
Northern	10·2
Upper East	8·6
Upper West	8·3

M: mean; SD: standard deviation

Table 2: Concentration index (CI) showing inequity in NHIS enrolment

Wealth quintile	Total		Within households (HH)				Between households (HH)	
	Enrolled	Not enrolled	Female-headed HH		Male-headed HH		Female	Male
			Enrolled	Not enrolled	Enrolled	Not enrolled		
Poorest	-0·0009	0·0021	-0·0023	0·0060	-0·0009	0·0020	0·0073	-0·0029
Poorer	-0·0014	0·0035	0·0061	-0·0153	-0·0010	0·0026	0·0096	-0·0039
Middle	0·0018	-0·0039	-0·0085	0·0234	-0·0002	0·0011	0·0268	-0·0108
Richer	-0·0116	0·0290	0·0000	0·0000	-0·0135	0·0321	0·0455	-0·0185
Richest	0·0000	0·0000	-0·0056	0·0167	0·0000	0·0000	0·0000	0·0000
Total	**-0·0120**	**0·0307**	**-0·0103**	**0·0307**	**-0·0156**	**0·0378**	**0·0891**	**-0·0362**

Table 3: Differences in household characteristics by wealth quintile (**n=16,772**)

Variable	Q1 (Poorest)	Q2 (Poorer)	Q3 (Middle)	Q4 (Richer)	Q5 (Richest)	Total	Pearson's χ2
NHIS status							0·000
Enrolled	72·6	70·9	70·3	72·4	67·0	70·5	
Not enrolled	27·4	29·1	29·7	27·6	33·0	29·5	
Highest education							0·000
None	80·1	62·7	51·9	39·8	25·8	50·7	
Primary	16·3	28·7	34·8	38·7	33·6	30·5	
Secondary	2·1	5·4	7·0	10·1	15·8	8·5	
Tertiary	1·5	3·2	6·3	11·4	24·8	10·3	
Employment status							0·065
Employed	90·9	89·6	90·5	88·7	88·8	89·5	
Unemployed	9·1	10·4	9·5	11·3	11·2	10·5	
Sex							0·000
Female	79·1	73·1	71·7	69·4	66·9	71·8	
Male	20·9	26·9	28·3	30·6	33·1	28·2	
Age (years)							0·000
<46	49·2	53·8	56·3	58·9	65·0	57·1	
46+	50·8	46·2	43·7	41·1	35·0	42·9	
Household size							0·000
<4	30·3	46·2	57·2	69·2	84·0	58·8	
4+	69·7	53·8	42·8	30·8	16·0	41·2	
Household setting							0·000
Rural	13·7	31·1	43·6	56·0	70·4	44·4	
Urban	86·3	68·9	56·4	44·0	29·6	55·6	
Geographic region							0·000
Western	5·6	9·4	11·1	12·8	11·9	10·2	
Central	5·1	10·6	12·2	10·8	9·5	9·6	
Greater Accra	2·3	4·4	8·0	14·0	24·7	11·5	
Volta	8·7	11·0	9·8	10·1	7·9	9·4	
Eastern	7·0	11·8	13·8	13·1	8·9	10·8	
Ashanti	4·0	9·2	11·9	14·6	17·7	11·8	
Brong-Ahafo	8·4	11·9	11·0	9·6	8·2	9·7	
Northern	20·0	12·9	9·6	6·4	3·6	10·2	
Upper East	14·7	11·4	8·3	6·2	3·8	8·6	
Upper West	24·2	7·4	4·2	2·5	3·8	8·3	

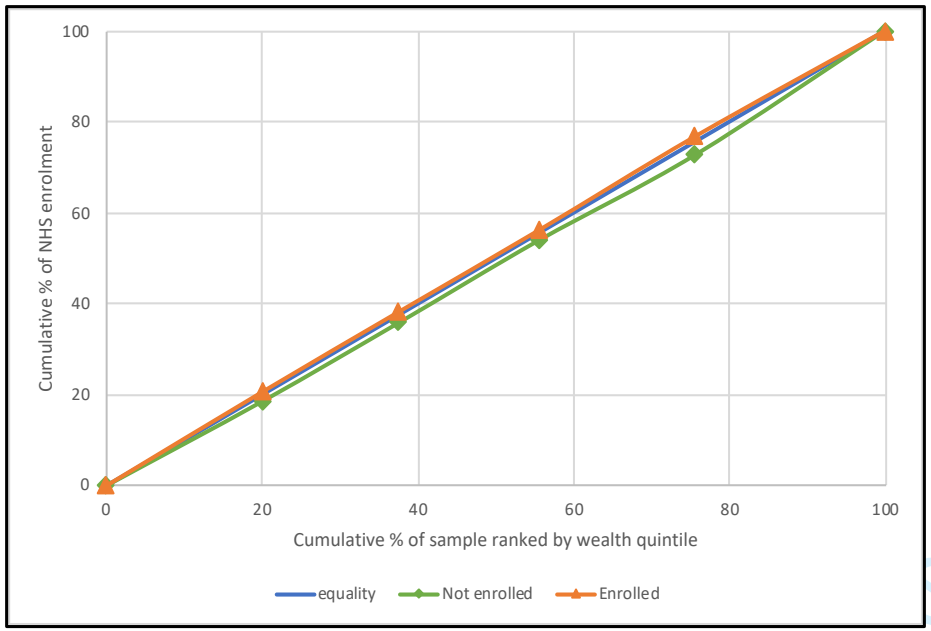
Table 4: Multivariate logistic regression model for enrolling in NHIS

Variable	Unadjusted OR	[95% C.I]	Adjusted OR	[95% C.I]
Wealth quintile				
Poorest	1·00		1·00	
Poorer	0·92	0·82–1·02	1·21**	1·07–1·37
Middle	0·89*	0·79–0·99	1·33***	1·18–1·51
Richer	0·98	0·88–1·09	1·60***	1·41–1·82
Richest	0·76***	0·69–0·84	1·26**	1·09–1·43
Highest education				
None	1·00		1·00	
Primary	1·05	0·98–1·14	1·55***	1·42–1·69
Secondary	1·27***	1·12–1·44	2·16***	1·88–2·49
Tertiary	1·75***	1·55–1·99	2·73***	2·36–3·16
Employment status				
Unemployed	1·00		1·00	
Employed	0·85**	0·76–0·95	0·94	0·83–1·06
Sex				
Male	1·00		1·00	
Female	1·11**	1·03–1·19	1·44***	1·32–1·57
Age (years)				
<46	1·00		1·00	
46+	1·47***	1·37–1·57	1·49***	1·38–1·60
Household size				
<4	1·00		1·00	
4+	1·81***	1·69–1·94	2·02***	1·86–2·19
Household setting				
Urban	1·00		1·00	
Rural	0·96	0·90–1·03	0·77***	0·79–0·83
Geographic region				
Western	1·00		1·00	
Central	0·64***	0·55–0·73	0·63***	0·55–0·73
Greater Accra	0·79**	0·69–0·90	0·63***	0·54–0·73
Volta	1·89***	1·62–2·21	2·04***	1·74–2·39
Eastern	1·33***	1·16–1·53	1·36***	1·17–1·56
Ashanti	1·15*	1·01–1·32	1·08	0·94–1·25
Brong-Ahafo	2·68***	2·27–3·15	3·02***	2·56–3·57
Northern	1·06	0·92–1·22	1·42***	1·22–1·65
Upper East	4·30***	3·56–5·19	5·84***	4·79–7·10
Upper West	3·61***	3·01–4·33	5·00**	4·11–6·08
_cons			0·49**	0·39–0·63

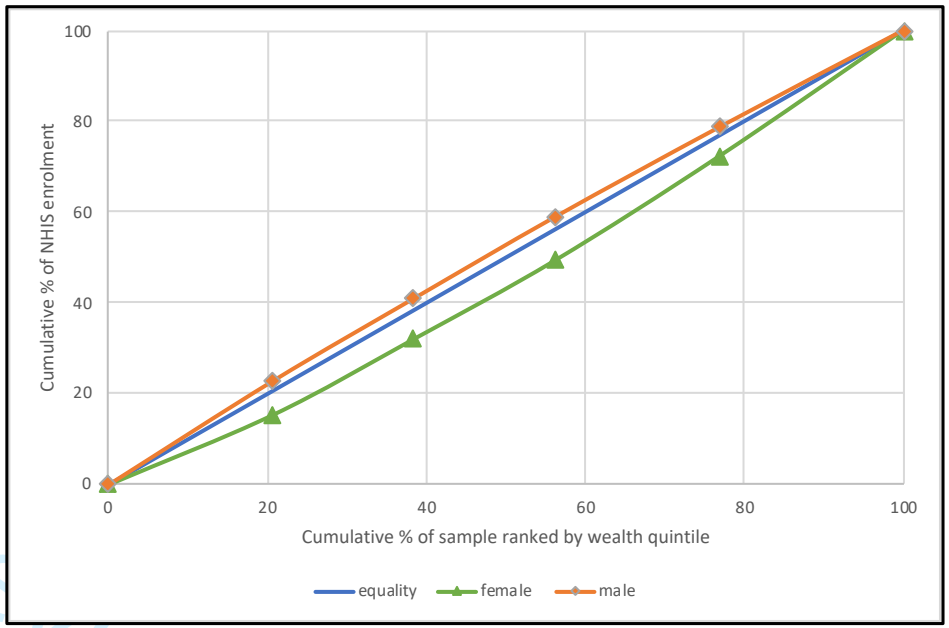
OR: odds ratio; $^{+}p<0·10$; $*p<0·05$; $**p<0·01$; $***p<0·001$; Control variables: education of household head, employment status of household head, sex of household, age of household head, household size, household setting and geographic region

Figure legends

Figure 1: Concentration curves for enrolment in NHIS

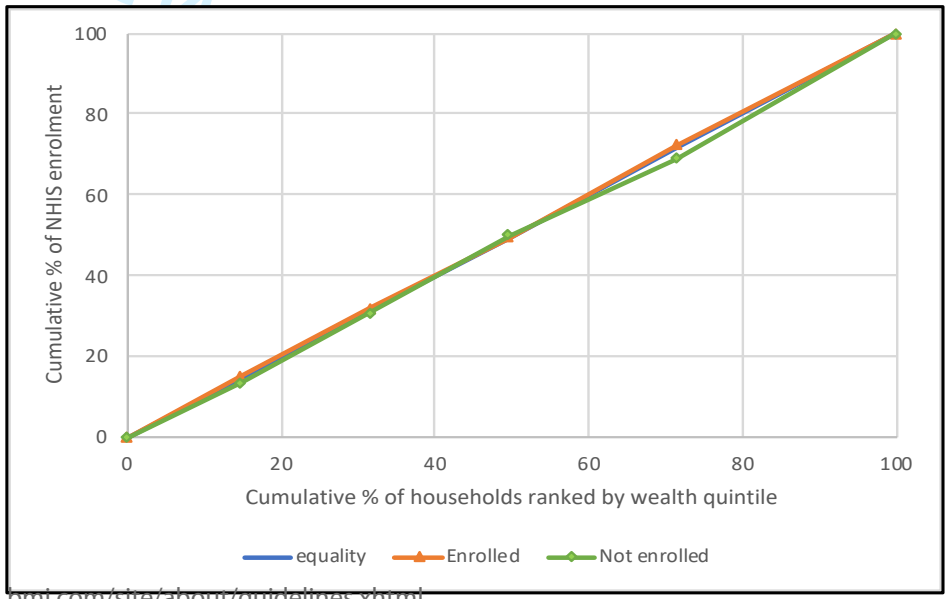


a: Concentration curves for NHIS enrolment



b: Concentration curves for NHIS enrolment by sex

c: Concentration curves for NHIS enrolment in male-headed households



d: Concentration curves for NHIS enrolment in female-headed households

Figure 1: **Concentration curves for enrolment in NHIS**

Appendix 1: Distribution of population by region, sex and locality of enumeration, 2010

