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Boko Haram insurgency and livelihood vulnerability of rural households in Northern Adamawa State, Nigeria

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ABSTRACT

This study examines the vulnerability of rural households in eight selected insurgency-affected communities using the household vulnerability index with particular consideration to six main components of socio-demographics, healthcare, food security, water resources, conflicts and marketing, and access to finance as effect factors caused by Boko Haram Insurgency. Primary data used for the analysis were generated using an interview schedule among 280 household respondents in eight communities, selected using a purposive random sampling technique in July–September 2019. Livelihood Vulnerability Index (LVI) was used to analyse the data. The result showed that Gulak, Shuwa, Vih, and Lughu were the most vulnerable communities. The major components that contributed substantially to the overall LVIs were the conflict index, market, and financial index. The results have implications for adaptive and household resilient projects by the government and other humanitarian organizations for specific target interventions in the area. The insurgency has adversely affected rural households in Adamawa State, North East Nigeria. Therefore, enhancing infrastructure facilities, provision of basic amenities, access to market and finance, and improving the security architecture of the region will go a long way in addressing the plight and vulnerability of the people.

1. Introduction

The Nigerian North-East region occupies the Sudano-Sahelian-Savannah belt on the southern fringes of the Sahara Desert. The area is most affected by desertification and land degradation. Nicholson et al. (1998) described this zone as the most “ecologically unstable” in the world. The *Jama’atuahlus-sunnah lidda’awati wal Jihad* (commonly referred to as *Boko Haram*) Islamic insurgency in the region which started in 2009, has had devastating effects on the social, economic, and institutional fabrics of the region with some negative consequences on the livelihoods of the people (United Nations Development Programme-UNDP, 2017). The conflict has claimed over 20,000 lives, significantly destroyed physical infrastructure, disrupted social services, and dislocated social cohesion among the people (World Bank, 2016). With almost 2.3 million people becoming either internally displaced, refugees in other countries, or community returnees, the Boko Haram insurgency becomes the single largest cause of displacement across the Lake Chad Basin (UNHCR, 2017). This has seriously affected the already precarious lives of one of Nigeria’s least developed regions (RPCA, 2016).

Furthermore, 60 percent of the population in the region lives in rural regions (UNDP, 2016), with a poverty rate of 69 percent and a literacy rate of 28 percent (NBS, 2012). More specifically, agriculture, fisheries, and livestock provide livelihoods and food security to 80–90 percent of the population (FAO, 2016), which has already been harmed by climate change (Federal Ministry of Environment, 2014). The 2018 UNDP Nigeria/National Bureau of Statistics computed Human Development Index (HDI) at the state level, shows that Nigeria has an average HDI of 0.521 and all the North-East states have HDI scores below the national average (UNDP, 2018). The armed conflict, which has lasted for about 12 years now, is direct violence against civilians, which escalated in 2014 and resulted in the forced displacement of over 2 million people and widespread destruction of public and private infrastructure, loss of livelihoods, and denied access to essential services (UNDP, 2017; UNHCR, 2017). Overall, the *Boko Haram* insurgency depleted people’s resources in the region and exhausted their coping strategies (Cadre Harmonise, 2017). A number of pre-existing economic, social, and governance restrictions have steadily decreased individual families’ resistance and capacity to handle shocks over the previous decades,

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exacerbating the severity and scale of insurgency's impact (UNDP, 2017).

The three states of Borno, Adamawa, and Yobe (BAY states) are the worst affected in the region, with more devastating impacts predominantly in rural areas (United Nations-UN, 2017). Within Adamawa State, the northern part, consisting of Michika, Madagali, Mubi North, Mubi South, and Maiha local government areas (LGAs) are among the areas that suffered the worst devastation due to their proximity to Sambisa Forest (the hub of the insurgents). These areas were among the territories seized by the insurgents in 2014 and remained under their control for almost a year (UNDP, 2017) until 2015 when the Nigerian Military formed a robust military operation, re-strategized and overpowered the insurgents and regained the areas (UNDP, 2017). During this period, the majority of the people flee their homes to escape killing and molestation. To back up this claim, the Food and Agriculture Organization-FAO (2016) claimed that some internally displaced persons (IDPs) have been displaced repeatedly, thus every time depleting their assets and heightening their vulnerability. Within the affected communities, several lives were lost, livestock was killed and looted, houses were burnt and vandalized, businesses and social infrastructure such as the source of water supply, and electricity were damaged, and social and financial institutions like banks, schools, hospitals, police stations were severely damaged. Despite remarkable improvements in most of the LGAs following the degrading of the insurgents by the military, some communities still witness pockets of attacks which made households unable to access distance farms and continue to face significant restrictions to their livelihoods and markets (FEWSNET, 2017). Today, many households that are making their livelihoods within the ambit of the insurgency operations are weak and insecure (Dunn, 2018).

