Health and Demographic Surveillance System: A Potential Tool for Solving Challenges Associated with Epidemic Surveillance and Social Protection Scheme for COVID-19 Pandemic Response in Nigeria

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Abstract

Nigeria recorded her first case of COVID 19 in Lagos State on 27th February 2019, and the number of confirmed cases of COVID 19 has risen to 59 287, with 1113 deaths as of 4th October 2020. The commentary highlighted the importance of a health and demographic surveillance system (HDSS) and its potential in addressing surveillance gap, and the inadequacy of existing sociodemographic database used for palliative administration. The authors examined the HDSS in the context of the COVID-19 pandemic response and learning from the Nahuche model. The Nahuche HDSS model has the potential of identifying poor households as it collects standard data on the socio-economic status of each of the households within the demographic surveillance area (DSA). Standard questionnaire in assessing the household socio-economic status adapted from standard surveys, such as Nigeria Health and Demographic Survey and Malaria Indicator Survey, was administered on the household heads of each household every 2 years to monitor socio-economic advancement of the households. Data on variables such as household possessions, including animals and livestock, were collected and analyzed using factor analysis to group the households into different wealth indices. HDSS provides an opportunity to ameliorate the challenges associated with halting the spread of the virus in the areas of surveillance and administration of palliatives in Nigeria, where there is a paucity of reliable demographic and household-level socio-economic data. This paper calls for the setting up of a functioning HDSS in each region of Nigeria to address the dearth of reliable data for planning health and socio-economic interventions.

Keywords

SARS-CoV-2, epidemic surveillance, social palliative, health and demography, Nigeria

Background

The emergence of SARS-CoV-2 (i.e., pathogen causing COVID-19) in December 2019,[1,2] has enormous consequences on the economy and population health across the globe. The effects on the existing sub-optimally performing health care systems in most developing countries cannot be ignored. The cost of the COVID-19 pandemic varies across countries and economies but disproportionately affects the low-and-middle-income countries (LMICs). The fact that the virus spreads fast and that the knowledge about its biology, clinical features, and epidemiology of the disease is still evolving suggests that the COVID-19 war is far from being won the world over.

Nigeria recorded her first case of COVID-19 in Lagos State on the 27th February 2020, and 7 months after, the number of confirmed cases of COVID-19 has risen to

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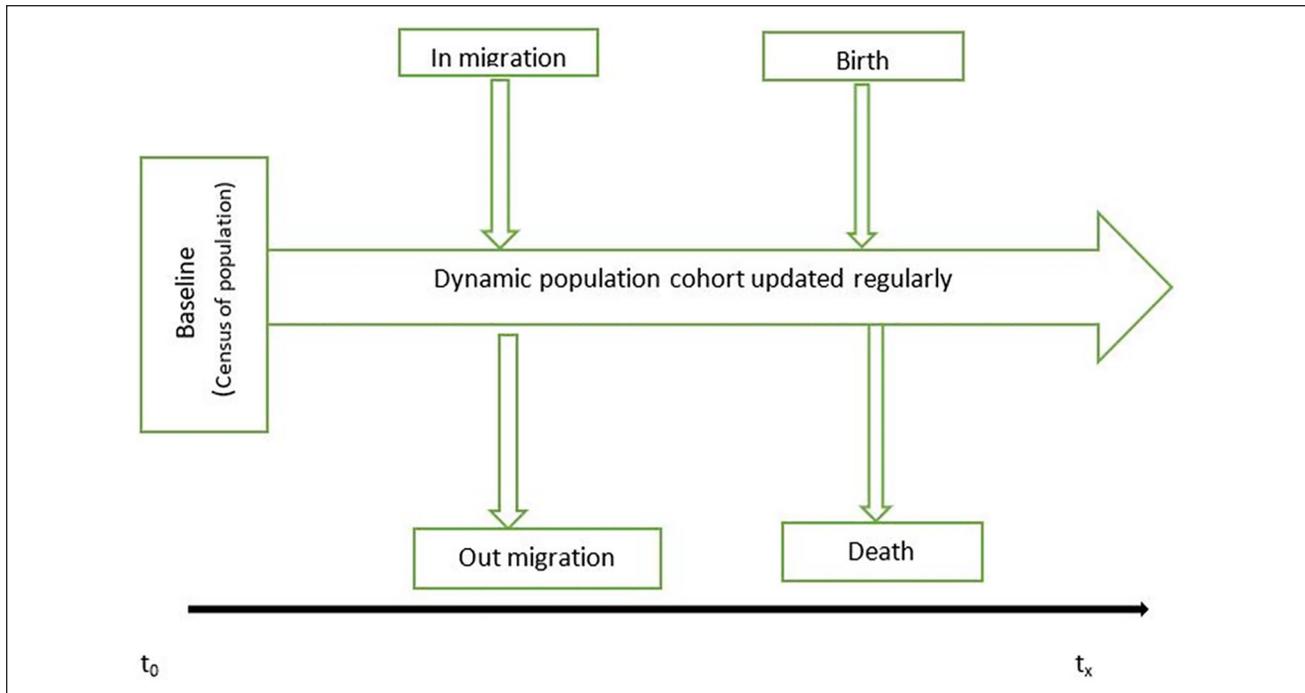Email: omolekes@who.int