Region	Total Population	Male	Female	Locality of enumeration		Share of Population (%)	Proportion urban	Sex Ratio	Percentage increase over 2000	Intercensal Growth Rate (%)
				Urban	Rural					
All Regions	**24,658,823**	**12,024,845**	**12,633,978**	**12,545,229**	**12,113,594**	**100.0**	**50.9**	**95.2**	**30.4**	**2.5**
Western	2,376,021	1,187,774	1,188,247	1,007,969	1,368,052	9.6	42.4	100.0	23.5	2.0
Central	2,201,863	1,050,112	1,151,751	1,037,878	1,163,985	8.9	47.1	91.2	38.1	3.1
Greater Accra	4,010,054	1,938,225	2,071,829	3,630,955	379,099	16.3	90.5	93.6	38.0	3.1
Volta	2,118,252	1,019,398	1,098,854	713,735	1,404,517	8.6	33.7	92.8	29.5	2.5
Eastern	2,633,154	1,290,539	1,342,615	1,143,918	1,489,236	10.7	43.4	96.1	25.0	2.1
Ashanti	4,780,380	2,316,052	2,464,328	2,897,290	1,883,090	19.4	60.6	94.0	32.3	2.7
Brong Ahafo	2,310,983	1,145,271	1,165,712	1,028,473	1,282,510	9.4	44.5	98.2	27.3	2.3
Northern	2,479,461	1,229,887	1,249,574	750,712	1,728,749	10.1	30.3	98.4	36.2	2.9
Upper East	1,046,545	506,405	540,140	219,646	826,899	4.2	21.0	93.8	13.7	1.2
Upper West	702,110	341,182	360,928	114,653	587,457	2.8	16.3	94.5	21.8	1.9

Source: Adapted from Ghana Statistical Service [18]

Appendix 2: Poverty incidence and poverty gap by region (%) 2005/06–2012/13 (Poverty line=GHS1,314=US$277.22)

Region	Poverty incidence (P_0)	Contribution to total poverty (C_0)	Poverty gap (P_1)	Contribution to total poverty gap (C_1)	Poverty incidence (P_0)	Contribution to total poverty (C_0)	Poverty gap (P_1)	Contribution to total poverty gap
2012/13					***2005/06***			
Western	20.9	7.9	5.7	6.8	22.9	7.3	5.4	5.0
Central	18.8	6.9	5.6	6.4	23.4	6.4	5.6	4.4
Greater Accra	5.6	3.8	1.6	3.5	13.5	5.9	3.7	4.7
Volta	33.8	12.1	9.8	11.0	37.3	8.7	9.2	6.2
Eastern	21.7	9.3	5.8	7.8	17.8	7.5	4.2	5.2
Ashanti	14.8	12.0	3.5	9.0	24.0	12.6	6.4	9.8
Brong Ahafo	27.9	11.4	7.4	9.4	34.0	9.8	9.5	7.9
Northern	50.4	20.8	19.3	24.9	55.7	21.0	23.0	25.2
Upper East	44.4	7.4	17.2	9.0	72.9	10.9	35.3	15.3
Upper West	70.7	8.4	33.2	12.3	89.1	10.0	50.7	16.4
All Ghana	24.2	100.0	7.8	100.0	31.9	100.0	11.0	100.0

Source: Adapted from Ghana Statistical Service [19]

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Is enrolment in the National Health Insurance Scheme in Ghana pro-poor? Evidence from the Ghana Living Standard Survey

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ABSTRACT

Objectives This article examines equity in enrolment in the Ghana National Health Insurance Scheme (NHIS) to inform policy decisions on progress towards realisation of universal health coverage (UHC).

Design Secondary analysis of data from the sixth round of the Ghana Living Standards Survey (GLSS 6).

Setting Household-based

Participants: A total of 16,774 household heads participated in the GLSS 6, which was conducted between 18 October 2012 and 17 October 2013.

Analysis Equity in enrolment was assessed using concentration curves and bivariate and multivariate analyses to determine associated factors.

Main outcome measure Equity in NHIS enrolment

Results Survey participants had a mean age of 46 years and mean household size of four persons. About 71% of households interviewed had at least one person enrolled in the NHIS. Households in the poorest wealth quintile (73%) had enrolled significantly (p<0.001) more than those in the richest quintile (67%). The concentration curves further showed that enrolment was slightly disproportionally concentrated among poor households, particularly those headed by males. However, multivariate logistic analyses showed that the likelihood of NHIS enrolment increased from poorer to richest quintile, low to high level of education., and young adults to older adults. Other factors including sex, household size, household setting, and geographic region were significantly associated with enrolment.

Conclusions From 2012–2013 enrolment in the NHIS was higher among poor households, particularly male-headed households, although multivariate analyses demonstrated that the likelihood of NHIS enrolment increased from poorer to richest quintile and from low to high level of education. Policy makers need to ensure equity within and across gender as they strive to achieve UHC.

Strengths and limitations of this study

- Our study is the first to use data from the Ghana Living Standards Survey (GLSS) to examine equity in enrolment in the National Health Insurance Scheme (NHIS).
- We developed concentration curves and multivariate logistic regression models to produce new findings to inform decision-making.
- Unlike previous studies, this study found that enrolment in the NHIS is slightly concentrated among the poor; however, the odds of enrolling increases with wealth quintile, level of education, and age.
- As a secondary analysis, the data used for the study lack a number of important factors including trust in scheme management, perceived quality of care, ease of enrolment, etc., which would be useful for better understanding NHIS enrolment.

Introduction

Many low and middle income countries are increasingly implementing prepayment schemes to provide financial risk protection and equitable access to healthcare services for their populations, particularly the poor. (1–3) Prepayment schemes such as social health insurance, if implemented effectively, can reduce out-of-pocket payments (OOP) and associated catastrophic effects on households. (4) The quest to ensure equity in access to healthcare services and to achieve Universal Health Coverage (UHC) has become more imperative, following adoption of the Sustainable Development Goals (SDGs) by member countries of the United Nations (UN). Equity in prepayment schemes is also recognised by WHO as one of the fundamental elements of UHC. (5)

Ghana had a free healthcare system after independence in the 1950s, financed by general taxation. However, this system of healthcare changed when the economy started declining and user fees were partially introduced in the 1970s and 1980s to offset costs of healthcare services delivery. (6–8) Although the OOP somewhat helped public healthcare services providers to recover partial costs of essential medicines and other pharmaceutical products and to raise revenue, the system created inequity in access to healthcare and in some cases led to avoidable deaths. (6,8,9) This situation resulted in the introduction of a National Health Insurance Scheme (NHIS) in 2003 to replace OOP and ensure equity in healthcare access. (10) The NHIS is managed by the National Health Insurance Authority (NHIA), a body mandated by law to regulate both public and private health insurance schemes in the country (11).

Membership in the NHIS is broadly categorised into exempt and non-exempt groups. (11) The exempt groups are members who are exempted from paying premiums to the scheme and they include persons below 18 years old, persons aged 70 years and above, pregnant women, indigent (extreme poor), formal sector workers who contribute to Social Security and National Insurance Trust (SSNIT), and beneficiaries of the Livelihood Empowerment Against Poverty (LEAP) programme. The non-exempt group includes members who pay premiums and enrolment processing fees to the scheme and these are workers in the informal sector of the economy. The NHIS is tax-funded through the National Health Insurance Fund (NHIF) which is based on 2.5% levy on selected goods and services. Other sources of funding are a 2.5% deduction from formal sector workers' SSNIT contributions, premiums from informal sector workers, funds allocated by Parliament, interest from investments, and donor funds and gifts. (11) The premium and enrolment processing fee from the non-exempt group is GHS30.00 (US$6.33) per year. However, the exempt group only pays a processing fee of GHS8.00 (US$1.69) for new enrolment and GHS5.00 (US$1.05) for renewal of membership per year. Relative to the per capital income of GHS8,863 (US$2,035) (12), the NHIS premium and processing fee represent 0.34%. Again, reference to the daily minimum wage of GHS10.65 (US$2.25) (13) or GHS2,769.00 (US$584.18) per year, the NHIS premium and processing fee constitute 0.38%.

Like many health systems around the globe, Ghana's health system is hierarchical with the Ministry of Health (MoH) as apex body mandated to formulate policies to improve health of the population. (14) The MoH has about 12 agencies, comprising of the public, quasi-government and private health facilities, as well health education institutions. The biggest agency is the Ghana Health Service, which is charged with the responsibility of delivering healthcare to the population, as well as implementing policies of the MoH. The Ghana Health

Service has a decentralised system of healthcare delivery with a considerable number of healthcare facilities located across the country. The lowest level of the healthcare delivery system is the community-based and health planning services (CHPS) compound and the highest being the tertiary or teaching hospitals at the national level. The number of healthcare facilities and professionals are unevenly distributed across the country, with the majority located in the urban areas. (15,16) On the other hand, many of the private healthcare facilities particularly the faith-based ones are located in remote areas, where they provide about 40% of healthcare services to the population. (14)

Evidence shows that the NHIS has made progress in population coverage and contributed to utilization of healthcare services and to expansion of healthcare facilities in its short period of existence. (17) A report of the NHIS shows that the scheme has covered 36% (10.8 million) of the population as of December 2018 (18). It has 166 district offices and a network of over 4000 healthcare providers comprising both public and private healthcare facilities across the country. The benefits package reportedly covers 95% of the disease conditions afflicting the population. It broadly covers outpatient services, inpatient services, oral health, eye care services, maternity care and emergencies.(19) Preventive services, for example, immunization and service that have the potential to pose sustainability challenges are excluded from the benefit package. (9,11)

There are few equity-oriented studies of the NHIS in Ghana. A mixed-method study that evaluated equity in NHIS enrolment in two regions (Central and Eastern) found that more males had registered in the scheme than females and households in the richest quintile were significantly more likely to enrol than those in the poorest quintile. (1) The study also found that old age, higher education, female-headed households, and perceived NHIS benefits were significantly associated with NHIS enrolment. Another mixed-method study examining why the NHIS is not reaching the poor used the same two regions and found fewer of the poor to be covered due to poverty and policy makers' and implementers' lack of commitment to pursue NHIS's equity goal. (20) Kusi et al., (21) in examining affordability of NHIS contribution, used three districts from the southern, middle and northern ecological zones of Ghana and also found that significantly more of the rich were enrolled in the NHIS than the poor. These three studies were conducted in 2008 and 2011 and employed bivariate and logistic regression analyses to examine enrolment equity. Other studies that also examined equity in NHIS enrolment, using data from the 2008 Ghana Demographic Health Survey (GDHS), employed concentration curves and logistic regression and found that coverage was highest among the educated, households in the richest quintile, and urban residents. (22,23)

This study examined equity in enrolment by concertation curves and logistic regression analysis. It is necessary now to study equity to assess major NHIS policy reforms instituted in recent years to make the scheme more attractive to the general public. One such policy is the intersectoral collaboration with state-owned social protection institutions, for example, Ministry of Gender and Social Protection, Ministry of Education, LEAP Secretariat, and Savannah Accelerated Development Authority (SADA), to increase the population of the poor and vulnerable in the NHIS and to improve equity. Findings from this study can inform policy making on UHC attainment and contribute to the body of knowledge on equity in NHIS enrolment and progress towards achieving the SDGs.

