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1 July 2010

Estimating household vulnerability to poverty from cross section data: an empirical evidence from Ghana

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July, 2010

Abstract

Background

In many developing countries, policies aimed at improving welfare through poverty reduction tend to target the current poor to the neglect of the vulnerable. An understanding of household susceptibility to future poverty will be crucial for sustainable growth and development. The objective of the study is to assess ex-ante welfare through vulnerability to poverty estimates among households in Ghana and to examine the effect of various socioeconomic characteristics on vulnerability to poverty.

Method

The study uses cross section data from the fifth round of the Ghana Living Standards Survey (GLSS) with a nationally representative sample of 8,687 households from all administrative regions in Ghana. The study employs a three step Feasible Generalized Least Squares (FGLS) estimation procedure to estimate vulnerability to poverty and to model the effect of household socioeconomic status on expected future consumption and variations in future consumption.

Results

The results show that, about 56% of households in Ghana are vulnerable to poverty and this is significantly higher than observed poverty level of about 28%. While the Eastern region was found to have the highest average vulnerability of approximately 73%, the Upper West

region had the least vulnerability with about 21% average vulnerability to poverty. Other regions with relatively high incidence of vulnerability to poverty include the Western region (70%) and the Volta region (69%). Vulnerability to poverty was estimated to be 61% among urban households and 25% among rural households. Moreover, household health status, household size and education attainments significantly influence vulnerability to poverty. Male headed households were found to be less vulnerable to future poverty.

Conclusion

The results suggest that poverty and vulnerability to poverty are independent concepts. This implies that policies directed towards poverty reduction need to take into account the vulnerability of current non-poor households. Also, various household characteristics should be considered in developing poverty reduction strategies.

Key words

Vulnerability to poverty; ex-ante welfare; poverty; Ghana

1. Introduction

Several countries, especially in sub-Saharan Africa, have made poverty reduction and hence improvement in income and welfare a prime area in their growth and development agenda. Most policy interventions adopted by these countries have however only focused on poverty at a point in time. For instance, the first millennium development goal only considers the current poor to the neglect of the future poor or vulnerable. Economists have identified the need for ex-ante welfare to be considered in poverty reduction strategies (Chaudhuri 2003; Azam and Imai 2009). An ex-ante welfare analysis evaluates the reaction of individuals and households to present shocks and also the possibility of maintaining or improving future consumption and expenditure in the event that such shocks occur. The presence of risks and uncertainties in most activities has triggered several debates on the need to consider the dynamic aspect of poverty interventions rather than the usual static measure of poverty. As noted by Ligon and Schechter (Ligon and Schechter 2003), a household's average income or expenditures and the risks it faces give a fair idea of its wellbeing, especially when the household's resources are insufficient.

An emerging concept that considers ex-ante welfare is the concept of vulnerability to poverty. The concept provides insight on how the impact of shocks that households face today affects their wellbeing in the future. Chaudhuri *et al.,* (Chaudhuri, Jalan et al. 2002) defined vulnerability to poverty as the "ex-ante risk that a household will be poor in the future, irrespective of their current state of welfare". The concept supports measuring welfare not only by observed poverty but future poverty hence giving a dynamic perspective of welfare as opposed to static welfare measures.

This study is motivated by the view that static measures of welfare are less exhaustive in terms of policy interventions. Tendon and Hasan (Tendon and Hasan 2005) viewed poverty measures that include lack of social protection and lack of access to consumption smoothening mechanisms as informative but admitted that this measure has not been easy to implement empirically. They argued that poverty should not be conceptualized in terms of monetary and social deprivations but also in terms of exposure to shocks (such as illness, flood and drought shocks). Understanding the effects of such shocks helps effective policy interventions as key micro-level binding constraints are identified.

An additional motivation of this study is from the growing literature (Appiah-Kubi, Oduro et al. 2005; Azam and Imai 2009) that provides evidence to suggest that there is a significant difference between the current poor and the vulnerable and in most cases vulnerability to poverty was found to be higher than static poverty levels. For instance in the case of Ghana, Appiah-Kubi *et al.,* (Appiah-Kubi, Oduro et al. 2005) found vulnerability to poverty level in 1998/99 to be about 50% whereas the observed poverty level was estimated to be 39.5%.

2. Poverty and Vulnerability to Poverty in Ghana

While available information in recent years suggests an improvement in the level of poverty in Ghana, it will be erroneous to conclude that vulnerability levels have also moved in the same direction.