Figure 1. The structure of a health and demographic surveillance system (adapted from Ye et al., 2012).

59 287 with 1113 deaths (1.9% case fatality rate) as of 3rd October, 2020.[3] These figures may likely increase exponentially since there is no evidence of either traditional or orthodox cure or an approved vaccine. Since its emergence in Nigeria, COVID-19 has raised many questions on Nigeria's fragile health system, government emergency preparedness, adequacy of social incentives to boost citizens' coping strategy, and adequacy of existing demographic and social databases. For instance, one of the most questioned issues since its emergence is in the area of palliative disbursement to the "poor" citizens. Citizens have raised questions on the quality and validity of the database used to generate the list of poor citizens for the disbursement of the COVID-19 palliatives. Consequently, the Ministry of Humanitarian Affairs, Disaster Management and Social Development has been heavily criticised, apart from the Nigeria Center for Disease Control (NCDC) in this ongoing battle against COVID 19 pandemic.

Besides protective personal equipment shortage (PPE), the non-disclosure of travel history by suspected COVID-19 patients to the frontline health practitioners is one of the risk factors responsible for the surge in frontline health workers' infections and deaths in Nigeria. The non-disclosure, coupled with a weak system for contact tracing, is a significant challenge identified as militating against reducing the spread of the dreaded virus.

Health and demographic surveillance system (HDSS) with its core objective of continuous enumeration of births, deaths, and migration—and the capacity to determine the probable cause of deaths through Verbal Autopsy (VA) data collection is a possible response to address part of the challenges mentioned.

Therefore, the paper aims to highlight the importance of a health and demographic surveillance system and its potential in addressing these challenges, especially the issue of quality and valid database for palliative such as food items and household cash transfers —disbursement in strengthening the coping strategies of the citizen in the face of the COVID-19 pandemic. Therefore, the paper is timely and relevant as it provides policy direction toward addressing the challenges of identification of at-risk population, contact tracing, and valid database for palliative disbursement.