Methods

Study design and setting

This study analyses secondary data from the sixth round of the Ghana Living Standards Survey conducted between 18 October 2012 and 17 October 2013. The survey covered a representative sample of 18,000 households in 1,200 enumeration areas across the 10 administrative regions of the country. (24) Survey participants had an average age of 44 years and 48 years for male and females, respectively. In the 2010 Population and Housing Census (PHC), Ghana had a population of 24,658,823, with 51·2% being females. The majority of the population resided in the Ashanti (19·4%) and Greater Accra (16·3%) regions, the two most urbanised regions (25) of the country. These two regions also have the lowest poverty rates, whilst those in the northern savannah ecological zones (Northern, Upper East, Upper West, Brong-Ahafo, Volta) have the highest poverty rates. (26) Appendices 1 and 2 provide more details on the population distribution and poverty profile of Ghana.

Data collection and analysis

Data were sourced from the Ghana Statistical Service and had already been cleaned and managed including creation of sampling weights and income quintiles. Bivariate analyses examined unadjusted relationships between socio-demographic factors and wealth quintiles. Equity in enrolment was assessed using concentration curves and indices, and multivariate logistic regression models to determine factors associated with enrolment. (1,22,27,28) Whilst the concertation curve analyses equity in NHIS enrolment between the poor and the rich, the logistic regression model shows factors associated with enrolment in the scheme. The use of these two analytical techniques is therefore meant to produce reliable findings for informed policy decision-making.

The unit of analysis was the household and we examined cumulative proportion of enrolment by wealth quintiles, decomposed by sex, within and across male-headed and female-headed households. A multivariate logistic regression model was employed to assess whether lower wealth groups were more likely to enrol in the NHIS than higher wealth groups, holding the other socio-demographic variables constant. The outcome or dependent variable 'NHIS enrolment status' was labelled 1 for active card-bearing members and 0 for inactive card-bearing members or those who had never enrolled in the scheme. The main independent variable was 'wealth quintile' and the others (control variables) were socio-demographic characteristics such as age of household head, sex of household head, household size, education level of household head, household head employment status, household setting, and geographic region of residence. Age of household head was categorised based on the Medical Subject Headings (MeSH) age defining. (29,30) Microsoft Excel 2016 and STATA version 13 were used for all analyses.

Patient and public involvement

Patients were not involved in this study.

Results

Characteristics of study participants

A total of 16,772 household heads with an average age of 46 years (*SD*=15.58) and household size of 4 persons (*SD*=2.78) responded to questions on NHIS in the survey (Table 1). Majority of the household heads (47%) were in the age bracket of 25-44 years. Out of the total number

of survey participants, 72% were females; 51% had no formal education; 90% were employed; 24% were in the richest quintile; 56% lived in urban areas; and 12% resided in the Ashanti region. About 71% of households had at least one person enrolled in the NHIS.

Equity in enrolment

Results of the concentration curve analyses demonstrate that enrolment was slightly more concentrated among poor households (Figure 1). Enrolment by sex also showed that enrolment was more concentrated among households headed by males compared to those headed by females. The concentration indices further revealed that among the study participants, equity was more pronounced in the insured than the uninsured and within male-headed households than female-headed households (Table 2).

Relationship between household characteristics and wealth quintiles

There were significant differences in all household characteristics by wealth quintiles, except employment status (Table 3). The poorest households (73%) enrolled in the NHIS more than the richest households (67%). Interestingly, the richer households had the second highest enrolment (72.4%) in the scheme. Majority of the poorest households (80.1%) had no formal education compared to about 25% of the richest households with tertiary level education. Similarly, majority of the poorest households (91%) were more employed as were the richest households (89%), and there were more females (79%) in the poorest quintile than in the richest quintile (67%). There were also significantly more household heads aged 45 years or more in the poorest quintile than those in the richest quintile, and more households in the poorest quintile (86%) living in urban settings than households in the richest quintiles (30%).

Results of the multivariate logistic regression showed that the likelihood of enrolling in the NHIS increases from poorer to richest quintile, low to high level of education, and young adults to older adults (Table 4). Females (OR: 1·52; 95% CI: 1·39–1·65) and persons living in the Upper East (OR: 5·99; 95% CI: 4·91–7·31), Upper West (OR: 5·04; 95% CI: 4·14–6·15), Brong-Ahafo (OR: 3·06; 95% CI: 2·58–3·62), Volta (OR: 2·04; 95% CI:1·74–2·39), and Northern (OR: 1·32; 95% CI: 1·13–1·54) regions were significantly more likely to enrol in the NHIS than their respective reference categories. Surprisingly, the employed were less likely to enrol in the NHIS (OR=0·99; 95% CI 0·87–1·12) although not significantly so. The unadjusted odds ratios (OR) showed similar associations except for wealth quintile, the explanatory variable of interest, which showed a decreased likelihood of enrolling in the NHIS from poorer to richest.

Discussion

This study examined equity in NHIS enrolment employing data from the Ghana Living Standards Survey (round 6), which was conducted between October 2012 and October 2013. The findings show inequity in enrolment and significant associations between socio-demographic factors and NHIS enrolment. Among households surveyed, enrolment is disproportionally concentrated among poor households especially those headed by males. The possible explanation relates to policy changes made over the last few years to increase enrolment in the scheme. One such policy is the deliberate attempt to increase numbers of the poor and vulnerable in the scheme through enrolment of the Livelihood Empowerment Against Poverty (LEAP) beneficiaries, students in secondary and tertiary institutions in Ghana, prisoners, and individuals living in less developed geographic regions, particularly those in the northern savannah ecological zone, where there is high prevalence of poverty. The

disproportionate concentration of enrolment among poor households contradicts previous studies on the NHIS, (1,20–22,31,32) due possibly to the years in which those studies were conducted (2008 and 2011), as well as the limited regional scope (three administrative regions except the 2008 Demographic Health Survey that covered the entire country). This present study employs a nationally representative survey.

Our study also shows that a number of socio-demographic factors are significantly associated with NHIS enrolment. Although unadjusted findings illustrate that enrolment is concentrated among poor households, multivariate findings illustrate that the odds of enrolling in the scheme increases with wealth quintiles, that is, the rich are more likely to enrol than the poor. This may be attributed to evidence that the rich are more able to afford the cost of enrolling in the health insurance programme than the poor. (1,20,33,34) Besides, as explained earlier, the policy decision to deliberately enrol the poor might have contributed to their higher numbers in the NHIS, but voluntarily other factors other than being poor contribute to enrolment in the scheme. Individuals with higher levels of education are more likely to enrol in the NHIS compared to those with no formal education; females are more likely to enrol than males; and older adults are more likely to enrol than young adults, consistent with previous studies. (1,22,32–35) The employed are less likely to enrol compared to the unemployed. The plausible explanation is that the employed may be able to afford OOP for healthcare services because they are more economically resourced than the unemployed. This result runs counter to earlier studies. (21,35)

Findings from this study also reveal that individuals residing in rural settings are significantly less likely to enrol in the NHIS compared to those living in urban areas, consistent with previous studies, (32,35) but contradicting a study by Jehu-Appiah et al, (1) One reason may be due to poverty; prior studies showed that the majority of rural dwellers are unable to afford the NHIS premium and processing or renewal fee. (20,31,34,36–38) This study's findings also show that the odds of enrolling in the NHIS increases with household size, consistent with other studies, (22,33,34) because larger households may be risk averse and thus would enrol in the NHIS to seek financial risk protection against their healthcare costs and to avoid catastrophic OOP. Our findings also reveal that individuals residing in less developed regions of the country are significantly more likely to enrol in the scheme compared to those in developed regions. Again, this may be attributed to policy reforms focused on enrolling individuals living in deprived regions, particularly those in the northern savannah ecological zones, comprising the Northern, Upper East, Upper West, and some parts of Brong-Ahafo and Volta regions, (24) consistent with some studies (22,23) and contradicting other. (35)

Our study's primary limitation is that the data lacked several important factors (such as trust in scheme management, perceived quality of care, ease of enrolment, etc.), which would be useful for better understanding NHIS enrolment. Nonetheless, the variables used in the multivariate logistic regression modelling did not significantly affect model robustness.

Conclusion

The study reveals that from 2012–2013, enrolment in the NHIS was higher among poor households, particularly male-headed households, although the multivariate analyses demonstrated that the likelihood of NHIS enrolment increased from poorer to richest quintile,

low to high level of education and young adults to older adults. Whilst the NHIS strives to achieve its pro-poor goal of providing financial risk protection for the poor and vulnerable in society, equity must be addressed within and across the entire population. Adequate funds are also required to cover the anticipated increase in medical claims costs because as more poor and vulnerable groups enrol in the scheme, the claims cost is likely to escalate and threaten the scheme's sustainability. Thus, policy decisions to ensure equity in enrolment must also ensure commensurate funding to avoid financial uncertainty and collapse. Further research on equity in healthcare services utilization, expenditures, and accreditation of healthcare providers is needed to provide a fuller picture of equity assessment in the NHIS.

Ethics approval
This study is a secondary analysis of the Ghana Living Standard Survey (round 6) data, however formal approval was obtained from the Ghana Statistical Service to use the data.

Funding
None

Competing interests
ENB is an employee of the National Health Insurance Authority, however his affiliation did not influence findings of this study. JPR and JN declare no competing interests.