Table 1: Summary of poverty incidence in Ghana

	1991/92	1998/99	2005/06
National poverty	51.7	39.5	28.5
Rural	64	50	39
Urban (Accra)	23	4	11
Administrative regions			
Western	59.6	27.3	18.4
Central	44.3	48.4	19.9
Greater Accra	25.8	5.2	11.8
Volta	57	37.7	31.4
Eastern	48	43.7	15.1
Ashanti	41.2	27.7	20.3
Brong Ahafo	65	35.8	29.5
Northern	63.4	69.2	52.3
Upper East	66.9	88.2	70.4
Upper West	88.4	83.9	87.9

Source: Ghana statistical service (2007)

Table 1 show that poverty levels in Ghana reduced from 51.7% in 1990/91 to 39.5% in 1998/99 and further to 28.5% in 2005/2006. About 18.2% of the population was described as extremely poor[1] in the 2005/06 period which shows an improvement from the 1998/99 figure of 26.8%. The incidence of poverty in the administrative regions indicates a reduction over 1991 to 2006. With exception of the Greater Accra and Upper West regions, all other administrative regions in Ghana experienced reduction in extreme poverty. However, the Greater Accra region experienced a reduction in poverty from 15.2% to 11.8% between 1998/99 and 2005/06. The Central and Eastern regions experienced the largest decline in poverty of about 28.5% (Table 1).

Urban poverty reduced from 23% in 1991/92 to 4% in 1998/99, it rose again to 11% in 2005/06. It is speculated that the sudden increase in poverty in the region is due to the large number of in-migrants.

Most welfare studies in Ghana have only focused on static poverty (Asenso-Okyere, Nsowah-Nuamah et al. 1997; Canagarajah, Mazumdar et al. 1998; Boateng, Boakye-Yiadom et al. 2001). The dynamic aspect of poverty and the impact of household risks and uncertainties have received little attention from researchers. Appiah-Kubi *et al.,* (Appiah-Kubi, Oduro et al. 2005) provided evidence to show that vulnerability to poverty levels (50%) are higher than observed poverty levels (39.5%) in Ghana.

Different types of risks have been identified among households in Ghana. They include both household and individual specific risks (idiosyncratic) and risks related to the community in which the households or individuals find themselves (covariate). According to Kunfaa (Kunfaa 1999) bush fires, infertile lands, snake bites and poor sanitary conditions are some of the sources of risk among rural communities in Ghana. These risks affect the well-being of most rural household's agricultural productivity directly or indirectly hence pushing them into poverty in the near future since their main source of livelihood is destroyed. While bush fires and land infertility directly affect productivity, snake bites and poor sanitation are likely to affect the health status of these households.

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[1] Extreme poverty is defined here as the proportion of the population living below the lower poverty line of GH¢ 288.47

3. Measuring Vulnerability

Vulnerability has been measured by different researchers based on the focus of study and available data. However, vulnerability measurement has some general perspectives which include the time horizon and the welfare measure. The time horizon in vulnerability measurement could be the next day, a year later or old age but welfare is mostly in terms of consumption[2]. Three main approaches have been discussed in the literature in measuring vulnerability. These include measuring vulnerability as expected poverty (VEP), vulnerability as low expected utility (VEU) and finally vulnerability as uninsured exposure to risk (VER) (Hoddinott and Quisumbing 2003; Christiaensen 2004).

The VEP approach has been used by Chaudhuri *et al.,* (Chaudhuri, Jalan et al. 2002) and Christiaensen and Subbarao (Christiaensen and Subbarao 2005). This approach defines a household's (h) vulnerability to poverty at time (t) as the probability that the household's consumption (C) at time (t+1) will fall below some benchmark (consumption poverty line, Z). That is

$$V_{ht} = \Pr(C_{h,t+1} < Z) \tag{3.5}$$

Pritchett *et al.,* (2000) extended the time horizon noting that since the future is uncertain, the degree of vulnerability rises with the length of the time horizon.