Description of Health and Demographic Surveillance System (HDSS) Model

Health and Demographic Surveillance System provides detailed longitudinal sociodemographic and health data to detect new health threats (through periodic health surveillance and link to the health facilities attendance records), track population changes, and assess policy interventions.[5] The surveillance system monitors the health and demographic events and their dynamics among a defined population. The core HDSS events include births, deaths, and migration. Other modules collected under an HDSS model include the cause of deaths and other health and socioeconomic indicators (see Figure 1).[6]

Health and demographic surveillance system commenced with a baseline survey to establish the surveillance area population and their characteristics (social, economic, and health). The International Network for the Demographic Evaluation of Populations and their Health (INDEPTH Network) is an organization responsible for the coordination of HDSS sites in low-and-middle-income countries (LMICs). Health and Demographic Surveillance System has two sections: Field and Data section:

(a) At Nahuche HDSS, for instance, the field section comprises routine data collectors, verbal autopsy data collectors, community key informants, and supervisors.
(b) The data section consists of a data manager, data entry clerks, and a filing clerk.

One of such INDEPTH Network member sites is the Nahuche Health and Demographic Surveillance System, Zamfara State, Northern Nigeria, established in 2009 by UKaid funded PRINN-MNCH programme. The Nahuche HDSS site is located in Nahuche community in Bungudu Local Government Area (LGA) of Zamfara State, in the Northwestern region of Nigeria. The study area is 32 km from the State capital, Gusau, and is composed of six traditional districts (not the same as LGAs) of Bella, Gada, Karakai, Nahuche Keku, Nahuche Ubandawaki, and Rawayya, which together have a total of 306 villages covering three political wards out of the 11 political wards in Bungudu LGA. The site attained its INDEPTH Network membership in 2012. Details of the operation of Nahuche HDSS have been documented elsewhere.[5,7]

Potentials of Health and Demographic Surveillance System for Solving Challenges Associated with Measures of Halting the Spread of the Virus: Nahuche HDSS Model

Identification of High-Risk Population (Nahuche HDSS Model)

Beyond the inadequate PPE and minimal understanding of the pathogen at the outset of the outbreak, one of the identified challenges in halting the spread of COVID-19 is the non-disclosure of the travel history of the patients to the health workers. This act has been identified as a contributing factor to the COVID-19 infection, particularly among the frontline health workers at the early stage of the pandemic when the suspicion index was much lower. A functioning HDSS can address the challenge of a lack of information on the travel history of suspected patients. For instance, Nahuche HDSS commenced activities with a baseline census of the surveillance area to establish the surveillance population and their characteristics such as age, sex,

residency, educational level, and wealth index. The baseline census data collection focused on social and demographic data collection. Based on the available database at the HDSS, it is easier to identify the at-risk population for the pandemic. For instance, the HDSS database showed that almost 10% of the total population were aged 50 years and above. According to the recent COVID-19 protocol, those above 50 years are considered at-risk populations.

Afterwards, the baseline, periodic and regular updates of data collection on births, deaths, migration events were routinely conducted every 6 months.[7] Although some sites run 4 rounds a year (3-monthly cycle). Migration events (in and out-migration) are defined as a semi or permanent movement of population between areas within or outside a country or, in the Nahuche HDSS case, within or outside a demographic surveillance area (migration in and migration out) for a period of at least 90 days. However, the migration event is noted immediately the new entrant arrives (through the key community informant system in place) the demographic surveillance area (DSA) but given the grace of 90 days before a form (for immigration or emigration) can be completed for such person (based on the definition of a migrant). Other population dynamics can be frequently updated as needed if adequate human and logistic capacities are available.

The Nahuche HDSS database has information on the migration profile of all individuals within the demographic surveillance area, and these pieces of information are disaggregated by demographic characteristics such as sex and age. Information on the place of destination at each migration event was also documented. With this model, it is easy tracking the movement pattern of all members of the DSA (defined as someone who has consistently resided within the DSA for at least 6 months). For instance, Figure 2 shows that migration rates are very low at the oldest ages though a bit higher for females than males and virtually non-existent up to age 40 for both sexes. For males, out-migration increases rapidly from age group 5 to 9, reaching a peak in the age group 20 to 24 and declining gradually from age 25 to 29. Anecdotal evidence suggests that among the males, most of the movements were due to religious activities (Almajirai), while the geographical mobility of the women was mainly for marriage purposes.