Contributors
ENB, JPR and JN conceived and designed the study. JN retrieved the data and ENB analysed the data and drafted the manuscript. JPR and JN provided intellectual contributions to develop and revise the manuscript. All the authors read and approved the manuscript for publication.

Patient consent
Not applicable

Data sharing statement
No additional data available

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Table 1: Individual and household characteristics

Variable	% (n=16,772)
NHIS status	
Covered	70·5
Not covered	29·5
Highest Education	
None	50·7
Primary	30·5
Secondary	8·5
Tertiary	10·3
Employment status	
Employed	89·5
Unemployed	10·5
Wealth quintile	
Poorest	20·1
Poorer	17·6
Middle	17·9
Richer	20·1
Richest	24·3
Sex of household head	
Female	71·8
Male	28·2
Age of household head	
19–24	4.9
25–44	47.1
45–64	33.3
65–79	11.7
80+	3.0
Household size, *M*(*SD*)	4.3 (2.78)
Household setting	

Rural	44·4
Urban	55·6
Geographic region	
Western	10·2
Central	9·6
Greater Accra	11·5
Volta	9·4
Eastern	10·8
Ashanti	11·8
Brong Ahafo	9·7
Northern	10·2
Upper East	8·6
Upper West	8·3

M: mean; SD: standard deviation

Table 2: Concentration index (CI) showing inequity in NHIS enrolment

Wealth quintile	**Total**		**Within households (HH)**				**Between households (HH)**	
	Enrolled	**Not enrolled**	**Female-headed HH**		**Male-headed HH**		**Female**	**Male**
			Enrolled	**Not enrolled**	**Enrolled**	**Not enrolled**		
Poorest	-0·0009	0·0021	-0·0023	0·0060	-0·0009	0·0020	0·0073	-0·0029
Poorer	-0·0014	0·0035	0·0061	-0·0153	-0·0010	0·0026	0·0096	-0·0039
Middle	0·0018	-0·0039	-0·0085	0·0234	-0·0002	0·0011	0·0268	-0·0108
Richer	-0·0116	0·0290	0·0000	0·0000	-0·0135	0·0321	0·0455	-0·0185
Richest	0·0000	0·0000	-0·0056	0·0167	0·0000	0·0000	0·0000	0·0000
Total	**-0·0120**	**0·0307**	**-0·0103**	**0·0307**	**-0·0156**	**0·0378**	**0·0891**	**-0·0362**

Table 3: Differences in household characteristics by wealth quintile (**n=16,772**)

Variable	**Q1 (Poorest)**	**Q2 (Poorer)**	**Q3 (Middle)**	**Q4 (Richer)**	**Q5 (Richest)**	**Total**	**Pearson's χ2**
NHIS status							0·000
Enrolled	72·6	70·9	70·3	72·4	67·0	70·5	
Not enrolled	27·4	29·1	29·7	27·6	33·0	29·5	
Highest education							0·000
None	80·1	62·7	51·9	39·8	25·8	50·7	
Primary	16·3	28·7	34·8	38·7	33·6	30·5	
Secondary	2·1	5·4	7·0	10·1	15·8	8·5	
Tertiary	1·5	3·2	6·3	11·4	24·8	10·3	
Employment status							0·065
Employed	90·9	89·6	90·5	88·7	88·8	89·5	
Unemployed	9·1	10·4	9·5	11·3	11·2	10·5	
Sex							0·000
Female	79·1	73·1	71·7	69·4	66·9	71·8	
Male	20·9	26·9	28·3	30·6	33·1	28·2	
Age of household head							0·000
19–24	2.4	4.1	4.4	5.9	7.0	4.9	
25–44	40.9	43.8	46.6	48.4	54.1	47.1	
45–64	37.5	35.0	34.7	32.0	28.7	33.3	

65–79	14.9	14.2	11.4	10.9	7.9	11.7	
80+	4.3	2.9	2.9	2.8	2.3	3.0	
Household size	20.1	17.7	17.9	20.1	24.3	100.0	0·000
Household setting							0·000
Rural	13·7	31·1	43·6	56·0	70·4	44·4	
Urban	86·3	68·9	56·4	44·0	29·6	55·6	
Geographic region							0·000
Western	5·6	9·4	11·1	12·8	11·9	10·2	
Central	5·1	10·6	12·2	10·8	9·5	9·6	
Greater Accra	2·3	4·4	8·0	14·0	24·7	11·5	
Volta	8·7	11·0	9·8	10·1	7·9	9·4	
Eastern	7·0	11·8	13·8	13·1	8·9	10·8	
Ashanti	4·0	9·2	11·9	14·6	17·7	11·8	
Brong-Ahafo	8·4	11·9	11·0	9·6	8·2	9·7	
Northern	20·0	12·9	9·6	6·4	3·6	10·2	
Upper East	14·7	11·4	8·3	6·2	3·8	8·6	
Upper West	24·2	7·4	4·2	2·5	3·8	8·3	

Table 4: Multivariate logistic regression model of enrolling in the NHIS

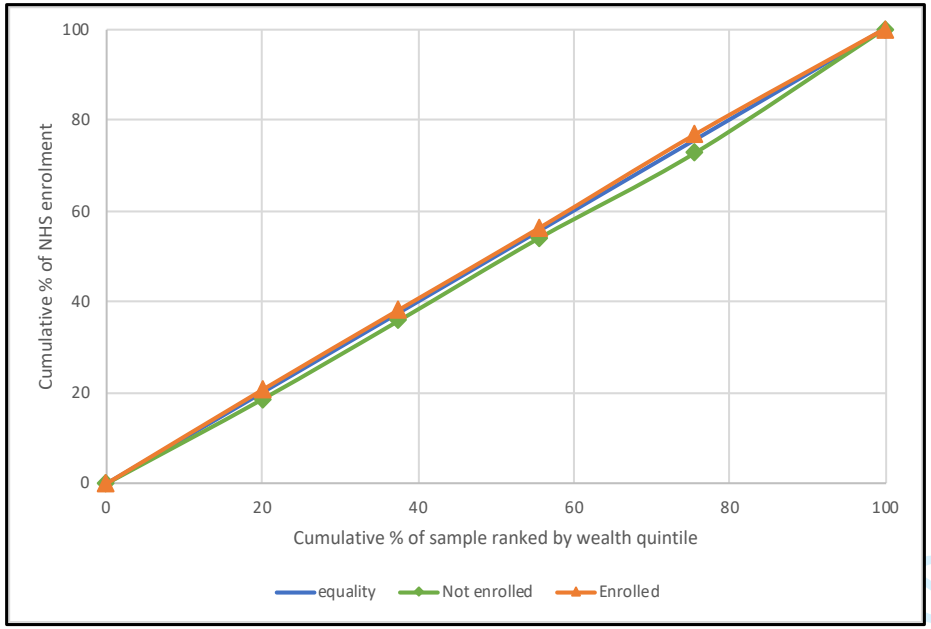
Variable	Unadjusted OR	[95% C.I]	Adjusted OR	[95% C.I]
Wealth quintile				
Poorest	1·00		1·00	
Poorer	0·92	0·82–1·02	1·33***	1·17–1·50
Middle	0·89*	0·79–0·99	1·54***	1·36–1·75
Richer	0·98	0·88–1·09	1·94***	1·70–2.22
Richest	0·76***	0·69–0·84	1·67***	1·45–1·91
Highest education				
None	1·00		1·00	
Primary	1·05	0·98–1·14	1·65***	1·51–1·80
Secondary	1·27***	1·12–1·44	2·35***	2.03–2·72
Tertiary	1·75***	1·55–1·99	2·87***	2·48–3·32
Employment status				
Unemployed	1·00		1·00	
Employed	0·85**	0·76–0·95	0·99	0·87–1·12
Sex of household head				
Male	1·00		1·00	
Female	1·11**	1·03–1·19	1·52***	1·39–1·65
Age of household head				
19–24	1·00		1·00	
25–44	1·99***	1·72–2·31	1·53***	1·31–1·79
45–64	2.38***	2.05–2.77	1.69***	1.43–1.99
65–79	3.43***	2.87–4.08	3.05***	2.51–3.69
80+	3.18***	2.47–4.08	3.28***	2.49–4.34
Household size	1·17***	1·15–1·18	1.23***	1·20–1.25
Household setting				
Urban	1·00		1·00	
Rural	0·97	0·91–1·04	0·75***	0·69–0·82
Geographic region				

Western	1·00		1·00	
Central	0·64***	0·55–0·73	0·63***	0·54–0·73
Greater Accra	0·79**	0·69–0·90	0·63***	0·52–0·69
Volta	1·89***	1·62–2·21	2·04***	1·73–2·39
Eastern	1·34***	1·16–1·53	1·39***	1·20–1·62
Ashanti	1·16*	1·01–1·32	1·08	0·94–1·25
Brong-Ahafo	2·68***	2·27–3·15	3·06***	2·58–3·62
Northern	1·07	0·92–1·22	1·32***	1·13–1·54
Upper East	4·30***	3·56–5·19	5·99***	4·91–7·31
Upper West	3·62***	3·01–4·33	5·04***	4·14–6·15
_cons			0·23***	0·18–0·29
Number of obs.	16,693			
LR chi2(24)	2236.60			
Prob > chi2	0.0000			
Pseudo R2	0.1106			

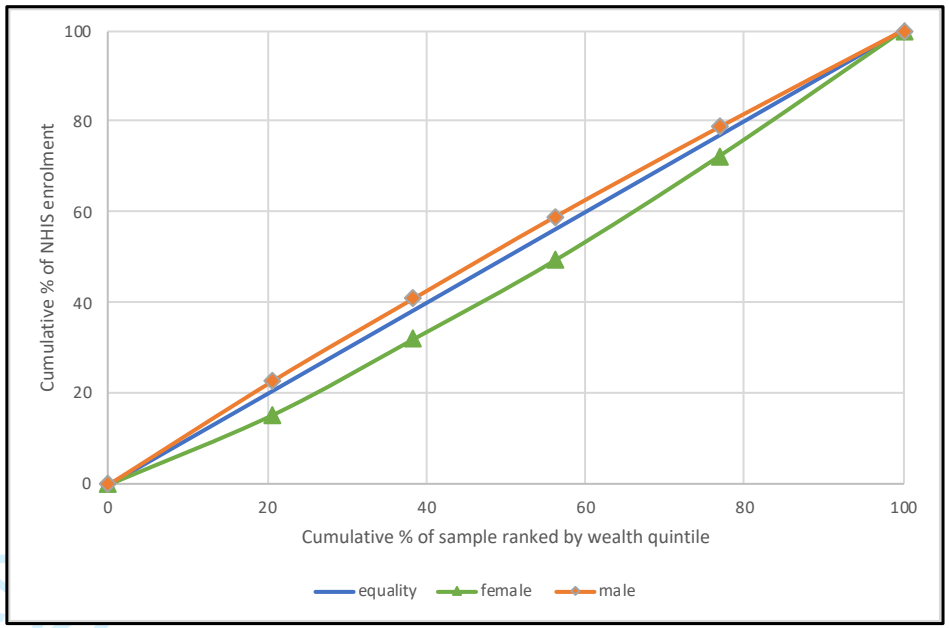
OR: odds ratio; $^{+}p<0{\cdot}10$; $^{*}p<0{\cdot}05$; $^{**}p<0{\cdot}01$; $^{***}p<0{\cdot}001$; Control variables: education of household head, employment status of household head, sex of household, age of household head, household size, household setting and geographic region