Individual and community vulnerability assessments are essential to developing a good understanding of people's vulnerability, responsiveness, and capacity to cope in preparation for specific target interventions (Marshall et al., 2009; Seppala et al., 2009; Mekonnen et al., 2019). Vulnerability assessment helps to assimilate community know-how and engage vulnerable communities in the formulation of adaptive plans that are operational and suitable to their circumstances. Studies such as (Scoones, 2009; USAID, 2014) have shown that households who could not maintain their assets during shocks are more vulnerable than households who could maintain their assets in times of such extreme events. Households often vary in terms of their demographics, socio-economics, and socio-political characteristics (Satapathy et al., 2014). Such parameters are responsible for the variations in vulnerability types and levels (Eriksen and Silvia, 2009; Hisali, Birungi, and Buyinza 2011). Considering the socio-economic perspective, according to O'Brien et al. (2004), vulnerability represents a present inability to cope with changing extreme conditions. Therefore, mitigating these perturbations requires an in-depth analysis and specification of the target group's concern. However, most studies conducted at the local, regional, and international levels have failed to account for the reality that people's exposure to risks and vulnerability differs (Coulbaly et al., 2015). This is reflected in a number of vulnerability studies that have been carried out in the North-East (FAO, 2016; UNDP, 2017; UNHCR, 2017), where they focus more on food security, displacement, immigration, and IDPs, with little attention on spatial distributions and other socio-economic parameters that informed different conditions and account for the minor details of the vulnerability, thereby finding it difficult to address the problem. The study assumed that the region's vulnerability caused by the Boko Haram insurgency varied across local and socioeconomic divides. The paper represents the analysis of a livelihood and vulnerability study conducted using empirical data from the Northern Adamawa region. The study focuses on the communities that suffered from the reparation of the Boko Haram insurgency and the accompanying effects on their socio-demographics, healthcare, food security, water resources, conflict and marketing, and access to finance to which they are vulnerable. It sets out to understand the level of vulnerability faced by individual households and communities. Apart from this section, the

remaining part of the paper proceeds with section two which presents the review of related literature on Boko Haram and vulnerability- Conceptual and theoretical frameworks, as methodology is explained in the third section; empirical results are presented and discussed in section four, while section five gives a conclusion and recommendations.

2. A review of related literature on Boko Haram and vulnerability

The West African sub-region and the Sahel have in past few decades suffered different conflicts leading to the devastation of their economic and social systems. Fogou et al. (2018) reported on how the incursions of Boko Haram affected the fragile economic base of the Northern Cameroun which sustained the three regions of North, far North, and the Central making them vulnerable. In Mali, hundreds of thousands of people have been displaced, making the refugees within and outside their countries following the terrorist activities of the different groups coupled with the hostilities between them and government forces (Akanji, 2019). As far back as 2013, about 377,000 people had been displaced (Daniel, 2013). Equally, the activities of the terrorist disrupted farming activities and the distribution of food by aid agencies leading to food shortages (Arief, 2013). In Nigeria, activities of the Boko Haram insurgency have led to the loss of lives and properties, displacement of people, and loss of the source of livelihood with about 38, 683 lives lost to Boko Haram insurgency, 2.5 million people displaced, about 244, 000 turned refugees, an estimated 952, 029 children made to drop out of school, forcing approximately 1.5 million people to flee their homes for fear of safety and brandishing the northeast with 60 percent i.e. 6.3 million, of the 10.5 million out-of-school children in Nigeria (Abiodun et al., 2020; Shola, 2020).

2.1. The concept of vulnerability

Across disciplines, the meaning of "vulnerability" as a concept has been vague due to its broadness (Gallop, 2006; USAID, 2014). Vulnerability is commonly seen to be made up of three elements: exposure to perturbations or external stresses, sensitivity to perturbations, and adaptability (Makondo et al., 2014). According to Cogswell, Blair, and Greenan, (2018), Vulnerability comprises a wide range of notions and components, notably sensitivity to stress and a lack of ability to effectively deal with situations. However, of the various existing concepts, no single definition has been universally agreed upon (Naihani, Champati, & Joshi, 2019). The vulnerability has been referred to as shocks, trends, and seasonality that affect the livelihoods of people (Scoones, 2009). It can also be defined as the probability that a system, sub-system, or aspect of a system will be harmed as a result of exposure to a hazard, such as a disturbance or shock (Turner et al., 2003). Vulnerability, according to Birkmann (2006), is a person's or a group's inability to handle, and mitigate the effects of natural or man-made hazards.

Vulnerability has emerged as a key notion in the design, evaluation, and direction of programs in recent years (USAID, 2014; Sujakha et al., 2018). Approaches to studying vulnerability are based on a variety of disciplines, including anthropology, sociology, climate science, and sustainable lifestyles (Adger, 2006; Gallop, 2006; IPCC, 2014). Generally, vulnerability assessment describes a diverse set of methods used to systematically integrate and examine interactions between humans and their physical and social surroundings (Hahn, et al., 2009; Zhang, 2016). For instance, Sujakha et al. (2018) used a composite livelihood vulnerability index, Naihani, Champati, and Joshi (2019) used an indicator-based approach for comparative vulnerability assessment at the village level. According to reports, for more than 20 years, specialists have placed a heavier premium on the multidimensionality of vulnerability, employing a range of measures to capture the ideas' complexity (USAID, 2014). This may be related to the fact that risk and vulnerability are likely to be perceived things in different ways at the

community, family, and individual levels considering some characteristics such as life stage, social group position, and geographic location, among others (Holmes et al., 2012).