This approach has been criticized on the point that it does not take into account the depth of expected poverty. However, one advantage of this measure is that it can be implemented using a single cross section data. Also, although the approach is defined for individual households, it can be aggregated over a number of households (Hoddinott and Quisumbing 2003)

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[2] Welfare measures could be diverse eg. Likelihood of a child growing slowly

The VEU approach defines vulnerability with reference to the difference between the utility derived from some level of certainty-equivalent consumption, Z_{CE} (analogous to the poverty line) at and above which the household would not be considered vulnerable and expected utility of consumption. This can be written as;

$$V_h = U_i(Z_{CE}) - EU_h(C_h)$$

<div align="right">(3.8)</div>

Where U_h is a weak concave, strictly increasing utility function.

Ligon and Schechter (Ligon and Schechter 2003) employed this approach in their study. This approach is advantageous in the sense that vulnerability estimates reflect low asset levels, unfavourable setting or poor returns to assets and also shocks and inability to cope with shocks (both idiosyncratic and covariate). The approach is, however, criticized on the following grounds; first, specification of a particular functional form of the utility function will affect the magnitude of the vulnerability estimates calculated. Secondly, since utility is the main focus of this approach, the unit of measurement is likely to be units of utility, for example utils, which may be difficult to understand by many policy makers (Hoddinott and Quisumbing 2003).

The VER approach seeks to capture the welfare loss a household suffers due to lack of effective risk management tools. This approach is similar to VEP and VEU in that it is concerned with assessing welfare and welfare losses in a world where some risks are at best partially insured. The differences between VER and the other approaches are that unlike VEP, it is backward looking: ex-post measure of welfare loss rather than an ex-ante welfare loss due to a negative shock. Secondly unlike the other two, it does not attempt an aggregate measure of vulnerability.

It must be mentioned that, aside the traditional measures of vulnerability to poverty explicated above, there are other measures emerging in the literature (Calvo and Dercon 2005; Chiwaula, Witt et al. 2011).

4. Methodology

4.1 Data

The study used 2005/2006 data from the Fifth Round of the Ghana Living Standards Survey (GLSS 5) conducted by the Ghana Statistical Service (GSS) with technical assistance from the World Bank and the European Union. Nationally representative sample of 8,687 households in 580 enumeration areas, containing 37,128 household members were covered in GLSS 5. The GLSS 5 focuses on the household as a key socio-economic unit and provides valuable insights into living conditions in Ghana. For the purpose of GLSS 5, a household is defined as a person or a group of persons, who live together in the same dwelling, share the same house-keeping arrangements and are catered for as one unit (GSS 2008). Detailed information on household income and expenditure make the data very vital for a vulnerability study like this one.

4.2 Econometric Technique

Some studies on vulnerability have used panel data collected over a long period due to the forward-looking nature of the concept of vulnerability (Christiaensen and Boisvert 2000; Ligon and Schechter 2003). However, other studies have shown that cross section data can also be used in estimating vulnerability to poverty (Chaudhuri 2000; Chaudhuri, Jalan et al. 2002; Chaudhuri 2003; Suryahadi and Sumarto 2003; Appiah-Kubi, Oduro et al. 2005; Azam and Imai 2009; Jamal 2009). The current study measures vulnerability as expected poverty and following Chaudhuri (Chaudhuri 2000), the probability of household h, finding itself to be consumption poor at time $t+j$ can be expressed as;

$$V_{ht} = p_r(\ln C_{h,t+j} < \ln z) \tag{1}$$

Where V_{ht} represents vulnerability of household h at time t, $C_{h,t+j}$ is consumption of household h at time $t+j$ and z shows poverty line of household consumption, ln is natural log.

The consumption generating process can be specified as;

$$\ln C_h = X_h\beta + \varepsilon_h \tag{2}$$

Where C_h is the per capita consumption expenditure for household h, X_h is observable household characteristics, β is a vector of parameters and ε_h is a zero-mean disturbance term that captures household's idiosyncratic factors contributing to differential level of per capita consumption for households that share the same characteristics.

The use of cross section data makes it necessary for some assumptions to be made. First, the disturbance term, ε_h is log-normally distributed which implies that consumption expenditure, C_h is also log-normally distributed. Secondly, the structure of the economy is stable over time, ruling out the possibility of aggregate shocks (i.e. unanticipated structural changes in the economy). This assumption implies that uncertainties about future consumption stems solely from uncertainty about idiosyncratic shocks that the household will experience in the future.