Figure legends

Figure 1: Concentration curves for enrolment in NHIS

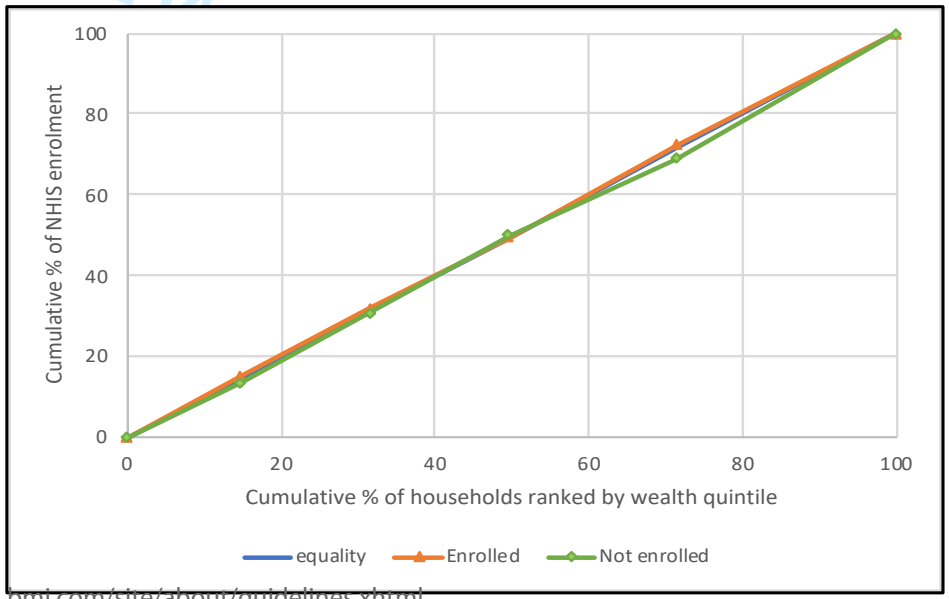


a: Concentration curves for NHIS enrolment



b: Concentration curves for NHIS enrolment by sex

c: Concentration curves for NHIS enrolment in male-headed households



d: Concentration curves for NHIS enrolment in female-headed households

Figure 1: **Concentration curves for enrolment in NHIS**

Appendix 1: Distribution of population by region, sex and locality of enumeration, 2010

Region	Total Population	Male	Female	Locality of enumeration		Share of Population (%)	Proportion urban	Sex Ratio	Percentage increase over 2000	Intercensal Growth Rate (%)
				Urban	Rural					
All Regions	**24,658,823**	**12,024,845**	**12,633,978**	**12,545,229**	**12,113,594**	**100.0**	**50.9**	**95.2**	**30.4**	**2.5**
Western	2,376,021	1,187,774	1,188,247	1,007,969	1,368,052	9.6	42.4	100.0	23.5	2.0
Central	2,201,863	1,050,112	1,151,751	1,037,878	1,163,985	8.9	47.1	91.2	38.1	3.1
Greater Accra	4,010,054	1,938,225	2,071,829	3,630,955	379,099	16.3	90.5	93.6	38.0	3.1
Volta	2,118,252	1,019,398	1,098,854	713,735	1,404,517	8.6	33.7	92.8	29.5	2.5
Eastern	2,633,154	1,290,539	1,342,615	1,143,918	1,489,236	10.7	43.4	96.1	25.0	2.1
Ashanti	4,780,380	2,316,052	2,464,328	2,897,290	1,883,090	19.4	60.6	94.0	32.3	2.7
Brong Ahafo	2,310,983	1,145,271	1,165,712	1,028,473	1,282,510	9.4	44.5	98.2	27.3	2.3
Northern	2,479,461	1,229,887	1,249,574	750,712	1,728,749	10.1	30.3	98.4	36.2	2.9
Upper East	1,046,545	506,405	540,140	219,646	826,899	4.2	21.0	93.8	13.7	1.2
Upper West	702,110	341,182	360,928	114,653	587,457	2.8	16.3	94.5	21.8	1.9

Source: Adapted from Ghana Statistical Service [18]

Appendix 2: Poverty incidence and poverty gap by region (%) 2005/06–2012/13 (Poverty line=GHS1,314=US$277.22)

Region	Poverty incidence (P_0)	Contribution to total poverty (C_0)	Poverty gap (P_1)	Contribution to total poverty gap (C_1)	Poverty incidence (P_0)	Contribution to total poverty (C_0)	Poverty gap (P_1)	Contribution to total poverty gap
2012/13					***2005/06***			
Western	20.9	7.9	5.7	6.8	22.9	7.3	5.4	5.0
Central	18.8	6.9	5.6	6.4	23.4	6.4	5.6	4.4
Greater Accra	5.6	3.8	1.6	3.5	13.5	5.9	3.7	4.7
Volta	33.8	12.1	9.8	11.0	37.3	8.7	9.2	6.2
Eastern	21.7	9.3	5.8	7.8	17.8	7.5	4.2	5.2
Ashanti	14.8	12.0	3.5	9.0	24.0	12.6	6.4	9.8
Brong Ahafo	27.9	11.4	7.4	9.4	34.0	9.8	9.5	7.9
Northern	50.4	20.8	19.3	24.9	55.7	21.0	23.0	25.2
Upper East	44.4	7.4	17.2	9.0	72.9	10.9	35.3	15.3
Upper West	70.7	8.4	33.2	12.3	89.1	10.0	50.7	16.4
All Ghana	24.2	100.0	7.8	100.0	31.9	100.0	11.0	100.0

Source: Adapted from Ghana Statistical Service [19]

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported
Objectives	3	State specific objectives, including any prespecified hypotheses
Methods		
Study design	4	Present key elements of study design early in the paper
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
Bias	9	Describe any efforts to address potential sources of bias
Study size	10	Explain how the study size was arrived at
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding
		(*b*) Describe any methods used to examine subgroups and interactions
		(*c*) Explain how missing data were addressed
		(*d*) If applicable, describe analytical methods taking account of sampling strategy
		(*e*) Describe any sensitivity analyses
Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed
		(b) Give reasons for non-participation at each stage
		(c) Consider use of a flow diagram
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders
		(b) Indicate number of participants with missing data for each variable of interest
Outcome data	15*	Report numbers of outcome events or summary measures
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included
		(*b*) Report category boundaries when continuous variables were categorized
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses

Discussion		
Key results	18	Summarise key results with reference to study objectives
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalisability	21	Discuss the generalisability (external validity) of the study results
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Is enrolment in the National Health Insurance Scheme in Ghana pro-poor? Evidence from the Ghana Living Standard Survey

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Is enrolment in the National Health Insurance Scheme in Ghana pro-poor? Evidence from the Ghana Living Standard Survey

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ABSTRACT

Objectives This article examines equity in enrolment in the Ghana National Health Insurance Scheme (NHIS) to inform policy decisions on progress towards realisation of universal health coverage (UHC).

Design Secondary analysis of data from the sixth round of the Ghana Living Standards Survey (GLSS 6).

Setting Household-based

Participants: A total of 16,774 household heads participated in the GLSS 6, which was conducted between 18 October 2012 and 17 October 2013.

Analysis Equity in enrolment was assessed using concentration curves and bivariate and multivariate analyses to determine associated factors.

Main outcome measure Equity in NHIS enrolment

Results Survey participants had a mean age of 46 years and mean household size of four persons. About 71% of households interviewed had at least one person enrolled in the NHIS. Households in the poorest wealth quintile (73%) had enrolled significantly (p<0.001) more than those in the richest quintile (67%). The concentration curves further showed that enrolment was slightly disproportionally concentrated among poor households, particularly those headed by males. However, multivariate logistic analyses showed that the likelihood of NHIS enrolment increased from poorer to richest quintile, low to high level of education, and young adults to older adults. Other factors including sex, household size, household setting, and geographic region were significantly associated with enrolment.

Conclusions From 2012–2013 enrolment in the NHIS was higher among poor households, particularly male-headed households, although multivariate analyses demonstrated that the likelihood of NHIS enrolment increased from poorer to richest quintile and from low to high level of education. Policy makers need to ensure equity within and across gender as they strive to achieve UHC.

Strengths and limitations of this study

- Our study is the first to use data from the Ghana Living Standards Survey (GLSS) to examine equity in enrolment in the National Health Insurance Scheme (NHIS).
- We developed concentration curves and multivariate logistic regression models to produce new findings to inform decision-making.
- Unlike previous studies, this study found that enrolment in the NHIS is slightly concentrated among the poor; however, the odds of enrolling increases with wealth quintile, level of education, and age.
- As a secondary analysis, the data used for the study lack a number of important factors including trust in scheme management, perceived quality of care, ease of enrolment, etc., which would be useful for better understanding NHIS enrolment.

Introduction

Many low and middle income countries are increasingly implementing prepayment schemes to provide financial risk protection and equitable access to healthcare services for their populations, particularly the poor. (1–3) Prepayment schemes such as social health insurance, if implemented effectively, can reduce out-of-pocket payments (OOP) and associated catastrophic effects on households. (4) The quest to ensure equity in access to healthcare services and to achieve Universal Health Coverage (UHC) has become more imperative, following adoption of the Sustainable Development Goals (SDGs) by member countries of the United Nations (UN). Equity in prepayment schemes is also recognised by World Health Organisation (WHO) as one of the fundamental elements of UHC. (5)

Ghana had a free healthcare system after independence in the 1950s, financed by general taxation. However, this system of healthcare changed when the economy started declining and user fees were partially introduced in the 1970s and 1980s to offset costs of healthcare services delivery. (6–8) Although the OOP somewhat helped public healthcare services providers to recover partial costs of essential medicines and other pharmaceutical products and to raise revenue, the system created inequity in access to healthcare and in some cases led to avoidable deaths. (6,8,9) This situation resulted in the introduction of a National Health Insurance Scheme (NHIS) in 2003 to replace OOP and ensure equity in healthcare access. (10) The NHIS is managed by the National Health Insurance Authority (NHIA), a body mandated by law to regulate both public and private health insurance schemes in the country (11).