Vulnerability, as defined by Bogale, Taeb, and Endo (2006), represents the probability of sliding, or maintaining, below a pre-determined threshold in the future. Because seasonal occurrences or unforeseen situations force them to fall below the threshold, vulnerable people are especially susceptible to shocks because their capacity to cope with a shock is limited (Bogale, Taeb, & Endo, 2006). The livelihood vulnerability index (LVI) was used to assess the vulnerability of insurgency-affected communities in Northern Adamawa State, North-east Nigeria. Hahn, Riederer, and Foster created the index that was employed in the study (2009). Several factors are included in the LVI technique to capture the level of household insurgent exposure. The score is calculated using primary data from eight communities and six components: social-demographics, healthcare, food security, water resources, conflicts and marketing, and access to finance.

2.2. Theoretical framework

This paper draws some insights from Fineman's vulnerability theory, precisely on the general approach to vulnerability, which provides a central anchor for our analysis of LVIs. Fireman's vulnerability theory is premised on an understanding of human conditions as one of universal and constant vulnerability (Fineman, 2008). According to the theory, as human beings, our embodied state leaves us susceptible to continuous change in our well-being and our embeddedness in social institutions and arrangements and the nature and operations of those institutions enable us to vary degrees to build and exercise resilience. Zakour and Swager (2018) asserted that in the progression to vulnerability root social causes interact with dynamic/structural processes to create unsafe conditions. Several studies have relied on this theory to explain human conditions in different vulnerable situations. For instance, in a study on vulnerability and disability focusing on inclusion and citizenship, Lid (2015) adopted Fineman's vulnerability theory. Similarly, vulnerability theory was used by Albertson (2017) to relate Vulnerability and inevitable inequality, while Olanrewaju et al. (2019) studied Insurgency and the invisible displaced population in Nigeria. Equally, Heikkilä et al. (2020) and Dehaghani (2021) adopted the same theory in their studies of disability and suspects in police custody respectively. From these findings, it can be inferred that the vulnerable approach captures the idea that human reality contains a diverse spectrum of interrelated and varying skills throughout a lifetime. This suggests that people are subject to both a "weakening of coping systems" and a "simultaneous increase in threats." In other words, human beings live in a society that is precarious and always vulnerable to internal collapse, disintegration, and other harmful external forces. To contextualize this assertion to the study context, the Boko-Haram insurgency has made all the affected communities vulnerable based on a number of indices of human wellbeing. The activities of the insurgency and counter-action from the government forces have simultaneously affected the livelihoods of the people in the area, and the coping mechanism that could be used to improve the livelihood is being weakened sustainably by the insurgency. It can be deduced that people in our study areas left their homes and sources of livelihood and became internally displaced for safety. Now with the relative calmness following a concerted effort by the government in restoring peace to the areas and re-integration people into their communities, the people are back but with varying degrees of vulnerability following the distortions in their social fabrics and infrastructure facilities, and household assets. This is reflected in the individual households and community differentials in the LVIs analysis. According to Virendra (2012), people became vulnerable if access to resources either at a household or at an individual level is the most critical factor in achieving a secure livelihood or recovering effectively from a disaster.

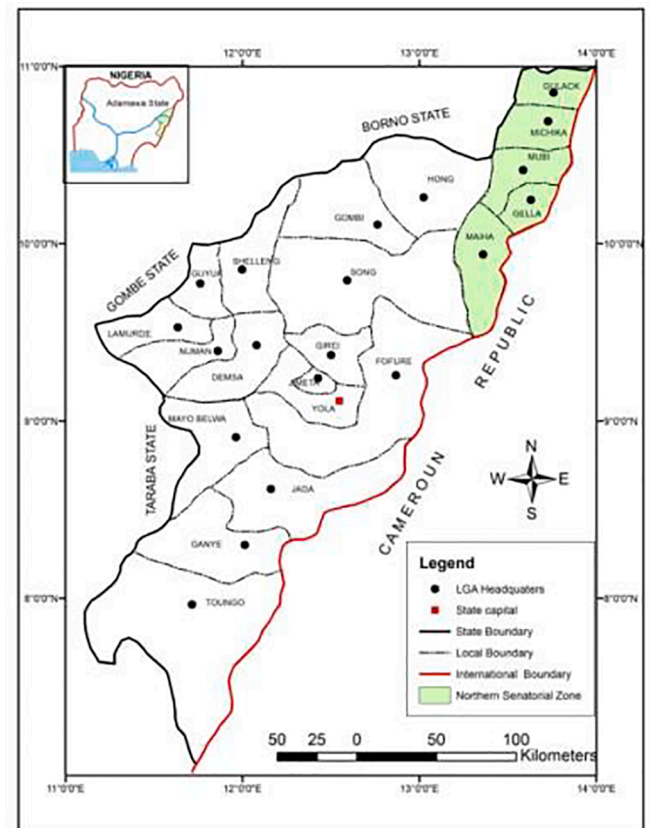


Fig. 1. Map of Adamawa State Showing Northern Senatorial Zone (Source: GIS laboratory department of geography, MAUTECH, Yola 2020).

