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Health shocks and consumption smoothing among rural households in Nigeria

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Abstract

Aim/purpose – The prevalence of poverty among Nigerian households and limited social safety nets predispose the country to health shock. Health shocks are associated with adverse economic consequences: they raise medical expenditure and reduce household consumption. The household responds with informal coping mechanism to smoothen consumption. The coping strategies are limited to household asset endowment and access to credit facility. This study examines the effect of health shock on changes in household consumption and investigates the coping strategies employed in the face of health shock.

Design/methodology/approach – The study is anchored on the full-insurance theory. Data were obtained from two waves of the General Household Survey (GHS) panel, 2011 and 2013. The GHS covered 5,000 households across the six geopolitical zones. Three measures of HS, death of a household member, disability and severe illness, were used. The household consumption was divided into food and non-food. A fixed effect model was estimated to examine the impact of health shock on change in consumption. Multinomial Logit Model was used to determine the coping strategies used by households.

Findings – Disability and death had a negative effect on food consumption. Death decreased non-food consumption of households, while disability was not statistically significant. Severe illness had significant positive impact on consumption. Borrowing significantly affected the ability of households to maintain consumption. Death reduced rural household consumption in Nigeria. Borrowing was the most prominent coping strategy.

Research implications/limitations – Provision of financial protection against health shocks such as payment of disability benefits and assistance to households that report death should be encouraged by the government. The sample was limited to those that reported illness in the four weeks preceding the GHS, thereby excluding those whose illness preceded 28 days before the survey.

Originality/value/contribution – Rural-urban dichotomy among households in Nigeria was acknowledged in examining the relationship between health shocks and variation in consumption.

Keywords: health shocks, consumption smoothing, coping strategies, rural household.

JEL Classification: I19, I31.

1. Introduction

Risks, shocks and vulnerability are common phenomena in life. Risks are closely related to vulnerability which determines the extent to which an individual is exposed to shock; therefore, an indication that a shock will lead to reduce welfare. Asset endowment and access to social safety net are major determinants of household vulnerability to risk. Moreover, the nature of the shock which is indicated by degree of severity and frequency of occurrence determines individual's vulnerability to shock (Olaniyan, Omobowale, & Abimbola, 2012; Oni, 2008; World Bank, 2001). These shocks can be covariate and/or idiosyncratic. Covariate shocks are social unrest, uncertainties associated with nature and institutional failure that affect the wellbeing of households, communities or a country. The idiosyncratic shocks are peculiar to individuals and households. Such shocks are health shocks, unemployment of household members, and fall in income that jeopardises household welfare. Generally, shocks induce welfare losses and the influence is intense in the absence of, or low access to insurance provision.

Welfare losses associated with health shocks pose greater consequences for an individual and household than other forms of shock (Dhanaraj, 2016; Wagstaff & Lindelow, 2014). But it is a source of shock relatively underexplored in Nigeria.

Health shocks are severe cases of illness or injury that predisposes the household to substantial medical expenditure and/or loss in labour productivity. It involves taking time-off work as a result of shock to any member of the household. Poor health status becomes health shock, only if it is so severe that it hampers the ability of the sick individual to carry out normal daily endeavours or prevent another individual in the household from working by staying back and caring for the sick member of the household. In this light, the household must have suffered considerable medical expenses or loss of earnings owing to sickness, disability, or the death of the breadwinner of the household.

Two adverse economic consequences are associated with health shocks (Dhanaraj, 2016; Genoni, 2012; Khan, Bedi, & Sparrow, 2015). They reduce household's hours of work, hence, labour earnings and raises medical bills. This can be substantial and even catastrophic if it is above a certain proportion of household's earnings (Alam & Mahal, 2014). These consequences can be severe depending on the kind and degree of health shocks, whether household will seek medical care (Wagstaff, 2007) and who provides the medical care (private or public) (Dalton & LaFave, 2017; Dhanarj, 2016; Pohl, Nelson, & Parro 2014). It also depends on employment status and whether members of the households are insured. Health shocks have negative outcomes on developed and less developed nations, but the impacts on households in developing countries might be greater because they tend to have low income and not covered by formal insurance to mitigate shocks and preserve consumption (Islam & Maitra, 2013).

The prevalence of poverty among Nigerian households and limited social safety nets predispose the country to health shock effects. In Nigeria, incidence of poverty is not just high; vulnerability to poverty is also a major issue. A substantial proportion of the Nigerian population (50.9 per cent) is multidimensionally poor with additional 18.4 per cent of Nigerians living near multidimensional poverty (United Nations Development Program [UNDP], 2016). As revealed by Olaniyan et al. (2012) rural households in Nigeria are vulnerable to different types of shocks. This is because their income tends to fluctuate widely due to the nature of their employment in the agriculture sector and the seasonal nature of agricultural production in Nigeria. In addition, many of the poor have to face sudden and large expenditures to cope with health shocks despite their limited and insufficient economic capabilities. Hence, rural households in Nigeria may be bedevilled with catastrophic spending burdens that increase vulnerability to poverty.

Nigerian households possess little or restricted access to social safety net and are unable to access formal credit necessary to mitigate the consequences of severe health challenges and smoothen consumption. Government and nongovernment organisations in Nigeria have been making effort to prevent fluctuation in earnings and consumption of households in Nigeria, most especially in the rural areas. The establishment of institutions such as National Directorate of Employment (NDE), Universal Basic Education Programme (UBE), National Poverty Eradication Programme (NAPEP), National Health Insurance Scheme (NHIS) are some of the programs aimed at reducing household vulnerability to shock. Others are Nigeria Social Insurance Trust Fund (NSITF), National Emer-

agency Management Agency (NEMA) and Agricultural Credit and Rural Development Bank (NACRDB), as well as Universal Health Coverage (UHC). The organisations are either engaged in ex ante or ex post risk mitigation and sharing arrangement. The basic prime is that the formal Health Insurance Scheme is not accessible to all and formal risk sharing institutions are scarce. In Nigeria, about 5 per cent of the population are enrollee of the NHIS, virtually all the enrollee are employed in the formal sector, hence, the workers in the informal sector are not insured. Consumption smoothing is therefore a big challenge for poor households in Nigeria due to low income and the absence of first-best solution¹.