Membership in the NHIS is broadly categorised into exempt and non-exempt groups. (11) The exempt groups are members who are exempted from paying premiums to the scheme and they include persons below 18 years old, persons aged 70 years and above, pregnant women, indigent (extreme poor), formal sector workers who contribute to Social Security and National Insurance Trust (SSNIT), and beneficiaries of the Livelihood Empowerment Against Poverty (LEAP) programme. The non-exempt group includes members who pay premiums and enrolment processing fees to the scheme and these are workers in the informal sector of the economy. The NHIS is tax-funded through the National Health Insurance Fund (NHIF) which is based on 2.5% levy on selected goods and services. Other sources of funding are a 2.5% deduction from formal sector workers' SSNIT contributions, premiums from informal sector workers, funds allocated by Parliament, interest from investments, and donor funds and gifts. (11) The premium and enrolment processing fee from the non-exempt group is GHS30.00 (US$6.33) per year. However, the exempt group only pays a processing fee of GHS8.00 (US$1.69) for new enrolment and GHS5.00 (US$1.05) for renewal of membership per year. Relative to the per capital income of GHS8,863 (US$2,035) (12), the NHIS premium and processing fee represent 0.34%. Again, reference to the daily minimum wage of GHS10.65 (US$2.25) (13) or GHS2,769.00 (US$584.18) per year, the NHIS premium and processing fee constitute 0.38%.

Like many health systems around the globe, Ghana's health system is hierarchical with the Ministry of Health (MoH) as apex body mandated to formulate policies to improve health of the population. (14) The MoH has about 12 agencies, comprising of the public, quasi-government and private health facilities, as well health education institutions. The biggest agency is the Ghana Health Service, which is charged with the responsibility of delivering

healthcare to the population, as well as implementing policies of the MoH. The Ghana Health Service has a decentralised system of healthcare delivery with a considerable number of healthcare facilities located across the country. The lowest level of the healthcare delivery system is the community-based and health planning services (CHPS) compound and the highest being the tertiary or teaching hospitals at the national level. The number of healthcare facilities and professionals are unevenly distributed across the country, with the majority located in the urban areas. (15,16) On the other hand, many of the private healthcare facilities particularly the faith-based ones are located in remote areas, where they provide about 40% of healthcare services to the population. (14)

Evidence shows that the NHIS has made progress in population coverage and contributed to utilization of healthcare services and to expansion of healthcare facilities in its short period of existence. (17) A report of the NHIS shows that the scheme has covered 36% (10.8 million) of the population as of December 2018 (18). It has 166 district offices and a network of over 4000 healthcare providers comprising both public and private healthcare facilities across the country. The benefits package reportedly covers 95% of the disease conditions afflicting the population. It broadly covers outpatient services, inpatient services, oral health, eye care services, maternity care and emergencies.(19) Preventive services, for example, immunization and service that have the potential to pose sustainability challenges are excluded from the benefit package. (9,11)

There are few equity-oriented studies of the NHIS in Ghana. A mixed-method study that evaluated equity in NHIS enrolment in two regions (Central and Eastern) found that more males had registered in the scheme than females and households in the richest quintile were significantly more likely to enrol than those in the poorest quintile. (1) The study also found that old age, higher education, female-headed households, and perceived NHIS benefits were significantly associated with NHIS enrolment. Another mixed-method study examining why the NHIS is not reaching the poor used the same two regions and found fewer of the poor to be covered due to poverty and policy makers' and implementers' lack of commitment to pursue NHIS's equity goal. (20) Kusi et al., (21) in examining affordability of NHIS contribution, used three districts from the southern, middle and northern ecological zones of Ghana and also found that significantly more of the rich were enrolled in the NHIS than the poor. These three studies were conducted in 2008 and 2011 and employed bivariate and logistic regression analyses to examine enrolment equity. Other studies that also examined equity in NHIS enrolment, using data from the 2008 Ghana Demographic Health Survey (GDHS), employed concentration curves and logistic regression and found that coverage was highest among the educated, households in the richest quintile, and urban residents. (22,23)

This study examines equity in enrolment in Ghana's NHIS to inform policy decisions regarding attainment of UHC. It is necessary now to study equity to assess major NHIS policy reforms instituted in recent years to make the scheme more attractive to the general public. One such policy is the intersectoral collaboration with state-owned social protection institutions, for example, Ministry of Gender and Social Protection, Ministry of Education, LEAP Secretariat, and Savannah Accelerated Development Authority (SADA), to increase the population of the poor and vulnerable in the NHIS and to improve equity. Findings from this study can inform policy making on UHC attainment and contribute to the body of knowledge on equity in NHIS enrolment and progress towards achieving the SDGs.

Methods

Study design and setting

This study analyses secondary data from the sixth round of the Ghana Living Standards Survey conducted between 18 October 2012 and 17 October 2013. The survey covered a representative sample of 18,000 households in 1,200 enumeration areas across the 10 administrative regions of the country. (24) Survey participants had an average age of 44 years and 48 years for male and females, respectively. In the 2010 Population and Housing Census (PHC), Ghana had a population of 24,658,823, with 51·2% being females. The majority of the population resided in the Ashanti (19·4%) and Greater Accra (16·3%) regions, the two most urbanised regions (25) of the country. These two regions also have the lowest poverty rates, whilst those in the northern savannah ecological zones (Northern, Upper East, Upper West, Brong-Ahafo, Volta) have the highest poverty rates. (26) Appendices 1 and 2 provide more details on the population distribution and poverty profile of Ghana.

Data collection and analysis

Data were sourced from the Ghana Statistical Service (GSS) and had already been cleaned and managed including creation of sampling weights and wealth quintiles. The GSS constructed the wealth quintiles using household expenditure as a proxy (24). The household expenditure is composed of food and non-food items. The total number of households covered in the survey was divided into five groups by their total household consumption expenditure. The quintile ranking was then constructed using the household members total expenditure per capital. Bivariate analyses examined unadjusted relationships between socio-demographic factors and wealth quintiles. Equity in enrolment was assessed using concentration curves and indices, and multivariate logistic regression models to determine factors associated with enrolment. (1,22,27,28) Whilst the concertation curve analyses equity in NHIS enrolment between the poor and the rich, the logistic regression model shows factors associated with enrolment in the scheme. The use of these two analytical techniques is therefore meant to produce reliable findings for informed policy decision-making.

The unit of analysis was the household and we examined cumulative proportion of enrolment by wealth quintiles, decomposed by sex, within and across male-headed and female-headed households. A multivariate logistic regression model was employed to assess whether lower wealth groups were more likely to enrol in the NHIS than higher wealth groups, holding the other socio-demographic variables constant. The outcome or dependent variable 'NHIS enrolment status' was labelled 1 for active card-bearing members and 0 for inactive card-bearing members or those who had never enrolled in the scheme. The main independent variable was 'wealth quintile' and the others (control variables) were socio-demographic characteristics such as age of household head, sex of household head, household size, education level of household head, household head employment status, household setting, and geographic region of residence. Age of household head was categorised based on the Medical Subject Headings (MeSH) age defining. (29,30) Microsoft Excel 2016 and STATA version 13 were used for all analyses.

Patient and public involvement

Patients were not involved in this study.

Results

Characteristics of study participants

A total of 16,772 household heads with an average age of 46 years (*SD*=15.58) and household size of 4 persons (*SD*=2.78) responded to questions on NHIS in the survey (Table 1). Majority of the household heads (47%) were in the age bracket of 25-44 years. Out of the total number of survey participants, 72% were females; 51% had no formal education; 90% were employed; 24% were in the richest quintile; 56% lived in urban areas; and 12% resided in the Ashanti region. About 71% of households had at least one person enrolled in the NHIS.

Equity in enrolment

Results of the concentration curve analyses demonstrate that enrolment was slightly more concentrated among poor households (Figure 1). Enrolment by sex also showed that enrolment was more concentrated among households headed by males compared to those headed by females. The concentration indices further revealed that among the study participants, equity was more pronounced in the insured than the uninsured and within male-headed households than female-headed households (Table 2).

Relationship between household characteristics and wealth quintiles

There were significant differences in all household characteristics by wealth quintiles, except employment status (Table 3). The poorest households (73%) enrolled in the NHIS more than the richest households (67%). Interestingly, the richer households had the second highest enrolment (72.4%) in the scheme. Majority of the poorest households (80.1%) had no formal education compared to about 25% of the richest households with tertiary level education. Similarly, majority of the poorest households (91%) were more employed as were the richest households (89%), and there were more females (79%) in the poorest quintile than in the richest quintile (67%). There were also significantly more household heads aged 45 years or more in the poorest quintile than those in the richest quintile, and more households in the poorest quintile (86%) living in urban settings than households in the richest quintiles (30%).

Results of the multivariate logistic regression showed that the likelihood of enrolling in the NHIS increases from poorer to richest quintile, low to high level of education, and young adults to older adults (Table 4). Females (OR: 1·52; 95% CI: 1·39–1·65) and persons living in the Upper East (OR: 5·99; 95% CI: 4·91–7·31), Upper West (OR: 5·04; 95% CI: 4·14–6·15), Brong-Ahafo (OR: 3·06; 95% CI: 2·58–3·62), Volta (OR: 2·04; 95% CI:1·74–2·39), and Northern (OR: 1·32; 95% CI: 1·13–1·54) regions were significantly more likely to enrol in the NHIS than their respective reference categories. Surprisingly, the employed were less likely to enrol in the NHIS (OR=0·99; 95% CI 0·87–1·12) although not significantly so. The unadjusted odds ratios (OR) showed similar associations except for wealth quintile, the explanatory variable of interest, which showed a decreased likelihood of enrolling in the NHIS from poorer to richest.

Discussion

This study examined equity in NHIS enrolment employing data from the Ghana Living Standards Survey (round 6), which was conducted between October 2012 and October 2013. The findings show inequity in enrolment and significant associations between socio-demographic factors and NHIS enrolment. Among households surveyed, enrolment is disproportionally concentrated among poor households especially those headed by males. The possible explanation relates to policy changes made over the last few years to increase

enrolment in the scheme. One such policy is the deliberate attempt to increase numbers of the poor and vulnerable in the scheme through enrolment of the Livelihood Empowerment Against Poverty (LEAP) beneficiaries, students in secondary and tertiary institutions in Ghana, prisoners, and individuals living in less developed geographic regions, particularly those in the northern savannah ecological zone, where there is high prevalence of poverty. The disproportionate concentration of enrolment among poor households contradicts previous studies on the NHIS, (1,20–22,31,32) due possibly to the years in which those studies were conducted (2008 and 2011), as well as the limited regional scope (three administrative regions except the 2008 Demographic Health Survey that covered the entire country). This present study employs a nationally representative survey.