Armed with this kind of information, it is easier to identify the high-risk population for the virus as well as easy tracking of travel history among the surveillance members and thus help in addressing the challenge of ascertaining the travel history of members and identification of high-risk population for the spread of the virus.

Ease of Contact Tracing (Nahuche HDSS Model)

Having realized the importance of geographical location as a factor in population and health outcomes, Nahuche HDSS included the data collection of geographic positional
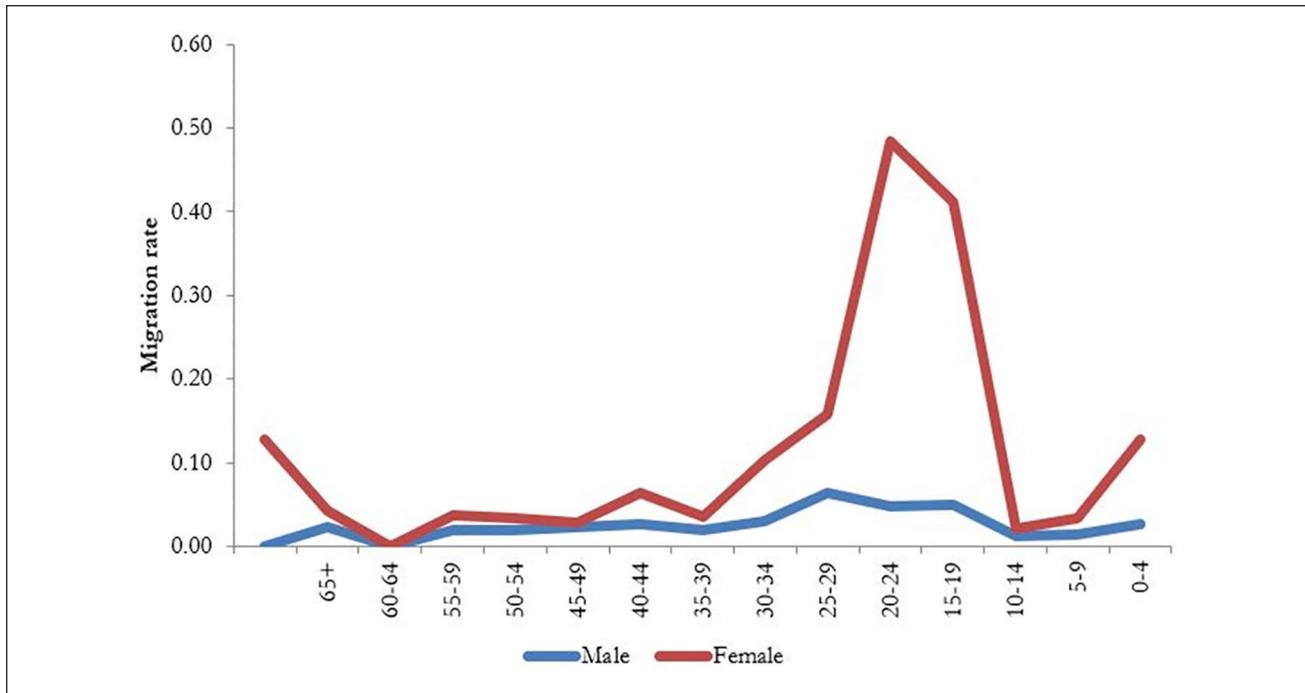
Figure 2. Migration rates across different age groups (source: Nahuche HDSS migration data, 2011).

coordinates of all households and dwelling units within communities in its baseline data collection activities and updated same for new households and dwelling units in each update rounds.[5] Thus, all the DSA members are linked to their location through the GPS coordinates collected and their unique identification number (Individual ID). The uniqueness of the identification number is that no two individuals within the DSA have the same individual ID. The individual ID is a combination of the enumeration area code, compound number, household number, and individual line number in the household. For instance, an individual in Bela District within enumeration area A will have enumeration area code BEA where "BE" represents the district, and "A" represents the enumeration area or cluster. A sample complete individual ID in Nahuche HDSS reads BEA00100100, which represents an individual in Bela district, cluster A, compound number 001, household number 001, and individual line number 001, who usually is the head of the household.