More worrisome is the fact that the Nigerian health sector is characterised by poor health conditions. The population recorded high incidence of illness such as HIV/AIDS; 1,996 per 100,000, Tuberculosis; 322 per 100,000 and malaria with prevalence rate of 31,913 per 100,000 (World Health Organization [WHO], 2016). The poor health condition in Nigeria is further shown by maternal mortality figure of 814 reported cases of death in every 100,000 live births, under-five mortality rate of 108 per 1000 and maternal death rate of 560 per 100,000 live births (World Bank, 2017). The average health facility-population ratio is considerably low. As at 2017, the national doctor-patient ratio stood at 1:6000, much lower than the WHO minimum standard of 1:600. While, there are private health facilities, they are sparsely located and characterised by high charges.

The predominant means of financing healthcare in Nigeria is private; approximately 65% of total medical expenses is paid by individual, a large proportion of which is out-of-pocket (WHO, 2016). Public expenditure on health as a given proportion of GDP has been poor, it was 3.5% in 2010, and stabilised at 3.7 per cent in 2013 and 2014. About 4.1 per cent was allocated to the health sector in the 2017 budget, as against the 4.4 per cent apportioned to the same sector in 2016. The percentage of private contribution in total health expenses is large, with a slight decline between 2002 and 2014, from 74.4 per cent to 68.9 per cent, respectively. Similarly, out-of-pocket spending as a proportion of overall health spending has been persistently greater than 70%. The implication is that, rural households that seek formal healthcare will have to incur high user fees, given that it is an integral part of out-of-pocket. The increasing out-of-pocket expenditure due to substantial burden of health risks on most vulnerable poor households has kept them in poverty trap. This is because many of the poor have to face sudden and large expenditures to cope with sickness and other shocks despite their limited and insufficient economic capabilities.

¹ Formal risk-sharing institutions.

In order to mitigate the economic outcomes of adverse health condition, households respond with second-best options or the informal coping mechanism. Coping is an immediate and sometimes temporary measure employed by households to avert adverse consequences of shock (Gupta, Singh, Seth, Agarwal, & Mathur, 2015). It may take several forms – that include dissaving, selling assets, borrowing, receiving financial assistance from friends and relations (Dalton & LaFave, 2017; Mitra, Palmer, Mont, & Groce, 2016). Nonetheless, these options are either inadequate or unavailable, therefore, households tend to reduce expenditures on food consumption or compel children to drop out of school, sending them to live with friends and increasing labour force participation of children.

Households, therefore, experience disruptions in welfare such as a decline in non-medical consumption, permanent loss; like disposing capital goods or permanent reduction of human capital through distortion of children's education, which further leads to poverty. In a situation where there is no asset to dispose and no formal social safety net to smoothen consumption, health shocks will lock their victims in perpetual poverty. Thus, the ability to smoothen consumption can be impaired by the availability of asset, ability to borrow and liquidity constraint. Given the negative effects, it is important to examine the availability and effectiveness of informal insurance strategies in dampening the adverse effects of shocks on household wellbeing.

In Nigeria, there are dearth of studies providing empirical analysis of the effect of the health shock on household's consumption. Given that formal health insurance is not readily available among rural households in Nigeria, the poor rural dwellers tend to bear a substantial portion of out-of-pocket health spending and forego earnings through lost workdays or reduced labour productivity (Olaniyan, Onisanwa, & Oyinlola, 2013; WHO, 2016). This may result in welfare disruption such as reduced expenditure on food items and impoverishment.

This study took the opportunity of the availability of the General Household Survey (GHS) dataset with its Panel nature and rich set of variables to examine the influence of health shocks (severe illness, disability and death of household member) on household health spending and non-medical consumption. Furthermore, this study identifies the coping mechanism households employ in the face of health shocks among rural households in Nigeria.

In addition, most empirical studies (Khan, 2010; Pohl et al., 2014) on health shocks used total sample of sub-national entities in the analysis. These studies, however, did not acknowledge the socio-economic background as well as vulnerabilities in terms of rural and urban households. Given Nigeria's rural-urban

disparity, resource distribution pattern, as well as, informal solidarity arrangements, this research develops an empirical framework that examines the effects of health shocks on rural household's consumption growth.

The remainder of the study is organised as follows: Section two reviewed relevant literature, the econometric methodology is presented in Section three. Empirical findings are given and discussed in section four. Finally, Section five is the conclusion.

2. Literature review

Theories that examine the relationship between health shocks and variation in consumption of households include: the full insurance theory, the inter-temporal consumption theory, and permanent income hypothesis.

Arrow (1964) developed the full insurance theory. The theory presupposes that when households are not risk lovers and perfect information exists in the market, coupled with prevailing informal institutions that can help mitigate or pool risk to attained Pareto-optimality, then the extra satisfaction derived from consumption among households would be maximised. The theory further assumed that households are non-risk lovers and informal insurance is available, hence, risk-sharing in the village can be attained through different risk-pooling strategies such as borrowing from relation and cooperative, disposing valuables and falling back on savings.

Similarly, the inter-temporal consumption theory explains the relationship between health shocks and households' ability to smoothen consumption when faced with uncertainty (Bales, 2014). The theory states that risk loving households confronted by health shocks will want to maximise utility overtime, given household consumption. Households choose consumption such that the extra satisfaction derived from consumption today equalises the discounted expected extra satisfaction from consumption tomorrow. The theory further suggests that growth in first period consumption is not a function of transitory income but of permanent earnings. In the absence of borrowing facilities and presence of institutional barriers to credit, it is pertinent for households to preserve welfare using different risk mitigation and risk-sharing strategies. The strategies include falling back on savings, borrowing from friends and relation, gift or transfers from government and NGOs as well as sending remittances (Bales, 2014; Dhanaraj, 2016).