3. Methodology

3.1. Study area

The research was carried out in Adamawa State, Nigeria's northeast (Fig. 1). The state is located between the equator's latitudes of 7° 15' and 10° 58'N, and the Greenwich meridian's longitudes of 11° 09' and 13° 47'E. It has a land area of around 39,972.3 km² (Adebayo, Tukur, and Zemba, 2020). According to the 2006 census, Adamawa State has a population of 4,504,337 people (NPC, 2006). The climate in the area is tropical, with high temperatures and humidity, as well as distinct rainy and dry seasons. The state is bordered on the south and west by Taraba State, on the northwest by Gombe State, and on the north by Borno State. Along its eastern border, the state has an international border with the Republic of Cameroon. Topographically, the area is a mountainous land crossed by large river valleys, particularly, Benue, Gongola, and Yedarem (Adebayo, Tukur, and Zemba, 2020). Specifically, the study centered on the northern part of Adamawa State based on the magnitude of insurgency activities. The northern part consists of five Local Government Areas (LGAs); Madagali, Michika, Maiha, Mubi North, and Mubi South with a population of 1.5 m and a land mass of 4343 km². The major tribes in the area are Michika, Marghi, Gude, Fali, Fulani, and Njai among others. This is an indication of a poly-ethnic composition, but with lots of commonalities in terms of culture, norms, and values. Prior to the emergence of the Boko Haram insurgency in 2009, the area enjoyed relative peace and prosperous economic activities at the local level occasioned by their strong traditional institutions, ties, and beliefs. The people are mostly farmers but often diversified into other portfolios such as fishing, trading, livestock rearing, etc. However, they generally suffered inadequacy of some basic infrastructure such as electricity, potable water supply, etc. which hampered their well-being.

3.2. Data collection and approach

This study relies on primary data obtained through scheduled interviews with 280 households in Adamawa State's northern region between July and September of this year. The selection of the local government areas (LGAs) viz-a-viz the communities was based on the confirmation of previous attacks and their absence, and relative accessibility at the time of the study, as gathered during the pre-survey consultation at the LGAs. The respondents were chosen using a two-step purposive random sampling process. In the first step, four of Northern Adamawa's five LGAs were purposefully chosen based on the insurgency's impact, namely: Michika, Madagali, Mubi North, and Mubi South. In the second step, two communities from each of the four LGAs were again purposively selected based on the magnitude of attack by the insurgency viz from Madagali (Shuwa and Gulak), Michika (Lughu and Vih), Mubi North (Muchala and Vimtim) and Mubi South (Gude and Monduva). Finally, from each community 35 households were selected at random, making a total of 280 respondents. The uniformity in the number of respondents per community was informed by the instability of the population in the selected communities to warrant stratification, and the figure represents at least 10 % of the households in each of the communities, which is statistically allowed in social sciences (Smith, 2015). Respondents' households were asked close-ended questions covering the seven components of vulnerability captured in the study.

3.3. Methods of data analysis

The study's communities were assessed using the Livelihood Vulnerability Index (LVI). The composite index approach as used by Hahn et al. (2009) and Ahsan and Warner (2014) was adopted for the computation of the LVI. It was scaled from 0 (least vulnerable) to 1 (most vulnerable). The index was composed of six components, namely; Social-Demographics (SD), Healthcare (HC), Food Security (FS), Water Resources (WR), Conflicts (CS), and Marketing and Access to Finance (MAF). The variables fit and traverse the households in the communities affected by insurgency in northern Adamawa. These components are the key human well-being indicators that influence livelihood in the area. Agriculture is the mainstay of about 80 % of the inhabitants of Adamawa state (FAO, 2019). Equally, submissions made by World Bank (2015), UNDP (2018), and Brechenmacher (2019) indicated how human capital development was affected by the insurgency, and the key indices in the study were Social-Demographics (SD), Healthcare (HC), Water Resources (WR), Conflicts (CS), and Marketing and Access to Finance. In the same vein, Food Security (FS) is a prominent outcome of livelihood well-being in the area (FAO, 2016; Adewuyi & Michael, 2020). The standardization of the components was done based on an algorithm adapted from the UNDP's (2015) human development report's dimension index, which considered component ratios, a pre-determined minimum and maximum, as well as the range of their pre-determined minimum and maximum values:

$$Index_{sd} = \frac{S_d - S_{min}}{S_{max} - S_{min}} \quad (1)$$

With S_d being the original sub-component for each local government area (LGA) surveyed (d), and S_{max} and S_{min} are the maximum and minimum values for each sub-component obtained from values of each local government area. Following the standardization of the components, the means were estimated to obtain values for the major component using:

$$M_d = \frac{\sum_{i=1}^n index_{s_{di}}}{n} \quad (2)$$

M_d represents one of the six major components in each Local Government, Social-Demographics (SD), Healthcare (HC), Food Security (FS), Water Resources (WR), Conflicts (CS), Marketing and Access to Finance (MAF)], $index_{s_{di}}$ is successive sub-components making up the major

Table 1

Description of Components of Livelihood Vulnerability Index in Northern Adamawa State Source: Developed by Authors.