Any given household h, with characteristics X_h can then have vulnerability to poverty level calculated using the estimated coefficients of equation (2) such that

$$V_h = p_r(\ln C_{h,t+1} < \ln z \,|\, X_h) = \Phi\left(\frac{\ln z - X_h\beta}{\sigma}\right)$$

(3)

Where V_h is estimated vulnerability to poverty (i.e. the probability that per capita consumption level will be lower than the poverty line conditional on some household characteristics), $\Phi(.)$ is the cumulative density of the standard normal distribution and σ is the standard error from equation (2).

4.3 Allowing for Heteroscedasticity

Some studies that explore household consumption behaviour treat the disturbance term as stemming from measurement error and, thus, usually assume that the variance of the disturbance term is the same for all households. This assumption, as noted by Chaudhuri (Chaudhuri 2003) leads to inefficient estimates not only in the main parameters of interest but also in the vulnerability estimates. This problem can be addressed by a simple functional form, which relates variance of the consumption function to household characteristics as follows:

$$\sigma_{\varepsilon,h}^2 = X_h\theta + \eta_h$$

(4)

A three-stage Feasible Generalized Least Squares (FGLS) procedure suggested by Amemiya (Amemiya 1977) is used to estimate β and θ. Equation (2) is first estimated using the Ordinary Least Squares (OLS) procedure. The estimated residuals from equation (2) are then used to estimate the following equation by OLS

$$\sigma^2{}_{ols,h} = X_h\theta + \eta_h \tag{5}$$

The predicted values from this auxiliary regression are used to transform equation (5).

$$\frac{\sigma^2{}_{ols,h}}{X_h\theta} = \frac{X_h}{X_h\theta}\theta + \frac{\eta_h}{X_h\theta} \tag{6}$$

Estimating equation (6) by OLS gives an asymptotically efficient FGLS estimate, θ_{FGLS}. It can be shown that $X_h\theta_{FGLS}$ is an efficient estimate of $\sigma^2_{e,h}$ which is the variance of the idiosyncratic component of household consumption. Equation (2) is also transformed with the standard error of θ_{FGLS} as follows;

$$\sigma_{\varepsilon,h} = \sqrt{X_h\theta_{FGLS}} \tag{7}$$

$$\frac{\ln C_h}{\sigma_{\varepsilon,h}} = \left(\frac{X_h}{\sigma_{\varepsilon,h}}\right)\beta + \frac{\varepsilon_h}{\sigma_{\varepsilon,h}} \tag{8}$$

OLS estimation of (8) yields an asymptotically efficient estimate of β. The estimated β_{FGLS} and θ_{FGLS} enable a direct estimation of expected log consumption (shown in equation 9) and expected variance of log consumption (shown in equation 10) respectively.

$$E\left[\left(\ln C_h \mid X_h\right)\right] = X_h\beta \tag{9}$$

$$Var\left[\left(\ln C_h \mid X_h\right)\right] = \sigma^2_h = X_h\theta \tag{10}$$

Finally, assuming that consumption is log normally distributed, vulnerability to poverty can be estimated as

$$V_h = \Phi\left(\frac{\ln z - X_h \beta_{FGLS}}{\sqrt{X_h \theta_{FGLS}}}\right)$$

(11)

Thus, the estimation of vulnerability to poverty depends on such elements as the distributional assumption of normality of log consumption, the choice of poverty line, the expected level of log consumption and the expected variability of log consumption. The level of vulnerability to poverty reduces as expected consumption and expected consumption variability increases.

The current study employed a vulnerability to poverty threshold of 0.5 as it is widely accepted as a reasonable threshold (Pritchett, Suryahadi et al. 2000; Chaudhuri, Jalan et al. 2002; Zhang and Wan 2008). While an upper poverty line[3] of GH¢370.89[4] was used, a lower poverty line of GH¢288.47 was also used to allow for robustness check (GSS 2008). Finally, time horizon was specified in this study as $t+j$ instead of $t+1$, where $j \geq 1$ (Chaudhuri, Jalan et al. 2002; Christiaensen and Subbarao 2005).

Household total food and non-food expenditure was used as the dependent variable in the estimation of vulnerability to poverty. Household health status, social and demographic characteristics were included as independent variables.

5. Results

5.1 Descriptive statistics

Table 2 shows that, on average, approximately three members per household reported ill during the two week period that preceded the survey. Average annual household consumption expenditure on food and non-food items was GH¢1,190. Mean age of the household head was 45 years. Average household size was four (with a minimum of one and a maximum of 29).

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[3] Poverty lines were computed from the GLSS 5 by the GSS (see GSS, 2008).