Friedman (1957) developed the Permanent Income Hypothesis. The theory states that only permanent earning has effect on overall earnings and hence, on real consumption. The theory suggests that individuals optimise consumption overtime by developing a likelihood of lifetime earnings, that ensures extra satisfaction derived from consuming additional unit of a good is the same throughout lifetime, therefore, severe illness or disability or death that does not affect permanent earnings cannot influence household welfare (Dhanaraj, 2015).

There are issues in investigating influence of adverse health condition on variation in households' expenditure on food and non-food consumption. At the forefront is the question of what constitutes health shocks? Health shocks must reveal the nature of health challenges, the degree of occurrence, the gravity or cost of the shocks and persistence of the event (Wagstaff, 2007). In addition, a health shock must be defined in line with the ability to carry out normal daily activities. For instance, at least a household member must abstain from work because of a health shock. In this sense, illness or disease becomes health shocks if they are critical to the point of preventing a sick person from going to work or a family member who had to stay away from work to look after the sick person (Pohl et al., 2014). Also, the health issue must have resulted in increased medical spending or the household experience reduction in hour of works and decline in earnings due to severe sickness, incapacitation owing to accident or injury and the demise of a household's head (Genoni, 2012; Wagstaff, 2007).

Dercon & Krishnan (2000) defined health shocks as period of incapacitation. A major weakness of days of disability is the likelihood of job prearrangement by households. Households with greater opportunity cost of absenting from work tend to report less disability compared to households with little or zero real cost of missing work (Pohl et al., 2014; Wagstaff, 2007). Similarly, people's adverse health conditions justify their absence from work. Results and inferences based on this measure of health shocks will be spurious and misleading.

Gertler & Guber (2002) emphasise the need to adequately measure an adverse health condition. They argue that measurement error might have led to the conclusion of perfect consumption insurance reported in some studies. Gertler & Gruber (2002) employ variation in individual's capability to do their daily activities in measuring health shocks, the study shows that earnings and households' consumption declined. The study concluded that there are hidden costs inherent in health shocks and suggests the need to focus on policies that prevent high medical spending. Their methodology, however, prevents the interpretation of the findings as cause and effect relation.

It must be noted that explaining the concept of a health shock involves a lot of complexities. The concept is relative to household depending on their level of earnings and academic qualification (Dhanaraj, 2015; Islam & Maitra, 2013; Wagstaff & Lindelow, 2005).

This accounted for the mixed conclusions in the literature. For instance, when different households experienced similar adverse health condition, meant to stop an individual from carrying out their routines, low-income individuals would not stop working in order to support their livelihoods. Meanwhile, high-income households or educated individuals would refrain from work; therefore, severe illness differs among low-income and well-to-do households, educated and uneducated (Pohl et al., 2014). The argument suggests that limitations in doing normal routine are not exogenous to decisions that relate to work duration.

Households in Nigeria are vulnerable to substances that pose a grave consequence on the environment and negatively influences income generating activities of the household particularly among low-income households. According to Alayande (2003), the common environmental challenges among poor households in Nigeria are environmental degradation, desertification, inadequate rainfall, various forms of erosion, pollution from industries, cars, smokes, indiscriminate waste disposal and bush burning that adversely impacted on the wellbeing of households vis-a-vis their ability to earn livelihood, which further impoverished the households. Most rural households in Nigeria engaged in the informal sector with agriculture as their main source of livelihood; however, erratic climatic condition tends to have an adverse implication on households' welfare (Oni & Yusuf, 2008; Oyekale & Yusuf, 2010).

Empirical evidence shows that on most occasions households fail to perfectly smoothen consumption using informal coping arrangement, especially when they encounter negative health conditions. Studies such as (Asfaw & von Braun, 2004; Genoni, 2012; Khan, 2010) show that vulnerable household further fall into penury in an attempt to maintain consumption level. Also, Dhanaraj (2016) states that coping through sales of valuables or child labour tends to destroy children's lifetime opportunity to earn income, thereby perpetuating vicious circle of poverty. Some studies (Asfaw & von Braun, 2004; Bales, 2014; Dhanaraj, 2016; Genoni, 2012; Gertler, Levine, & Moretti, 2009; Khan et al., 2015) determined the welfare implication of an adverse health crisis on households consumption. They also examined household's ability to smoothen spending on food and non-food consumption items when confronted with health shocks. They report mixed findings.

Gertler & Gruber (2002) suggest past studies that predicted perfect consumption insurance might have used not large, predictable and anticipated condition of health as measure of health shock. They concluded that households experiencing health shocks could not perfectly preserve consumption, with results revealing that household cannot sustain consumption level when faced with adverse health condition. Lindelow & Wagstaff (2005) revealed that adverse and unpredictable health conditions caused a major decline in household earnings and hours of work in China. The study also found a substantial increase in household personal health spending. When stratified along location, poor rural households tended to insure income evidence by rising income level.

Wagstaff (2007) finds that Vietnam households that encountered health shocks experienced significant reduction in expenditure on food items. The study shows further that urban dwellers are more exposed to health shocks as evidenced by reduction in earnings and rising medical expenses owing to high user fees.

Gertler et al. (2009) revealed that the influence of health shocks on consumption expenditure conforms to Gertler & Gruber's (2002) results. The findings suggest availability of credit markets that assists households in maintaining consumption level when they encounter adverse health conditions.

Genoni (2012) while accounting for the correlation of health conditions with omitted or unobserved variables found that unexpected and protracted sickness caused a decline in family income; however, the influence on food and non-food item was minimal. This can be associated with unobserved household specific characteristics as well as omitted key variables. Sparrow, Van de Poel, Hadiwidjaja, Yumna, Warda, & Suryahadi (2013) found evidence of perfect consumption smoothening among high income households in Indonesia; however, low income households experienced reduction in welfare.

The use of children to raise income in order to supplement household earnings and out-of-retirement labour adjustment to increase household income and preserve consumption was not successful in smoothing consumption in Burkina Faso (Sauerborn, Adams, & Hien, 1996). This tends to result in poor education attainment, with negative multiplier effect on the children's productivity later in life, therefore, perpetuating hardship (Dercon, 2002). According to Demenet (2016), intra-household labour adjustment was able to mitigate the direct hours of work, but substantial out-of-pocket medical spending crowded out expenditure on profitable venture, decreased investment and reduced household income. Therefore, microenterprises are susceptible to health shocks affecting their operators and/or other household members.