Main Components	Sub-components
Social-Demographics	Average age of HHs Dependency ratio Percentage of female headed HHs Percentage of HHs with no formal education Percentage of HHs that have farming as primary occupation Percentage of HHs that do not belong to any association Percentage of HHs that received/given help (in kind) from other families
Healthcare	Percentage of HHs that have access to any health care facility Percentage of HHs with member who suffers from chronic illness Percentage of HHs that cannot afford health services
Food Security	Percentage of HHs that have to buy food for consumption Percentage of HHs that do not store/reserve food Percentage of HHs that do not store/reserve seed for cultivation the next season Percentage of HHs whose farm output cannot adequately sustain their families
Water Resources	Percentage of HHs that do not have access to portable drinking water Percentage of HHs that do not store water Percentage of HHs that have experienced water shortage Percentage of HHs that do not practice irrigation
Conflicts	Percentage of HHs that have noticed reduced number of schools and school enrolment/attendance Percentage of HHs that have noticed reduced in number of manpower in schools Percentage of HHs that have reduced farming activities Percentage of HHs that have reduced herding activities Percentage of HHs that have lost family member (s) Percentage of HHs that currently live in fear of insurgents
Marketing and Access to Finance	Percentage of HHs that have noticed reduced number of buyers coming to the town Percentage of HHs that have noticed reduced number of suppliers of commodities to the town Percentage of HHs that have noticed restricted transportation activities in the area Percentage of HHs that have noticed reduced number of financial institutions and services Percentage of HHs that have noticed reduced access to financial services Percentage of HHs that borrow money from other families

component and n is the number of sub-components that make the major component.

Upon obtaining the values for the seven major components for the local government, a mean was derived using the following equation to obtain the Local Government level LVI:

$$LVI_d = \frac{\sum_{i=1}^6 w_{M_i} M_{di}}{\sum_{i=1}^6 w_{M_i}} \quad (3)$$

Expanding this equation, gave:

$$LVI = \frac{w_{SD}SD_d + w_{HC}HC_d + w_{FS}FS_d + w_{WR}WR_d + w_{CS}CS_d + w_{MAF}MAF_d}{W_{NDCV} + W_{SD} + W_{HC} + W_{FS} + W_{WR} + W_{CS} + W_{MAF}} \quad (4)$$

Defining the term, LVI_d = livelihood vulnerability index for LGA d , and it is the mean weight of the seven listed components. Weights of

Table 2

Distribution of the Social-Demographics LVIs of the Communities Areas.

LGA	Madagali		Michika		Mubi North		Mubi South	
Selected Communities	Shuwa	Gulak	Lughu	Vih	Muchala	Vimtim	Gude	Monduva
<i>(Sub-Components)</i>								
Age of HHs	1.00	1.29	0.79	0.27	0.46	0.00	0.59	0.75
Dependency ratio	0.43	0.61	0.00	0.04	0.43	0.31	0.04	0.37
Female headed HHs	0.22	0.16	0.19	0.13	0.00	0.01	0.03	0.06
HHs with no formal education	0.08	0.12	0.00	0.17	0.17	0.04	0.08	0.13
HHs that have farming as primary occupation	0.64	0.58	0.77	0.73	0.14	0.06	0.00	0.52
HHs that do not belong to any association	0.30	0.30	0.00	0.40	0.15	0.35	0.50	0.25
HHs that received/given help (in kind) to other families	0.05	0.08	0.01	0.09	0.00	0.04	0.02	0.01
Social-Demographics Index	0.39	0.45	0.25	0.26	0.19	0.12	0.18	0.30

Source: Field Survey, 2019. HH- Household.

Table 3

Distribution of the Healthcare LVIs of the Communities Areas.

LGA	Madagali		Michika		Mubi North		Mubi South	
Selected Communities	Shuwa	Gulak	Lughu	Vih	Muchala	Vimtim	Gude	Monduva
<i>(Sub-Components)</i>								
HH that have access to any health care facility	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00
HHs that with member who suffers from chronic illness	0.11	0.11	0.00	0.02	0.11	0.07	0.07	0.08
HHs that cannot afford health services	0.08	0.10	0.06	0.03	0.09	0.00	0.14	0.01
Healthcare Index	0.06	0.09	0.02	0.02	0.07	0.02	0.07	0.03

Source: Field Survey, 2019 HH- Household.

each component (W_{Mi}) was determined using the number of sub-components within the major component as shown in Table 1.

4. Results and discussion

4.1 Livelihood vulnerability of the respondents

The LVI for each of the LGA is presented in Table 2 while the major components' index is presented in Table 3. The first major component was the social demographics component consisted of seven sub-components, and when the results of the sub-components were aggregated, Shuwa and Gulak in Madagali LGA, were found to be more vulnerable with 0.39 and 0.45 index respectively, while Vimtim (Mubi North) and Gude (Mubi South) were found to be less vulnerable with index of 0.12 and 0.18 respectively. Some of the parameters considered include age of the household head and whether or not is headed by a female, the dependency ratio, educational level, remittances etc. The effects of vulnerability are generally more on households with less capital assets. For instance, households with aged household head, high dependency ratio and female headed household are likely to be less productive. Rather, this, will further subject the household to low income and food insecurity thereby lowering their adaptive capacity, which make them more vulnerable (Hadley et al., 2011). Agriculture can be negatively impacted by conflict and insurgency in a number of ways. It can sabotage the flow of inputs and outputs, shock prices, and result in significant worker displacement. Additionally, despite the fact that farm

settlements have historically been destroyed by insurgency, people who survived the attacks have abandoned their farms and relocated to areas that are relatively safer (Jelilov et al., 2018). Again, due to location disadvantages of communities in Madagali and Michika the households have low literacy level and mostly not affiliated to any farmers' group or association. This, to a greater extent inhibits them from accessing relevant and improved farming technologies and good agricultural practices that will enhance their productivity, thereby making their adaptive capacity low and hence vulnerable.