Our study also shows that a number of socio-demographic factors are significantly associated with NHIS enrolment. Although unadjusted findings illustrate that enrolment is concentrated among poor households, multivariate findings illustrate that the odds of enrolling in the scheme increases with wealth quintiles, that is, the rich are more likely to enrol than the poor. This may be attributed to evidence that the rich are more able to afford the cost of enrolling in the health insurance programme than the poor. (1,20,33,34) Besides, as explained earlier, the policy decision to deliberately enrol the poor might have contributed to their higher numbers in the NHIS, but voluntarily other factors other than being poor contribute to enrolment in the scheme. Individuals with higher levels of education are more likely to enrol in the NHIS compared to those with no formal education; females are more likely to enrol than males; and older adults are more likely to enrol than young adults, consistent with previous studies. (1,22,32–35) The employed are less likely to enrol compared to the unemployed. The plausible explanation is that the employed may be able to afford OOP for healthcare services because they are more economically resourced than the unemployed. This result runs counter to earlier studies. (21,35)

Findings from this study also reveal that individuals residing in rural settings are significantly less likely to enrol in the NHIS compared to those living in urban areas, consistent with previous studies, (32,35) but contradicting a study by Jehu-Appiah et al, (1) One reason may be due to poverty; prior studies showed that the majority of rural dwellers are unable to afford the NHIS premium and processing or renewal fee. (20,31,34,36–38) This study's findings also show that the odds of enrolling in the NHIS increases with household size, consistent with other studies, (22,33,34) because larger households may be risk averse and thus would enrol in the NHIS to seek financial risk protection against their healthcare costs and to avoid catastrophic OOP. Our findings also reveal that individuals residing in less developed regions of the country are significantly more likely to enrol in the scheme compared to those in developed regions. Again, this may be attributed to policy reforms focused on enrolling individuals living in deprived regions, particularly those in the northern savannah ecological zones, comprising the Northern, Upper East, Upper West, and some parts of Brong-Ahafo and Volta regions, (24) consistent with some studies (22,23) and contradicting other. (35)

Our study's primary limitation is that the data lacked several important factors (such as trust in scheme management, perceived quality of care, ease of enrolment, etc.), which would be useful for better understanding NHIS enrolment. Nonetheless, the variables used in the multivariate logistic regression modelling did not significantly affect model robustness.

Conclusion
The study reveals that from 2012–2013, enrolment in the NHIS was higher among poor households, particularly male-headed households, although the multivariate analyses demonstrated that the likelihood of NHIS enrolment increased from poorer to richest quintile, low to high level of education and young adults to older adults. Whilst the NHIS strives to achieve its pro-poor goal of providing financial risk protection for the poor and vulnerable in society, equity must be addressed within and across the entire population. Adequate funds are also required to cover the anticipated increase in medical claims costs because as more poor and vulnerable groups enrol in the scheme, the claims cost is likely to escalate and threaten the scheme's sustainability. Thus, policy decisions to ensure equity in enrolment must also ensure commensurate funding to avoid financial uncertainty and collapse. Further research on equity in healthcare services utilization, expenditures, and accreditation of healthcare providers is needed to provide a fuller picture of equity assessment in the NHIS.

Ethics approval
This study is a secondary analysis of the Ghana Living Standard Survey (round 6) data, however formal approval was obtained from the Ghana Statistical Service to use the data.

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Competing interests
ENB is an employee of the National Health Insurance Authority, however his affiliation did not influence findings of this study. JPR and JN declare no competing interests.

Contributors
ENB, JPR and JN conceived and designed the study. JN retrieved the data and ENB analysed the data and drafted the manuscript. JPR and JN provided intellectual contributions to develop and revise the manuscript. All the authors read and approved the manuscript for publication.

Patient consent
Not applicable

Data sharing statement
No additional data available

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Table 1: Individual and household characteristics

Variable	% (n=16,772)
NHIS status	
Covered	70·5
Not covered	29·5
Highest Education	
None	50·7
Primary	30·5
Secondary	8·5
Tertiary	10·3
Employment status	
Employed	89·5
Unemployed	10·5
Wealth quintile	
Poorest	20·1
Poorer	17·6
Middle	17·9
Richer	20·1
Richest	24·3
Sex of household head	
Female	71·8
Male	28·2
Age of household head	
19–24	4.9
25–44	47.1

45–64	33.3
65–79	11.7
80+	3.0
Household size, *M*(*SD*)	4.3 (2.78)
Household setting	
Rural	44·4
Urban	55·6
Geographic region	
Western	10·2
Central	9·6
Greater Accra	11·5
Volta	9·4
Eastern	10·8
Ashanti	11·8
Brong Ahafo	9·7
Northern	10·2
Upper East	8·6
Upper West	8·3

M: mean; SD: standard deviation

Table 2: Concentration index (CI) showing inequity in NHIS enrolment

Wealth quintile	**Total**		**Within households (HH)**				**Between households (HH)**	
	Enrolled	**Not enrolled**	**Female-headed HH**		**Male-headed HH**		**Female**	**Male**
			Enrolled	**Not enrolled**	**Enrolled**	**Not enrolled**		
Poorest	-0·0009	0·0021	-0·0023	0·0060	-0·0009	0·0020	0·0073	-0·0029
Poorer	-0·0014	0·0035	0·0061	-0·0153	-0·0010	0·0026	0·0096	-0·0039
Middle	0·0018	-0·0039	-0·0085	0·0234	-0·0002	0·0011	0·0268	-0·0108
Richer	-0·0116	0·0290	0·0000	0·0000	-0·0135	0·0321	0·0455	-0·0185
Richest	0·0000	0·0000	-0·0056	0·0167	0·0000	0·0000	0·0000	0·0000
Total	**-0·0120**	**0·0307**	**-0·0103**	**0·0307**	**-0·0156**	**0·0378**	**0·0891**	**-0·0362**

Table 3: Differences in household characteristics by wealth quintile (**n=16,772**)

Variable	**Q1 (Poorest)**	**Q2 (Poorer)**	**Q3 (Middle)**	**Q4 (Richer)**	**Q5 (Richest)**	**Total**	**Pearson's χ2**
NHIS status							0·000
Enrolled	72·6	70·9	70·3	72·4	67·0	70·5	
Not enrolled	27·4	29·1	29·7	27·6	33·0	29·5	
Highest education							0·000
None	80·1	62·7	51·9	39·8	25·8	50·7	
Primary	16·3	28·7	34·8	38·7	33·6	30·5	
Secondary	2·1	5·4	7·0	10·1	15·8	8·5	
Tertiary	1·5	3·2	6·3	11·4	24·8	10·3	
Employment status							0·065
Employed	90·9	89·6	90·5	88·7	88·8	89·5	
Unemployed	9·1	10·4	9·5	11·3	11·2	10·5	
Sex							0·000

Female	79·1	73·1	71·7	69·4	66·9	71·8	
Male	20·9	26·9	28·3	30·6	33·1	28·2	
Age of household head							0·000
19–24	2.4	4.1	4.4	5.9	7.0	4.9	
25–44	40.9	43.8	46.6	48.4	54.1	47.1	
45–64	37.5	35.0	34.7	32.0	28.7	33.3	
65–79	14.9	14.2	11.4	10.9	7.9	11.7	
80+	4.3	2.9	2.9	2.8	2.3	3.0	
Household size	20.1	17.7	17.9	20.1	24.3	100.0	0·000
Household setting							0·000
Rural	13·7	31·1	43·6	56·0	70·4	44·4	
Urban	86·3	68·9	56·4	44·0	29·6	55·6	
Geographic region							0·000
Western	5·6	9·4	11·1	12·8	11·9	10·2	
Central	5·1	10·6	12·2	10·8	9·5	9·6	
Greater Accra	2·3	4·4	8·0	14·0	24·7	11·5	
Volta	8·7	11·0	9·8	10·1	7·9	9·4	
Eastern	7·0	11·8	13·8	13·1	8·9	10·8	
Ashanti	4·0	9·2	11·9	14·6	17·7	11·8	
Brong-Ahafo	8·4	11·9	11·0	9·6	8·2	9·7	
Northern	20·0	12·9	9·6	6·4	3·6	10·2	
Upper East	14·7	11·4	8·3	6·2	3·8	8·6	
Upper West	24·2	7·4	4·2	2·5	3·8	8·3	

Table 4: Multivariate logistic regression model of enrolling in the NHIS

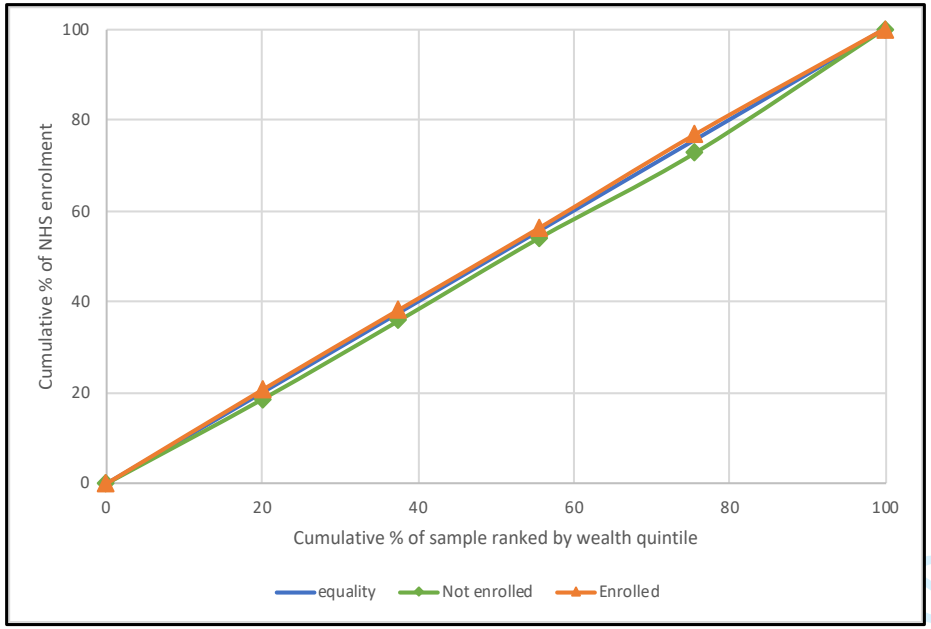
Variable	Unadjusted OR	[95% C.I]	Adjusted OR	[95% C.I]
Wealth quintile				
Poorest	1·00		1·00	
Poorer	0·92	0·82–1·02	1·33***	1·17–1·50
Middle	0·89*	0·79–0·99	1·54***	1·36–1·75
Richer	0·98	0·88–1·09	1·94***	1·70–2.22
Richest	0·76***	0·69–0·84	1·67***	1·45–1·91
Highest education				
None	1·00		1·00	
Primary	1·05	0·98–1·14	1·65***	1·51–1·80
Secondary	1·27***	1·12–1·44	2·35***	2.03–2·72
Tertiary	1·75***	1·55–1·99	2·87***	2·48–3·32
Employment status				
Unemployed	1·00		1·00	
Employed	0·85**	0·76–0·95	0·99	0·87–1·12
Sex of household head				
Male	1·00		1·00	
Female	1·11**	1·03–1·19	1·52***	1·39–1·65
Age of household head				
19–24	1·00		1·00	
25–44	1·99***	1·72–2·31	1·53***	1·31–1·79
45–64	2.38***	2.05–2.77	1.69***	1.43–1.99
65–79	3.43***	2.87–4.08	3.05***	2.51–3.69
80+	3.18***	2.47–4.08	3.28***	2.49–4.34