In addition, individuals that travelled out send remittances or token back home and borrows from friends and relations (Asfaw & von Braun, 2004; Dhanaraj, 2016; Wagstaff, 2007). Khan et al. (2015) accepted the claim that household can smoothen consumption in the immediate period by borrowing from friends, relatives and cash lenders in response to illness and death.

However, the non-formal risk-distribution mechanisms could be jeopardised by covariate shocks and fluctuations in macroeconomic condition (Bardhan & Udry, 1999). This implies that perfect consumption smoothing is not achievable and low-income households are not often absorb into risk-distribution arrangement (Alam & Mahal, 2014; Hangoma, Aakvik, & Robberstad, 2017).

3. Research methodology

3.1. Theoretical framework

The theoretical framework underpinning this study is the full insurance theory developed by Arrow (1964) as used in Townsend (1995); Asfaw & von Braun (2004) and Sparrow et al. (2013). It is developed as follows: assume a community planner, with T number of households that strive to optimise the sum of lifetime satisfactions of society (equation 1) given the village endowment limits, uncertainty, and distinct weight (equations 2 and 3). The ambiguous factor defined as H_{τ} assumes definite figure (H) at time t and satisfied requirement that the addition of the likelihood of realisation of all conditions (of nature or health status) will be one at a given time t . This implies $\sum_{\tau=1}^H \pi(H_{\tau}) = 1$ being $\pi(H_{\tau}) = 1, \dots, H$. In addition, it was assumed that the optimiser optimises consumption of household j at time t and condition $\tau(C_t^j(H_{\tau}))$, and leisure ($l_t^j(s_{\tau})$) and given that consumption and leisure were separable. Therefore, the maximisation problem could be written as:

$$Max \sum_{j=1}^T \omega^j \sum_{t=1}^{\infty} (r^j)^t \sum_{\tau=1}^H \pi(H_{\tau}) [U^j(C_t^j(H_{\tau}), \delta_t^j(H_{\tau})) + V^j(l_t^j(H_{\tau}), \delta_t^j(H_{\tau}))] \quad (1)$$

Equation (1) states that the community maximise a weighted sum of households' utilities by choosing consumption and leisure optimally subject to the constraints (2) and (3):

$$\sum_{j=1}^N C_t^j(\mathbf{H}_{\tau t}) \leq \bar{C}_t(\mathbf{H}_{\tau t}), \quad C_t^j(\mathbf{H}_{\tau t}) \geq 0 \quad (2)$$

and

$$\sum_{j=1}^N l_t^j(\mathbf{H}_{\tau t}) \leq \bar{l}_t(\mathbf{H}_{\tau t}), \quad 0 \leq l_t^j(\mathbf{H}_{\tau t}) \leq T_t^j(\mathbf{H}_{\tau t}) \quad (3)$$

Equations (2) and (3) were the feasibility constraints of maximisation. Equation (2) implies overall consumption cannot be greater than community endowment in each time and at all condition. ω^j denotes fixed optimum weight associated of j^{th} family which is assumed to be time invariant and fulfilling

$0 \leq \omega^j \leq 1$ and $\sum_{j=1}^T \omega^j = 1$. It is the weight each household placed on the utility

derivable from consumption. \bar{C}_t is the average village or community consumption overtime t and \bar{l}_t is the average leisure in the community, $(r^j)^t$ is j^{th} household rate of time preference presumed to be constant across households, $\pi(\mathbf{H}_{\tau t})$ is the likelihood that τ happens at time t . $U^j(\cdot)$ and $V^j(\cdot)$ are preference equations of the j^{th} household for consumption and leisure correspondingly and assumed to be additive and at least twice differentiable over time and across conditions, and δ_t^j is an predilection shock. The Lagrangian for the maximisation problem is thus:

$$\begin{aligned} L = & \sum_{j=1}^T \omega^j \sum_{t=1}^{\infty} (r^j)^t \sum_{\tau=1}^S \pi(\mathbf{H}_{\tau t}) \left[U^j(C_t^j(\mathbf{H}_{\tau t}), \delta_t^j(\mathbf{H}_{\tau t})) \right. \\ & \left. + V^j(l_t^j(s_{\tau t}), \delta_t^j(s_{\tau t})) \right] \\ & + \lambda_c \left[\bar{C}_t(\mathbf{H}_{\tau t}) - \sum_{j=1}^T C_t^j(s_{\tau t}) \right] \\ & + \lambda_l \left[\bar{l}_t(\mathbf{H}_{\tau t}) - \sum_{j=1}^T l_t^j(\mathbf{H}_{\tau t}) \right] \end{aligned} \quad (4)$$

Taking the FOC with respect to consumption yielded

$$\omega^j (r^j)^t U_c \left[(C_t^j(\mathbf{H}_{\tau t}), \delta_t^j(\mathbf{H}_{\tau t})) \right] = \lambda_c^* (H_{\tau t}) \quad (5)$$

Where λ_c^* denotes Lagrange multiplier correlated with endowment constraint in (2). Thus, $\lambda_c^*(s_{\tau t})$ is the endowment constraint correlated with consumption divided by $\pi(\mathbf{H}_{\tau t})$.

If the preference (U) in Equation (1) was assumed, it could be presented as exponential preference equation:

$$U^j [(C_t^j(H_{tt}), \delta_t^j(H_{tt}))] = -\frac{1}{\rho} \exp[-\rho(C_t^j(H_{tt}) - \delta_t^j(sH_{tt}))] \quad (6)$$

Symbol ρ is the absolute risk aversion term, presumed to be the same for all households and time invariant. It could be shown in equation (8) that health shocks cannot impact the change or growth rate of consumption (outcome variable), once total consumption is accounted for. The exponential utility function brought out the implication of risk sharing within the community given that households were risk averse. This reveals that changes in consumption were equalised across households.