The aggregate results of the second major component (Health care) showed that Lughu, Vih and Vimtim were less vulnerable with 0.02 index each compared to Gulak with 0.09. This is as a result of poor access to medical health facilities and suffering from certain ailments, yet no financial capabilities (Table 3). This might not be unconnected with the social formation of the area, particularly considering the involvement of Gulak youth in the insurgency activities, which made it easier for them to destroy the health facilities. On the other hand, Lughu, Vih and Vimtim are closed to Mubi, the second largest town in Adamawa with relatively good number of health facilities which the neighbouring communities always access. Overall, the communities' Healthcare Index shows that all the communities were relatively less vulnerable in this regard. At the peak of the insurgents' attacks, most of the health facilities in these communities were affected. However, as part of the rebuilding and reintegration process, government and NGOs have provided most of these facilities to the communities which improve their accessibility. Access to health facilities tends to improve the health

Table 4

Distribution of the Food Security LVIs of the Communities Areas.

LGA	Madagali		Michika		Mubi North		Mubi South	
Selected Communities	Shuwa	Gulak	Lughu	Vih	Muchala	Vimtim	Gude	Monduva
<i>(Sub-Components)</i>								
HHs that have to buy food for consumption	0.38	0.41	0.26	0.28	0.00	0.36	0.33	0.22
HHs that do not store/reserve food	0.37	0.35	0.25	0.24	0.00	0.22	0.03	0.13
HHs that do not store/reserve seed for cultivation the next season	0.31	0.37	0.17	0.21	0.00	0.15	0.04	0.14
HHs whose farm output cannot adequately sustain their families	0.37	0.41	0.17	0.23	0.00	0.15	0.17	0.21
Food Security Index	0.36	0.39	0.21	0.24	0.00	0.22	0.15	0.18

Source: Field Survey, 2019 HH- Household.

Table 5

Distribution of the Water Resources LVIs of the Communities Areas.

LGA	Madagali		Michika		Mubi North		Mubi South	
Selected Communities	Shuwa	Gulak	Lughu	Vih	Muchala	Vimtim	Gude	Monduva
<i>(Sub-Components)</i>								
HHs that do not have access to portable drinking water	0.06	0.13	0.00	0.04	0.02	0.01	0.03	0.00
HHs that do not store water	0.07	0.14	0.02	0.03	0.00	0.02	0.00	0.02
HHs that have experienced water shortage	0.02	0.21	0.05	0.04	0.00	0.02	0.00	0.01
HHs that do not practice irrigation	0.53	1.00	0.70	0.69	0.00	0.33	0.28	0.69
Water Resources Index	0.17	0.37	0.19	0.20	0.01	0.09	0.08	0.18

Source: Field Survey, 2019 HH- Household.

Table 6

Distribution of the Conflicts LVIs of the Communities Areas.

LGA	Madagali		Michika		Mubi North		Mubi South	
Selected Communities	Shuwa	Gulak	Lughu	Vih	Muchala	Vimtim	Gude	Monduva
<i>(Sub-Components)</i>								
HHs that have noticed reduced number of schools and school enrolment/attendance	0.81	0.85	0.05	0.20	0.01	0.05	0.10	0.00
HHs that have noticed reduced the number of manpower in schools	0.85	0.87	0.26	0.20	0.09	0.19	0.00	0.08
HHs that have reduced farming activities	1.00	1.00	0.87	0.00	0.50	0.16	0.36	0.38
HHs that have reduced herding activities	1.00	1.00	0.58	0.60	0.20	0.13	0.00	0.14
HHs that have lost family member (s)	0.21	0.47	0.09	0.14	0.00	0.01	0.00	0.00
HHs that have currently lived in fear of insurgents	1.00	1.00	0.55	0.69	0.12	0.37	0.28	0.00
Conflicts Index	0.81	0.86	0.40	0.30	0.15	0.15	0.13	0.10

Source: Field Survey, 2019 HH- Household.

status thereby making the people less vulnerable.