[4] Ghana Cedi to US Dollar exchange rate in 2006 (i.e. the data year) was GH¢0.917=US$ 1.00

Table 2: Summary of descriptive statistics

Variable	Mean	Number (%)
Household characteristics		
Number sick	3.425317	
Good hygiene		3392 (39.42)
Size	4.281181	
Head education		
None		1788 (31.88)
Primary		2556 (45.57)
Secondary		890 (15.87)
Tertiary		375 (6.89)
Male head		6202 (72.09)
Age of head	45.35476	
Married head		7783 (90.45)
Employed head		7319 (85.07)
Urban residence		5031 (58.48)
Good housing		3847 (44.72)
Use communication		
facility		1121 (13.03)
Consumption expenditure (GH¢)	1190	
Administrative region		
Western		829 (9.24)
Central		682 (7.93)
Greater Accra		1226 (14.25)
Volta		715 (8.310
Eastern		901 (10.47)
Ashanti		1561 (18.14)
Brong Ahafo		793 (9.22)
Northern		788 (9.16)
Upper East		599 (6.96)
Upper West		509 (5.12)
Ecological Zone		
Coastal		2530 (29.41)
Forest		3524 (40.96)
Savannah		2549 (29.63)

Note: The exchange rate between the cedi and United States Dollar in 2006 was US$1:

5.2 Vulnerability to poverty in Ghana

Average vulnerability to poverty in Ghana was estimated to be 56%. While the Eastern region was found to have the highest average vulnerability of approximately 73%, the Upper West region had the least vulnerability with about 21% average vulnerability to poverty. Other regions with relatively high incidence of vulnerability to poverty include the Western

region (70%) and the Volta region (69%) (Table 3). Vulnerability to poverty was estimated to be 61% among urban households and 25% among rural households.

Regarding gender, male-headed households were more vulnerable to poverty than female-headed households with mean vulnerability estimates of 0.58 and 0.51 respectively. Further, households located in the forest zones are more vulnerable to poverty with mean vulnerability of approximately 68%. Households in the savannah zones have the lowest average vulnerability of approximately 33%.

Table 3: Vulnerability to poverty profile for various population characteristics

	Population share	Mean vulnerability	Vulnerability to population ratio
Total	100	56	100
Administrative region			
Western	9.64	69.96	12.04
Central	7.93	64.37	9.11
Greater Accra	14.25	59.79	15.21
Volta	8.31	68.53	10.16
Eastern	10.47	73.47	13.73
Ashanti	18.14	61.63	19.96
Brong Ahafo	9.22	60.15	9.91
North	9.16	24.87	4.07
Upper East	6.96	28.38	3.54
Upper West	5.92	21.41	2.27
Residence			

Urban	41.52	61.06	45.27
Rural	58.48	52.42	54.75
Gender of household head			
Male	72.09	57.88	74.52
Female	27.91	51.15	25.00
Ecological zones			
Coastal	29.41	63.32	33.25
Forest	40.96	67.62	49.46
Savannah	29.63	32.68	17.29

Note: Upper poverty line of GH¢370.89 was used for the profiles above

5.3 Poverty and vulnerability to poverty

Results from the chi-square test of independence (Table 4) shows that there is no association between poverty and vulnerability to poverty (P value = 0.177).

Table 4: The vulnerable and the poor (percent)

	Vulnerable	Non-vulnerable	Total
Poor	55.69	44.31	100
Non-Poor	57.64	42.36	100
Total	56	44	100

Pearson Chi2 (1): 1.8233

Probability: 0.177

5.4 Determinants of vulnerability to poverty

Vulnerability to poverty was found to be lower for households with less number of ill members and this was significant at 1%. Also, the household hygienic condition dummy variable significantly relates to lower expected mean of consumption (Table 5).