Substituting (6) in (4) for U^j gave the FOC for consumption optimisation.

$$\omega^j \exp[-\rho(C_t^j(H_{tt}) - \delta_t^j(H_{tt}))] = \hat{\lambda}_c^\Lambda(H_{tt}) \quad (7)$$

Where: $\hat{\lambda}_c^\Lambda(H_{tt})$ is $\frac{\lambda_c(H_{tt})}{(r^j)^t \pi(H_{tt})}$. Taking log of (7), and aggregating over

T households, and solving for the consumption of household j gives:

$$C_t^j = \frac{1}{T} \sum_{j=1}^T C_t^j + \frac{1}{\rho} (\log \omega^j - \frac{1}{T} \sum_{j=1}^T \log \omega^j) + (\delta_t^j - \frac{1}{T} \sum_{j=1}^T \delta_t^j) \quad (8)$$

Equation (8) indicates that given the social (optima) weight (ω) and the alternative shock (δ) (a discount factor which redistributes income between household experiencing health shocks and households not experiencing health shocks) of families, individual consumption was a function of community level consumption, but not a function of household resources. Equation (8) specifically shows that after accounting for overall consumption and Pareto weight, and alternative shifters remaining constant, health shocks would not affect individual consumption. Consumption of household j was below (above) the community average of consumption if the sign of $\log \omega^j - \frac{1}{T} \sum_{j=1}^T \log \omega^j$ was negative (posi-

tive). Therefore, consumption of family j in period T with condition H yields the village level overall consumption plus constant family unique factor. Equation (8) suggests that the movement in consumption of household and the movement in community consumption divided by the number of households must be equalised between two consecutive periods.

Household resources did not enter the model, hence cannot influence the consumption size. However, the optima weights can be associated with a member capability and then with a member consumption. According to Cochrane (1991), this problem could be solved by taking differences between two FOC (equation (8)) at time $t + 1$ and t , since the social weight is presumed to be constant over time. It yields:

$$C_{t+1}^j - C_t^j = \hat{C}_{t+1} - \hat{C}_t + \left[(\delta_{t+1}^j - \delta_t^j) - (\overset{\wedge}{\delta}_{t+1} - \overset{\wedge}{\delta}_t) \right] \quad (9)$$

Where $\hat{C} = \frac{1}{T} \sum_{j=1}^T C^j$ and $\overset{\wedge}{\delta} = \frac{1}{T} \sum_{j=1}^T \delta^j$ for two periods $t + 1$ and t .

Therefore, changes in consumption, less preference shocks, are the same among households. The household fixed effect in equation (8) was removed with first difference. In equation (9) the social factor and the absolute risk aversion figure did not appear in the consumption equation between consecutive periods $t + 1$ and t .

3.2. Model specification

3.2.1. Health shocks and consumption smoothing

To investigate households' capabilities to smoothen consumption when confronted with severe ailment, disability or demise of a member, equation 10 was specified in line with (Asfaw & von Braun, 2004; Islam & Maitra, 2013).

According to the model of consumption smoothening discussed in the theoretical framework, community pooled the consequences of households' illness, disability or death in an efficient manner which guarantee Pareto-efficiency in the distribution of shocks. By intuition, community can pool risk via risk mitigation or reduction strategies that maximise the extra satisfaction from consumption among existing households in the village. The specification below tests for the capability of families to smoothen consumption empirically against death, disability and severe illness:

$$\Delta C_{jlt} = \alpha_1 + \alpha_2 H_{jlt} + \alpha_3 X_{jlk} + \beta \Delta C_{vt}^k + \varepsilon_{jlt} \quad (10)$$

Equation (10) entails regressing household consumption (food and non-food) changes for household j in community l , at time t against change in village level consumption ΔC_{vt}^k , health shocks (H_{jlt}) encountered by household j in period t and a vector of covariates at the family level (X_{jvt}). The composite stochastic term ε_{jlt} entails preference shifters and captures omitted and unobservable households heterogeneity, the stochastic terms are identical, has zero mean and is independently distributed. The full-insurance equation suggests thus $\beta = 1$ and $\alpha_2 = 0$, then death, disability and severe illness cannot influence growth in family consumption. It allowed the determination of whether households were vulnerable to death, disability and severe illness. According to Ravallion & Chaudhuri (1997), the hypothesis $\beta = 1$ and $\alpha_2 = 0$ yields spurious result in the sense that the estimates obtained would be too large, hence the acceptance of the hypothesis when it should actually have been rejected, this is due to the presence of village round variable in household consumption changes. Therefore, the following model is specified:

$$\Delta C_{jlt} = \alpha_1 + \alpha_2 H_{jlt} + \alpha_3 X_{jlt} + \delta + \mu_t + (\delta \times \mu_t) + \varepsilon_{jlt} \quad (11)$$

where:

δ represents community specific effects;

μ_t is the fixed time effect;

$(\delta \times \mu_t)$ is the interaction term of village-time effects;

ε_{jlt} denotes family-characteristic stochastic term, the stochastic term accounts for the hidden or omitted family peculiarity.

The study includes household level covariates (X_{jlt}) to control for cross-household heterogeneity.

The study captures changes in community consumption through the introduction of community specific effects (δ) dummy. The community specific effects prevent biased estimates that may emanate from the correlation between neglected or hidden community level features and the stochastic term. The study accounted for common shocks experienced by all the families surveyed. Interaction of time effects and community specific dummy ensures the study control for changes in village level characteristics over a period of time. Covariate shocks were controlled for as well. If community is able to insure households' consumption through the informal coping mechanism, then family consumption would not respond to changes in H_{jlt} death, disability or severe sickness of a member, once total community endowments were accounted for, $\alpha_2 = 0$. That is, if death,

disability or severe sickness were fully insured, the variation or growth of households' food and non-food expenses will be patterned after variation or growth of overall community consumption and the coefficients of village level total food and non-food expenses variables will be approximately one.