Household size	1·17***	1·15–1·18	1.23***	1·20–1.25
Household setting				
Urban	1·00		1·00	
Rural	0·97	0·91–1·04	0·75***	0·69–0·82
Geographic region				
Western	1·00		1·00	
Central	0·64***	0·55–0·73	0·63***	0·54–0·73
Greater Accra	0·79**	0·69–0·90	0·63***	0·52–0·69
Volta	1·89***	1·62–2·21	2·04***	1·73–2·39
Eastern	1·34***	1·16–1·53	1·39***	1·20–1·62
Ashanti	1·16*	1·01–1·32	1·08	0·94–1·25
Brong-Ahafo	2·68***	2·27–3·15	3·06***	2·58–3·62
Northern	1·07	0·92–1·22	1·32***	1·13–1·54
Upper East	4·30***	3·56–5·19	5·99***	4·91–7·31
Upper West	3·62***	3·01–4·33	5·04***	4·14–6·15
_cons			0·23***	0·18–0·29
Number of obs.	16,693			
LR chi2(24)	2236.60			
Prob > chi2	0.0000			
Pseudo R2	0.1106			

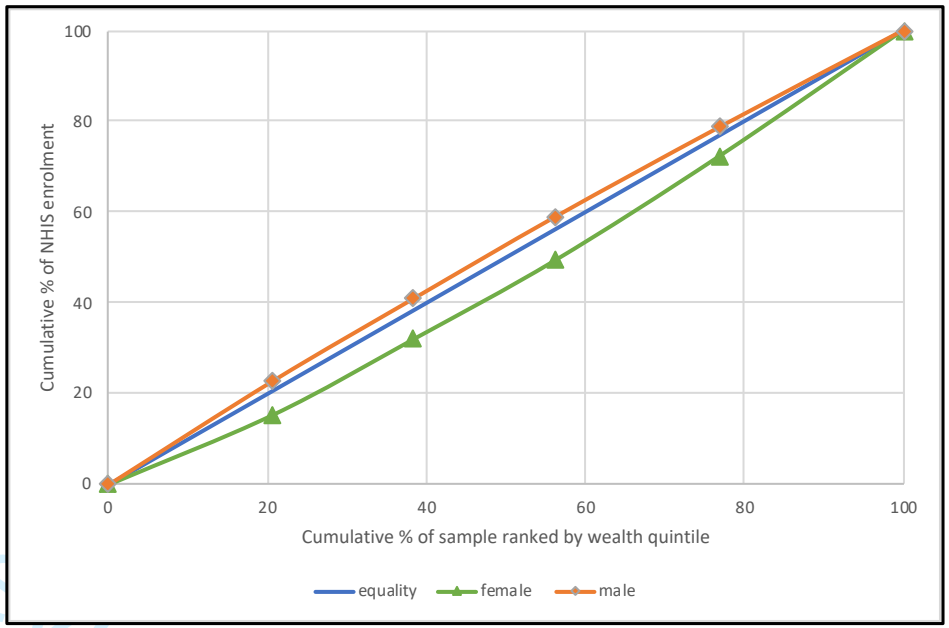
OR: odds ratio; $^{+}p<0{\cdot}10$; $^{*}p<0{\cdot}05$; $^{**}p<0{\cdot}01$; $^{***}p<0{\cdot}001$; Control variables: education of household head, employment status of household head, sex of household, age of household head, household size, household setting and geographic region

Figure legends

Figure 1: Concentration curves for enrolment in NHIS

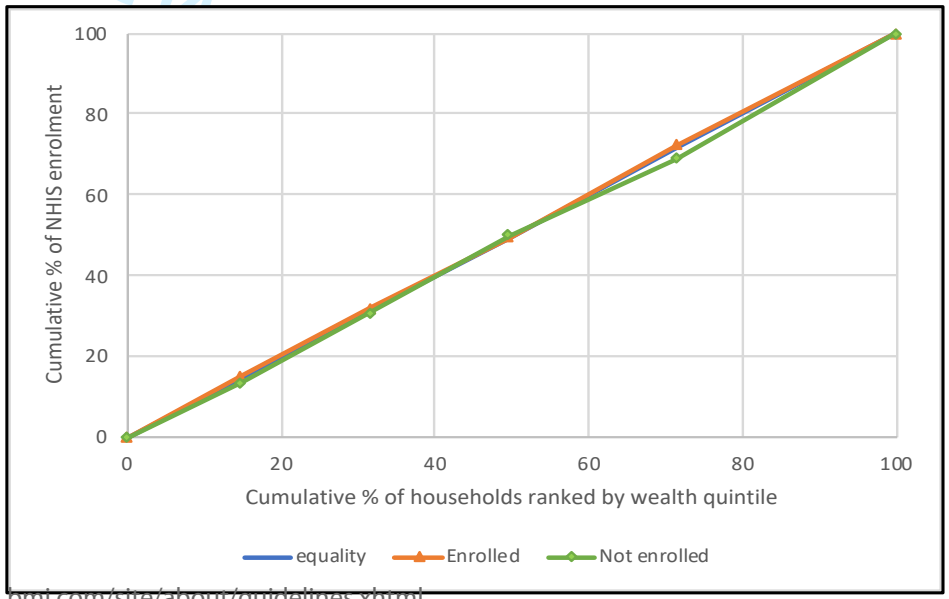


a: Concentration curves for NHIS enrolment



b: Concentration curves for NHIS enrolment by sex

c: Concentration curves for NHIS enrolment in male-headed households



d: Concentration curves for NHIS enrolment in female-headed households

Figure 1: **Concentration curves for enrolment in NHIS**

Appendix 1: Distribution of population by region, sex and locality of enumeration, 2010

Region	Total Population	Male	Female	Locality of enumeration		Share of Population (%)	Proportion urban	Sex Ratio	Percentage increase over 2000	Intercensal Growth Rate (%)
				Urban	Rural					
All Regions	**24,658,823**	**12,024,845**	**12,633,978**	**12,545,229**	**12,113,594**	**100.0**	**50.9**	**95.2**	**30.4**	**2.5**
Western	2,376,021	1,187,774	1,188,247	1,007,969	1,368,052	9.6	42.4	100.0	23.5	2.0
Central	2,201,863	1,050,112	1,151,751	1,037,878	1,163,985	8.9	47.1	91.2	38.1	3.1
Greater Accra	4,010,054	1,938,225	2,071,829	3,630,955	379,099	16.3	90.5	93.6	38.0	3.1
Volta	2,118,252	1,019,398	1,098,854	713,735	1,404,517	8.6	33.7	92.8	29.5	2.5
Eastern	2,633,154	1,290,539	1,342,615	1,143,918	1,489,236	10.7	43.4	96.1	25.0	2.1
Ashanti	4,780,380	2,316,052	2,464,328	2,897,290	1,883,090	19.4	60.6	94.0	32.3	2.7
Brong Ahafo	2,310,983	1,145,271	1,165,712	1,028,473	1,282,510	9.4	44.5	98.2	27.3	2.3
Northern	2,479,461	1,229,887	1,249,574	750,712	1,728,749	10.1	30.3	98.4	36.2	2.9
Upper East	1,046,545	506,405	540,140	219,646	826,899	4.2	21.0	93.8	13.7	1.2
Upper West	702,110	341,182	360,928	114,653	587,457	2.8	16.3	94.5	21.8	1.9

Source: Adapted from Ghana Statistical Service [18]

Appendix 2: Poverty incidence and poverty gap by region (%) 2005/06–2012/13 (Poverty line=GHS1,314=US$277.22)

Region	Poverty incidence (P_0)	Contribution to total poverty (C_0)	Poverty gap (P_1)	Contribution to total poverty gap (C_1)	Poverty incidence (P_0)	Contribution to total poverty (C_0)	Poverty gap (P_1)	Contribution to total poverty gap
2012/13					***2005/06***			
Western	20.9	7.9	5.7	6.8	22.9	7.3	5.4	5.0
Central	18.8	6.9	5.6	6.4	23.4	6.4	5.6	4.4
Greater Accra	5.6	3.8	1.6	3.5	13.5	5.9	3.7	4.7
Volta	33.8	12.1	9.8	11.0	37.3	8.7	9.2	6.2
Eastern	21.7	9.3	5.8	7.8	17.8	7.5	4.2	5.2
Ashanti	14.8	12.0	3.5	9.0	24.0	12.6	6.4	9.8
Brong Ahafo	27.9	11.4	7.4	9.4	34.0	9.8	9.5	7.9
Northern	50.4	20.8	19.3	24.9	55.7	21.0	23.0	25.2
Upper East	44.4	7.4	17.2	9.0	72.9	10.9	35.3	15.3
Upper West	70.7	8.4	33.2	12.3	89.1	10.0	50.7	16.4
All Ghana	24.2	100.0	7.8	100.0	31.9	100.0	11.0	100.0

Source: Adapted from Ghana Statistical Service [19]

STROBE Statement—Checklist of items that should be included in reports of ***cross-sectional studies***

	Item No	Recommendation
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract **(Page 1)**
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found **(Page 1)**
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported **(Page 3)**
Objectives	3	State specific objectives, including any prespecified hypotheses **(Page 4)**
Methods		
Study design	4	Present key elements of study design early in the paper **(Page 5)**
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection **(Page 5)**
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants **(N/A)**
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable **(Page 5)**
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group **(N/A)**
Bias	9	Describe any efforts to address potential sources of bias **(N/A)**
Study size	10	Explain how the study size was arrived at **(Page 5)**
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why **(Page 5)**
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding **(Page 5)**
		(*b*) Describe any methods used to examine subgroups and interactions **(Page 5)**
		(*c*) Explain how missing data were addressed **(NA)**
		(*d*) If applicable, describe analytical methods taking account of sampling strategy **(N/A)**
		(*e*) Describe any sensitivity analyses **(N/A)**
Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed **(N/A)**
		(b) Give reasons for non-participation at each stage **(N/A)**
		(c) Consider use of a flow diagram **(N/A)**
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders **(Page 6)**
		(b) Indicate number of participants with missing data for each variable of interest **(N/A)**
Outcome data	15*	Report numbers of outcome events or summary measures **(Page 6)**
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included **(Page 6)**

		(*b*) Report category boundaries when continuous variables were categorized **(Page 6)**
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period **(N/A)**
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses **(Page 6)**
Discussion		
Key results	18	Summarise key results with reference to study objectives **(Page 7)**
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias **(Page 7)**
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence **(Page 7)**
Generalisability	21	Discuss the generalisability (external validity) of the study results **(Page 8)**
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based **(Page 8)**

*Give information separately for exposed and unexposed groups.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.