Table 5: Determinants of vulnerability to poverty

Variable	Ex-ante mean consumption	Ex-ante variance consumption
Household characteristics		
Number sick	-0.05979***	0.03127

	(-0.01082)	(-0.03025)
Good hygiene	0.16392***	0.09645
	(-0.02349)	(-0.06303)
Size	-0.08166***	-0.05454*
	(-0.01052)	(-0.02952)
Male head	0.08315***	0.16654**
	(-0.02636)	(-0.07198)
Head age	0.02169***	0.01844
	(-0.00539)	(-0.01425)
Head age squared	-0.00022***	-0.00013
	(-0.00006)	(-0.00015)
Head married	-0.19583***	-0.07615
	(-0.03975)	(-0.1054)
Head education		
Primary	0.20835***	-0.16446**
	(-0.02649)	(-0.0712)
Secondary	0.49199***	-0.09041
	(-0.03736)	(-0.09741)
Tertiary	1.03125***	-0.0064
	(-0.05476)	(-0.1354)
Head employed	0.11416***	-0.11189
	(-0.03877)	(-0.09783)
Urban residence	0.30650***	0.09768
	(-0.02865)	(-0.07717)
Good housing	0.21758***	-0.00895
	(-0.02782)	(-0.07513)
Use communication facility	0.16492***	0.09847
	(-0.03272)	(-0.08425)
Administrative region		
Central	-0.03581	-0.08761
	(-0.04995)	(-0.13661)
Greater Accra	0.04723	0.08923
	(-0.04854)	(-0.12843)
Volta	-0.34805***	0.01774
	(-0.0506)	(-0.13454)
Eastern	-0.16944***	-0.05501
	(-0.04647)	(-0.1255)
Ashanti	0.13590***	-0.11635
	(-0.04413)	(-0.11851)
Brong Ahafo	-0.20803***	0.01148
	(-0.05544)	(-0.14741)
Northern	-0.53820***	0.11144
	(-0.08278)	(-0.22665)
Upper East	-0.61294***	-0.03274
	(-0.08327)	(-0.23587)
Upper West	-0.80698***	1.15071***
	(-0.14081)	(-0.2671)
Ecological zone		
Coastal	-0.00053	0.0483
	(-0.05677)	(-0.16016)
Forest	0.00897	0.19193
	(-0.04849)	(-0.13656)
Constant	13.87075***	-2.31557***
	(-0.12152)	(-0.32787)
No of Observations	8603	8603

R^2	0.48	0.13
Adjusted R^2	0.47	0.1
Pseudo R^2		
F-Value	316.79***	4.57***
LR Chi2		

Note: 1. The dependent variable for the first estimation is the ex-ante mean of consumption.

2. The dependent variable for the second estimation is ex-ante variance of consumption.

3. Values of standard errors are reported in parenthesis.

4. ***significant at 1%; **significant at 5%; *significant at 10%.

The results also show that households with larger family sizes are more likely to be vulnerable in the future as shown in the negative relationship with expected consumption. However, a contradicting relationship is revealed in expected variance of consumption where vulnerability is lower among households with larger size. As expected, higher education attainments relates to lower levels of vulnerability to poverty. Education attainments also relates negatively to future variations in consumption.

While household vulnerability to poverty tends to increase as the age of the household head increases, male headed households were found to be less vulnerable to poverty, relative to female headed households.

6. Discussions

Table 3 shows that 56% of the Ghanaian population was vulnerable to poverty. This is significantly higher than the observed poverty level of about 28%. The estimate, however, reduced to about 49% when the lower poverty line was used (see appendix 1) (Appiah-Kubi, Oduro et al. 2005). Interestingly, rural households had lower average vulnerability to poverty than urban households. A reverse situation is reported on current poverty in Ghana with rural households poorer than urban households (Table 1).

This result contradicts the findings of earlier studies that vulnerability is higher in rural areas than in urban areas (Appiah-Kubi, Oduro et al. 2005; Azam and Imai 2009). One reason that could be speculated for this result is the increase in rural-urban migration. The GLSS report indicated that about four in every ten residents in urban areas were in-migrants (GSS 2008). Such in-migrants face an enormous challenge posed by the high standard of living and lack of jobs. Further, the finding supports the premise that poverty and vulnerability to poverty are not necessarily the same and need to be treated as such.

Again, vulnerability to poverty was found to be higher among male-headed households than in female-headed households (Alayande and Alayande 2004). This finding confirms the findings of Appiah-Kubi et al. (Appiah-Kubi, Oduro et al. 2005) who reported a lower vulnerability estimate of 36.3% for female-headed households compared to male-headed households with estimated vulnerability of 54.4%. Also, contrary to the current poor (Table 1), the Upper West (21.41%) and Eastern (73.47%) regions were the least and most vulnerable regions respectively.