3.2.3. Coping mechanism in the face of health shocks

This subsection focuses on the chances of utilising any of the coping strategies by households when they encounter severe sickness, disability or death. Coping strategies were categorised into three groups: sales of assets, borrowing, and 'other strategies' to weather the outcomes of sickness, disability and death. A multinomial logit (equation 12) was used to explore them:

$$Cop_{it} = \alpha_1 + \alpha_2 d_2 + \alpha_3 d_3 + \beta H_{ijt} + \sum_{\tau} \gamma_{\tau} X_{ijt} + \varepsilon_{ijt} \quad (12)$$

where:

Cop_i denotes a categorical dependent variable, representing either sales of assets or borrowing, relative to the base outcome variable (coping strategies) used in financing costs of household j health care.

The regressand representing coping measures were presumed equal to 1, if a particular strategy is chosen and 0, otherwise. H_{ijt} indicates any of the measure of health shocks encountered by households. The model has X_{ijt} a set of unobservable household specific preference. ε_{ijt} is the disturbance terms representing omitted and unobservable household specific preference.

3.3. Data and data source

The study utilised survey data obtained from the Nigerian General Household Survey (GHS) developed by the National Bureau of Statistics (NBS) and World Bank. GHS survey started in 2010 with development of the first wave. It surveys about 5,000 Nigerian households that span rural and urban areas. The second wave was carried out in 2012, with the same sampled households.

It combines the two distinct components of poverty survey instruments developed by NBS. These are the Core Welfare Indicator Questionnaire (CWIQ) referred to as the Harmonized Nigeria Living Standard Survey (HNLSS) Part A and the Nigerian Living Standard survey (NLSS) otherwise known as the HNLSS Part B. The GHS was designed to provide data for socioeconomic indi-

cators such as demographics, academic qualification obtained, health, hours of work, expenditure on food and non-food consumption, family-earning activities, other sources of household income, shocks, informal coping mechanism and assets.

The sampling frame used in the GHS-panel for 2010 and 2012, comprised of 774 Local Government Areas. The GHS sample frame was constructed into replicates such that each state in Nigeria and FCT has 60 Primary Sampling Units (PSUs). A total of 2,220 Enumeration Areas (EA) were surveyed. Ten households were randomly chosen from each EA, hence a sample size of 22,200 households across the federation. The 5,000 households were randomly selected from 500 EAs to form the panel component. Meanwhile, 4,916 households completed the interviews in the first Wave. As a result of the panel structure of the survey, some households had relocated from their place of residence as at the time, the Wave 2 was conducted. This gives to discrepancy in the number of households between the two waves. Precisely, 4,716 households completed the interview during the Wave 2 visit.

General population distribution revealed that the survey comprised of 50.62% males and 49.38% females. Information on age distribution showed that the population comprised more of those in the working age. Persons aged 0 to 14 years accounted for 42.2% of the population. Individuals aged 15 to 64 years (working age population) comprised 52.5% of the populace and those aged 65 and above made up 5.1%. Area distribution of persons shows that the Nigerian population was predominantly made up of rural dwellers (74.88%). Health data provides information on the households' health history that lasted minimum of 14 days. A total of 24,849 (7.46%) individuals reported one form of the 21 illness types recorded during the survey. Persons with disability accounted for 3.07% (10,221). Households were questioned with respect to their ability to see, hear, memories and concentrate, walk, caring for oneself as well as assimilation. In aggregate, 11.45% of households were incapacitated over the study period. Overall, over a two year period, 1323 of sampled households had to deal with death.

4. Research findings/results

4.1. Effects of health shocks on households' consumption

The main interest of this subsection is to see whether households are able to smooth their food consumption in the face of health shocks. Household consumption is divided into food and non-food consumption.

4.1.1. Effects of health shocks on households' food consumption

The estimates of equation (11) are presented for the effect of health shock on household food consumption in Table 1. The dependent variable is the log of change in household food consumption.

Table 1. Effects of health shocks on food consumption

Variables	Random effect	Fixed effect	Random effect	Fixed effect	Random effect	Fixed effect
Age of household's head	-0.000812 (0.0157)	-0.250* (0.0806)	0.0284 (0.0250)	-0.410** (0.166)	-0.00259 (0.0157)	-0.231*** (0.0804)
Head's age square	-0.000297 (0.000278)	0.00322** (0.00163)	-0.0008* (0.0005)	0.00727** (0.00327)	-0.000257 (0.000276)	0.00285* (0.00164)
Head is male	0.0271 (0.158)	0.0868 (0.933)	0.377 (0.261)	0.0162 (2.214)	0.0318 (0.158)	0.255 (0.985)
Head is married	-0.358 (0.237)	1.531* (0.825)	-0.604* (0.364)	2.961 (2.761)	-0.370 (0.236)	1.586* (0.826)
Head attended primary	0.617** (0.261)	1.327 (2.916)	1.709 (1.608)	-4.536** (2.073)	0.673** (0.263)	3.214 (2.192)
Head completed sec	0.743*** (0.266)	1.239 (2.919)	1.818 (1.605)	-5.092*** (1.924)	0.842*** (0.267)	3.192 (2.208)
Head attained tertiary	0.757*** (0.262)	1.471 (2.917)	1.859 (1.605)	-5.255*** (2.001)	0.856*** (0.264)	3.401 (2.200)
Severe illness	0.429*** (0.132)	0.841*** (0.249)				
Disability			-0.0192 (0.0866)	-0.403* (0.242)		
Death					0.104 (0.0902)	-0.229 (0.227)
Observations	1,909	1,909	782	782	1,871	1,871
Number of household	1,589	1,589	704	704	1,557	1,557

Note:

***, **, * denote significance at 1%, 5%, and 10% levels, respectively, while robust standard errors are in parentheses. Dependent variable = change in per capita food expenditure.

The result shows that disability has no significant effect on food consumption for rural households, though negatively signed. Similarly, death of a household member is negatively associated with food consumption for the fixed effect model but not statistically significant. Meanwhile, the random effect model reveals a positive but insignificant relationship. On the contrary, severe illness is positively associated with food consumption and the effect is statistically significant.

4.1.2. Effect of health shocks on non-food consumption

Table 2 presents estimates of non-food consumption equation. The dependent variable is the log of the change in food consumption.