Food security which consisted of four sub-components, served as the third major component as shown in Table 4. The Boko haram insurgency in the Northeast has had an impact on households' nutritional status primarily because staple foods were inadequate throughout the insurgency, daily food consumption declined, and the quality of the staple foods that were available (Otovwu et al., 2022). Similarly, there was geometric increase in cost of food prices and inability to access their farms and carry out their daily farming activities (Tari et al., 2016). In this study, after the summation of the outcomes of all the sub-components, Shuwa and Gulak in Madagali LGA were found to be more vulnerable with 0.36 and 0.39 respectively while Muchala in Mubi North was the less vulnerable. The parameters considered for vulnerability for food insecurity include household that have to buy food for consumption, those without reserve and those with output that cannot adequately sustain the family. Spatially, Shuwa and Gulak shared border with the hub of *Boko Haram* (Sambisa Forest), which provides an incentives and accessibility to insurgents and thereby made the communities to still suffer some incessant and intermittent attacks. Again, these constant threats by the insurgents had already instilled fear into the people, thereby limiting their access, particularly to far distant farms, which are often more productive, thereby making them vulnerable to food insecurity. On the other hand, Muchala is one of the communities in the zone that was less attacked by the insurgents and still not facing any such threats. Therefore, they are undertaking their farming activities as

usual, which make them less vulnerable. Generally, improved in crop yield guarantees food security and thereby decrease the communities' vulnerability to food insecurity.

Water resources is critical to human existence, this forms the fourth major component of the vulnerability index of the study as indicated in Table 5. This is because in the whole northeast Nigeria, more extreme heat and decreasing precipitation are leading to desertification (King, 2017). This challenge was compounded by the insecurity caused by the Boko-Haram insurgency due to the destruction of water infrastructure. In this component in this study consisted of four sub-components which include not having access to portable drinking water, water storage, experience water shortage, and not practicing irrigation. After the summation of the outcomes of all the sub-components, Shuwa and Gulak in Madagali LGA were found to be more vulnerable with 0.81 and 0.86 index respectively. On the other hand, Gude and Monduva in Mubi South LGA were found to be less vulnerable with index of 0.13 and 0.01 respectively. Again, looking at the location of the two communities it can be inferred that closeness of Shuwa and Gulak to the hub of *Boko Haram* (Sambisa forest), which presents certain level of threats is responsible for denial of the community members access to source of water, mostly from the river and streams, as water supply from tap was never available in the area. Contrast to that, Gude and Moduwa are closed to Mubi, where they suffer less security threat thereby having access to water, making them less vulnerable.

Conflicts was assessed as the fifth major component consisting of six

Table 7

Distribution of the Marketing and Access to Finance LVIs of the Communities Areas.

LGA	Madagali		Michika		Mubi North		Mubi South	
Selected Communities	Shuwa	Gulak	Lughu	Vih	Muchala	Vimtim	Gude	Monduva
<i>(Sub-Components)</i>								
Noticed reduced number of buyers coming to the town	1.00	1.00	0.93	0.95	0.37	0.23	0.00	0.23
Noticed restricted transportation activities in the area	1.00	1.00	0.91	0.94	0.35	0.35	0.00	0.07
Noticed reduced number of suppliers of commodities to the town	1.00	1.00	1.00	1.00	0.07	0.00	0.33	0.55
Noticed reduced number of financial institutions and services	1.00	1.00	1.00	1.00	0.00	0.07	0.01	0.00
Noticed reduced access to financial services	1.00	1.00	1.00	1.00	0.06	0.13	0.07	0.00
HHs that borrow money from other families	0.11	0.18	0.06	0.13	0.04	0.00	0.14	0.09
Marketing and Access to Finance Index	0.85	0.86	0.82	0.84	0.15	0.13	0.09	0.16

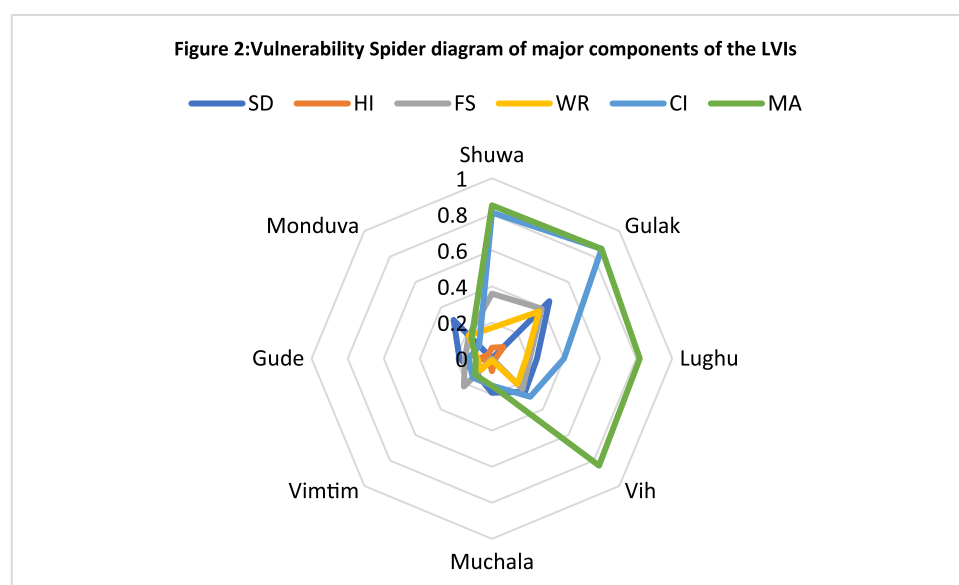
Source: Field Survey, 2019 HH- Household.