Policies directed only towards observed poverty are not enough if poverty is to be reduced in the longer term. That is, if poverty reduction programmes focus only on the current poor households and regions, the other part of the population who are currently not poor but are likely to be poor in the future are neglected at the time of implementation of the programme, hence making it difficult to adequately reduce poverty among the population.

It is evident from the results that household health status is an important determinant of vulnerability to poverty. Expected average consumption relates to lower number of ill household members which implies that, as the general household health declines, future consumption is expected to reduce, making the household vulnerable to poverty in the near future. A complement of this finding was seen in the household hygiene condition variable which relates to significantly lower levels of vulnerability. Thus, households with good hygienic conditions were more likely to have good health, hence improved welfare. The results suggest that good health status is an important vulnerability-improving variable which has to be taken into consideration in designing policy interventions.

This finding confirms that health is both a consumption and investment commodity as good health enables individuals to engage in productive activities that translate positively into their consumption and investment activities. Moreover, this finding provides empirical evidence to Grossman's (Grossman 1972a) theory of health capital, which suggests that good health in itself is a resource that helps individuals to improve their welfare as they spend much more time working and less in ill health. Similar result was found by Azam and Imai (Azam and Imai 2009) in Bangladesh.

In Ghana, health workforce and infrastructure are still relatively inadequate and sanitation conditions are relatively poor (WHO 2009). Hence, efforts at improving access to basic health services are crucial as argued by Nonvignon and Aglobitse (Nonvignon and Aglobitse

2008) and Nonvignon et al. (Nonvignon, Aikins et al. 2010). Good hygiene practices also need to be promoted at the household level. These interventions will not only facilitate the achievement of the health-related Millennium Development Goals but also translate into improving current and future welfare by reducing future poverty.

While mean future consumption was estimated to be low among larger households, variations in future consumption expenditure was estimated to be lower with larger households. This may be explained by the fact that large households tend to have larger labour force since even children may be used as a source of labour in times of difficulty (Makoka 2008). Moreover, households with more members usually have better social networks as each member of the household establishes relationships with others in the community. Such networks also work as a form of insurance in times of difficulties. However, the impact on expected mean consumption is more significant (1%) than the impact on expected variance of consumption (10%) so that the overall effect could be said to be an increase in vulnerability to poverty.

These results prove that education is an important factor in considering both poverty and vulnerability to poverty. Moreover, while all levels of education significantly reduce vulnerability to poverty, the significant impact of the primary education dummy on both expected mean and variance of consumption implies that even primary education attainment could make a difference in improving household welfare. This explains the significance of the second MDG of achieving universal primary education. In sum, it is obvious that households headed by educated heads are less vulnerable to poverty. These results agree with Ligon and Schechter (Ligon and Schechter 2003) who showed that households with more educated heads are less vulnerable, with college educated heads being on average 16% less vulnerable than households with uneducated heads. This may be attributed to the fact that educated household heads are expected to have higher consumption expenditure.

7. Conclusions

The study sought to assess ex-ante welfare by estimating vulnerability to poverty among households in Ghana. The study underscores the significance of ex-ante welfare and confirmed the notion that poverty and vulnerability to poverty are different concepts. The study also found that health shocks, education attainments and large family sizes are significant determinants of vulnerability to poverty in Ghana.

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The study was limited by the lack of panel data with sufficient length and richness. Such data provide inter-temporal consumption expenditure for household vulnerability assessments. The study is also limited by its inability to control for the existence of a possible simultaneity problem due to the lack of a good instrument in the data. Future research should, therefore, consider the above mentioned limitations.

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Appendix

Appendix1: Vulnerability to poverty profile for various population characteristics

	Population share	Mean vulnerability	Vulnerability to population ratio
Total	100	49	100
Region			
Western	9.64	63	12.39
Central	7.93	57	9.22
Greater Accra	14.25	43	12.51
Volta	8.31	66	11.18
Eastern	10.47	69	14.73
Ashanti	18.14	50	18.51

Brong Ahafo	9.22	57	10.73
North	9.16	24	4.49
Upper East	6.96	28	3.98
Upper West	5.92	21	2.53
Location			
Urban	41.52	47	39.82
Rural	58.48	51	60.86
Gender of household head			
Male	72.09	51	75.04
Female	27.91	44	25.06
Coastal	29.41	51.46	30.88
Forest	40.96	60.7	50.73
Savannah	29.63	31.97	19.33

Note: Lower poverty line of GH¢288.47 was used for the profiles above