Table 2. Effects of health shocks on non-food consumption

Variables	Random effect	Fixed effect	Random effect	Random effect	Random effect	Fixed effect
Age of household's head	0.0242 (0.0281)	-0.343*** (0.0795)	0.0308 (0.0408)	-0.759*** (0.283)	0.00551 (0.0285)	-0.343*** (0.0811)
Head's age square	8.22e-05 (0.000473)	0.00607*** (0.00119)	-5.91e-05 (0.000685)	0.0148** (0.00586)	0.000440 (0.000474)	0.00615*** (0.00122)
Head is male	-0.681** (0.298)	1.295 (1.874)	-0.795* (0.463)	5.270 (4.249)	-0.795*** (0.301)	1.424 (1.825)
Head is married	-1.411*** (0.475)	-1.230 (1.639)	-0.952 (0.718)	9.611** (4.166)	-1.395*** (0.474)	-0.913 (1.605)
Head attended primary	0.610 (1.723)	5.237*** (1.212)	3.212*** (0.949)	11.07*** (3.945)	0.734 (1.687)	8.482*** (1.870)
Head completed sec	0.924 (1.725)	4.969*** (0.910)	3.412*** (0.962)	9.583*** (3.557)	1.066 (1.689)	8.331*** (1.851)
Head attained tertiary	1.093 (1.722)	4.789*** (1.050)	3.989*** (0.957)	10.06*** (3.713)	1.196 (1.686)	8.099*** (1.863)
Severe illness	1.086*** (0.227)	0.839* (0.460)				
Disability			-0.198 (0.180)	-0.154 (0.456)		
Death					-0.491** (0.198)	-1.080** (0.460)
Observations	2,183	2,183	836	836	2,135	2,135
Number of household	1,818	1,818	760	760	1,776	1,776

Note:

***, **, * denote significance at 1%, 5%, and 10% levels, respectively, while robust standard errors are in parentheses. Dependent variable = change in per capita non-food expenditure.

The result shows that non-food consumption is negatively associated with death of a household member and disability, though only the demise of a member is statistically significant in influencing non-food consumption. On the contrary, severe illness of household member is positively associated with non-food consumption and statistically significant.

4.2. Likelihood of coping strategies among Nigerian households

This sub-section explores the likelihood of using different coping mechanisms by rural households in Nigeria in the face of health shocks. Table 3 shows the regression results for different coping strategies: the likelihood of depleting assets or borrowing relative to the base outcomes (other strategies).

Table 3. Households' coping strategies in the face of health shocks

Variables	Asset Depletion	Borrowing
Age	0.999 (0.00511)	0.993 (0.00516)
Log of age square	0.999 (0.0423)	1.100** (0.0497)
Log of household size	1.684*** (0.152)	1.001 (0.0888)
Male	0.940 (0.0768)	1.121 (0.0943)
Married	1.050 (0.128)	0.922 (0.113)
Tertiary	1.001 (0.807)	0.556 (0.596)
Severe-illness	0.805 (0.114)	1.065 (0.146)
Disability	0.703 (0.151)	0.912 (0.177)
Deaths	1.091 (0.149)	0.666** (0.113)
Constant	0.121*** (0.0293)	0.200*** (0.0496)
Observations	4,150	4,150

Note:

***, **, * denote significance at 1%, 5%, and 10% levels, respectively.

The rural households were more likely to obtain credit, this increased their option in the case of death of a household member.

5. Discussion

The finding reveals that food consumption was negatively associated with death of a household member, but does not have a significant effect. The demise of household member shows a negative and insignificant relationship with food consumption. This might be the case if the dead member of the household was

neither a net contributor nor the main earner of the household. The results tend to reject the hypothesis that household cannot insure consumption against health shocks when measured as death in rural Nigeria.

Severe illness was positively associated with food consumption and the effect was statistically significant for the rural sample. The results reveal that severe illness significantly increased household food consumption by 84.1% at 1% significant level for the fixed effect model. The findings were further affirmed using the random effect model. It shows that severe illness significantly increased food consumption for the rural sample. The annual growth rate in food consumption was about 84.1% higher for the rural households. These results show that severe illness importantly increase the households' food consumption either through intra-household support or borrowing, or through the use of other coping strategies. This suggests that households were able to smoothen consumption against severe illness.

Retaining or using the same specifications for food consumption, this study examined the effects of disability of any household member. Disability was negatively associated with food consumption, but the estimated coefficients were statistically insignificant for both models. Hence, the claim of perfect consumption smoothen when confronted with disability cannot be rejected.

These results suggest the rejection of the hypothesis that households cannot smoothen food consumption against disability, death and severe illness of any household member. Therefore, overall, the results suggest that the hypothesis that the household can smoothen food consumption against health shocks could not be rejected. In other words, rural households could smoothen their consumption after facing severe illness, disability or death of any household member. This result makes sense in a setting where there was no heavy dependence upon a member or main earner of the family and where intra-households network helped pooled risk. The result was in harmony with Khan et al. (2015) that used mortality and sickness to measure health shocks in Bangladesh. However, this result contradicts the findings of Genoni (2012) and Bales (2014) in Indonesia and Vietnam, respectively, who found evidence of imperfect consumption smoothen.

The study specified the non-food consumption function for the rural households. The results show that non-food consumption expenditure was negatively related to the death of a household member. Death significantly reduced non-food consumption by 49.1%, suggesting about 49.1% reduction in total (non-food) consumption. Similarly, the estimated coefficient for the fixed effect model indicates the demise of a household member importantly diminished con-

sumption or expenditure on non-food items in the rural area. The fixed effect model shows that the demise of a family member has an inverse association with non-food expenditure and is statistically significant. It shows that death reduced non-food consumption by approximately 100%.

Severe illness was positively associated with non-food consumption, and the effect was statistically significant. Findings reveal that household non-food consumption increased by about 84% for households that reported severe illness. This result was consistent with that of the random effect model, where illness shows a significant positive effect on non-food consumption. It suggests severe illness increased rural households' non-food consumption by over 100%. The fact that households were still capable of preserving consumption that prevailed in previous period in the case of health challenges implies that there must be coping measures through which the household financed medical expenditure and smoothen consumption. Disability of any member of the household is negatively associated with non-food consumption, but not statistically different from zero, hence, no precise conclusion can be drawn. This tends to suggest that disability does not decrease household non-food consumption.