Table 8

Component Means and LVI for all the Local Government Areas.

Components	Shuwa	Gulak	Lughu	Vih	Muchala	Vimtim	Gude	Monduva
Social-Demographics Index	0.39	0.45	0.25	0.26	0.19	0.12	0.18	0.30
Healthcare Index	0.06	0.09	0.02	0.02	0.07	0.02	0.07	0.03
Food Security Index	0.36	0.39	0.21	0.24	0.00	0.22	0.15	0.18
Water Resources Index	0.17	0.37	0.19	0.20	0.01	0.09	0.08	0.18
Conflicts Index	0.81	0.86	0.40	0.30	0.15	0.15	0.13	0.10
Marketing and Access to Finance Index	0.85	0.86	0.82	0.84	0.15	0.13	0.09	0.16
LVI	0.45	0.50	0.32	0.31	0.10	0.12	0.12	0.16

Source: Field Survey, 2019.

**Fig. 2.** Vulnerability Spider diagram of major components of the LVIs.

subcomponents as presented in Table 6. This component assessed the direct physical effect of the conflict on households in the study area. The aggregate results of the sub-components revealed that Shuwa and Gulak in Madagali LGA were found to be more vulnerable with index of 0.81 and 0.86 respectively. While Muchala and Vimtim, (Mubi North) Gude and Monduva (Mubi South) were found to be less vulnerable with indexes of 0.15, 0.15, 0.13 and 0.10 respectively. This is glaring owing to the fact that communities that shared borders with *Sambisa* forest suffered most of the killings and still live in fear of attacks by the insurgents. The *Sambisa* forest has been used by Boko Haram as a haven and staging area for many years (Ezugwu et al., 2019). Communities around Mubi, where presence of military and other security operatives are visible eminent, enjoyed relative peace with normal economic activities taking place on regular basis, thereby making them less vulnerable.

The primary livelihood activity of most of the people of the study area is farming, and the outputs are traded in markets within and outside the region. Similarly, financing is key to enhancing marketing activities. Hence, marketing and access to finance form the sixth major component of LVI in this study. It is comprised of six sub-components these include reduction in number of buyers, restrictions in transportation, reduction in number of financial institutions etc. After the summation of the outcomes of all the sub-components, Shuwa, Gulak in Madagali LGA, Lughu and Vih in Michika LGA were found to be more vulnerable with 0.85, 0.86, 0.82 and 0.84 index respectively. In the same vein, Muchala, Vimtim, (Mubi North) Gude and Monduva (Mubi South) were found to be less vulnerable with indexes of 0.15, 0.13, 0.09 and 0.16 respectively (Table 7). The pockets of insurgents' activities in Madagali and Michika still remain an impediment to access to market and finance in the area thereby making them vulnerable. The relative security and absence of

attacks in both Mubi North and South LGAs made the communities to have access to markets and finance thereby less vulnerable.

The overall livelihood vulnerability Indices for the communities is summarized in Table 8 and further depicted in Fig. 2. The vulnerability spider (Rader) showed both the overall LVI per community and the index of the specific components which ranges between 0 (least vulnerable) to 1 (extremely vulnerable). The results depict that Shuwa, Gulak, Lughu and Vih, were the most vulnerable communities in the study area. The results for the rural areas were as follows: 0.45, 0.50, 0.32, and 0.31 for Gulak, Shuwa, Vih, and Lughu respectively. Similarly, livelihood vulnerability was least in Muchala, Vimtim, Gude and Monduva. The indices were 0.10, 0.12, 0.12, and 0.16 respectively. Market and access to finance, conflicts, and water resources are the most important factors that contribute to vulnerability. This implies that different factors contribute to household vulnerabilities and the effects vary community wise.

5. Conclusion and recommendations

The study analysed vulnerability in Boko Haram insurgency affected communities in Adamawa State, North-East, Nigeria, using livelihood vulnerability index. Understanding the differential vulnerabilities among the communities will promote integration and inclusiveness which are critical in building household resilience to the impact of insurgency. It was deduced from the results of this study that vulnerability cut-across the entire communities. However, the most prominent aspects of vulnerabilities were in terms of socio-demographic features, food security, water resources, and marketing and access to finance. Therefore, enhancing infrastructure facilities, provision of basic

amenities, access to market and finance and improving the security architecture of the region will go a long way in addressing the plight and vulnerability of the people. Government and non-governmental organisations should lead the process of providing the aforementioned infrastructure through their re-integration and stabilisation programmes. Meanwhile, the community self-help efforts is expected to compliment and solidify the programmes thereby ensuring community and households resilience against vulnerability and at the long run foster growth and sustainability in the state and the region overall.

CRedit authorship contribution statement

A.A. Tafida: Conceptualization, Methodology, Investigation, Data curation, Formal analysis, Writing – original draft. **A.L. Tukur:** Conceptualization, Writing – original draft. **E.F. Adebayo:** Data curation, Formal analysis, Writing – review & editing. **A.A. Ndaghu:** Writing – original draft, Writing – review & editing. **J.I. Onu:** Data curation, Writing – review & editing. **J.A. Momodu:** Data curation, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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