The results suggest acceptance of the hypothesis of households' capability to smoothen non-food consumption when confronted with severe illness, given that the impact on non-food consumption was positive and statistically significant. In addition, the results rejected the hypothesis of perfect consumption smoothen of non-food when a household member died. This implies consumption smoothen in the face of severe illness, but not when a household reported death of any member. The finding was compatible with work of Gertler & Gruber (2002) who measured illness shocks as activities of daily living index.

Generally, the findings indicate discrepancy in households' ability to smoothen consumption across health shock measures. Given that there was a significant decline in non-food consumption in response to death, while death shows tendency of reducing food consumption.

Severe illness and disability among rural household members were neither statistically associated with assets depletion nor borrowing, but the sign shows the likelihood of using both strategies.

Meanwhile, death of any household member in the rural area was significantly associated with borrowing. Rural households were more likely to obtain credit by patronising cooperatives and intra society network; this increased their option when a member of household died. The findings for the sample suggest that on the average, disability and severe illness of any household member were not significantly

associated with asset depletion and borrowing. This is an indication that the rural households in Nigeria did not have the resources to cope in the face of health shocks. These results suggest that borrowing is an important informal mechanism for the Nigerian households to knock down the impacts of health shocks.

Rural households seemed to effectively insure consumption against severe illness and disability, with no significant decline in consumption, and were able to increase food and non-food consumption in relation to some health shocks. Full consumption smoothening was found in some studies (Mitra et al., 2016; Lim, 2016), but as Genoni (2012) noted, the consumption effects might be hiding substantial amount of heterogeneity that could be unfolded with different disaggregation, for instance the possibility of rural households to possess greater smoothen consumption ability than urban ones (Wagstaff, 2007).

The result was also consistent with the outcome of some studies in the literature, such as Khan (2010) and Bales (2014) who found that households in Bangladesh and Vietnam were capable of preserving food and non-food against disability and death by depleting assets and borrowing respectively. Finally, Islam & Maitra (2013) concluded that households which possess credit facilities would not dispose valuables in response to health challenges and maintain consumption level.

The result of this study was suggestive of the importance of institutional developments to ensure health needs receive sufficient fund and to address the issue of coping in the face of health shocks. Without formal safety nets, access to borrowing and dissaving might be an efficient coping mechanism. This is in agreement with findings of Islam and Maitra (2013) that microfinance and lending organisations could aid households to deal with health shocks. Hence, it is necessary to develop formal credit markets accessible to low-income households in Nigeria. From a policy perspective, these results call for the development of a formal risk sharing institution to address issues of coping with health shocks and financing health care.

6. Conclusions

6.1. Summary of findings

This study is anchored on the theoretical argument that, in the presence of informal insurance institution, risk-sharing and mitigation can be achieved in a community. Therefore, household's consumption is maintained by the risk-

sharing arrangement in the community. Hence, households are not vulnerable to a health shock that is peculiar to a household. The results tend to reject the hypothesis of non-food consumption smoothing in the event of death of household member. Food consumption responds positively to severe illness of a household member, while disability was not statistically significant in reducing household's consumption. These results suggest that we can reject the hypothesis that the rural household can smooth non-food consumption against death in Nigeria. While, the rural household effectively insured consumption against severe illness and disability.

The result reveals that households that experienced death tend to borrow in order to finance health expenditure. However, borrowing money can worsen long-term poverty by affecting future income and human capital. Therefore, though the results seem to suggest a short term smoothing, there is a longer-term effect of health shocks through coping strategies like borrowing. Moreover, households may not have adequate access to a credit facility.

6.2. Research contribution

Several empirical studies on health shocks used total sample of sub-national entities in their analysis. These studies did not acknowledge the socioeconomic background as well as vulnerabilities in terms of rural and urban households. Given Nigeria's rural-urban disparity, resource distribution pattern, as well as informal solidarity arrangements, this research developed an empirical framework that separately investigated the effects of health shocks on rural households. This rural-urban household dichotomy of the analysis constituted an extension of the existing literature. This study further advanced the frontier of knowledge by investigating the strategies adopted by households to deal with health shocks.

6.3. Research implication

This study revealed that rural households in Nigeria cannot perfectly insure non-food consumption with the aid of informal coping strategy in the face of death of a member. The results also show food and non-food consumption were smoothed across severe illness. This is an indication of a rural household ability to smoothen away the impacts of severe illness. The results are in line with the

outcome of several studies. According to Bales (2014), household's non-medical consumption was not affected by health shock in Vietnam. The results of Khan (2015) also show that households in Bangladesh were able to smoothen food and non-food consumption when faced with severe illness. In contrast to our finding, death of a household member has no significant negative impact on consumption (Bales, 2014; Khan, 2015). In fact, death of an adult was found to increase with non-food consumption in Vietnam. Similarly, in India, serious illness or death of the household's head reduced consumption in the short term (Dhanaraj, 2015).

These results thus lends credence to the idea that health shocks have economic consequences on households, depending on the type of health shock.

6.4. Research limitations and future works

There is no clear framework with which to distinguish between expected and unexpected health shock episodes. Certain households may possess the right information and able to predict changes in health status. If households make provision in anticipation of unforeseen health contingencies, the estimates may overstate the capability of households to smoothen consumption against health shocks. Therefore, the knowledge of households' expectations with regards to health is important in the determination of household consumption smoothening ability.

Besides, the panel dataset used in this study contains two consecutive rounds surveyed within two years. This time frame is relatively short for examining long-term influence of health shocks on household welfare. Studies with longer panel data would go a long way in addressing the issues of expectation and endogeneity. Similarly, the use of survey data collected in 2011 and 2013 means the results may need to be interpreted with caution and policy implemented with caveat given the time lag between 2013 (data collection) and 2018 (analysis).

Further research on health shocks considering the aforementioned issues would be able to explore effects of health shocks on household's welfare more specifically and be invaluable in addressing these shortcomings.

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