With this unique individual ID, it is easier to trace a confirmed case as well as likely contact persons within the DSA. In some HDSS, for instance, Kitampo HDSS in Ghana (INDEPTH Network, 2013), the individual ID is linked to the hospital records of all individuals who at some time or the other visited health facility for health care services and thus, with each visit, the hospital record is updated to reflect reasons for the visit which can easily provide the health-seeking behavior history of a typical DSA member. This mechanism can also trigger case detection and reporting as well as easing case mapping and contact tracing (as applicable for any of the immediate-notifiable diseases, including COVID-19 disease. The limitation to this model is when a non-DSA member migrates to the DSA as this will take nothing less than 90 days before such a person can be registered as a DSA member.

Quality Database for the Distribution of Palliatives as a Coping Strategy during the Pandemic (Nahuche HDSS Model)

Recently, during the COVID pandemic in Nigeria, the most criticized Ministry is the Federal Ministry of Humanitarian Affairs, Disaster Management and Social Development. The Ministry has come under severe attack in the wake of COVID-19 pandemic as regards the modalities and transparency in the selection of the beneficiaries of the federal government palliatives for COVID-19. One of the areas of contention was the allegation of lack of quality and valid database for identifying who is poor in the Nigerian communities.

The Nahuche HDSS model has the potential of identifying poor households as it collects standard data on the socio-economic status of each of the households within the DSA. Standard questionnaire in assessing the household socio-economic status adapted from standard surveys such as Nigeria Health and Demographic Survey (NDHS), Malaria Indicator Survey (MIS), among others were administered on the household heads of each household every two years to monitor the socio-economic advancement of the households. Data on variables, such as household possessions, including

animals and livestock, were collected and analyzed using factor analysis (Principal Component Analysis (PCA) as it is done in all standard surveys) to group the households into different wealth indices. A mere click and search of the Nahuche HDSS, for instance, will provide the list of the households in the "poor" wealth index. Continuous monitoring of the household socio-economic status every two years provides a measure of household vulnerability and household coping strategies in a stressful or crisis period.

The Population and Housing Census could have been a viable alternative to provide information about the neighborhood and household wealth indices that may guide the administration of palliatives. Sadly, the last census in Nigeria was conducted in 2006 (14 years ago). Hence, the projection or estimates would be heavily prone to huge errors and low levels of data reliability for a critical intervention like social protection programme in this dire time (during the ongoing pandemic). This is despite the background apprehension due to the politicization and sensitivity of census data. Furthermore, the DHS may not require substantial additional resources as existing health and social workers within the relevant Ministry (in our model, Ministry of Health) could be deployed for continuous data collection and periodic updates.

Conclusion

COVID-19 pandemic has exposed different system weaknesses in countries across the world and provides an opportunity to strengthen the health systems. In recent times, facts are emerging that the virus may be with us for a while than initially thought. Thus, we should devise coping or adaptive strategies to live with the emerging reality while hoping for a biomedical countermeasure within the shortest possible time to complement the current adaptive strategies. Health and demographic surveillance system provides an opportunity to better handle the challenges associated with halting the spread of the virus in the areas of surveillance and administration of palliatives in LMICs like Nigeria, where there is a paucity of reliable demographic and household-level socio-economic data. This paper highlights the potentials of HDSS in the generation of quality and timely data requisite for effective planning for emergency response and disaster risk management.

Contributors

OA led the writing of the manuscript. OA and AA provided technical guidance on the operation of HDSS. SAO provided technical guidance on disease surveillance system and social protection schemes. All authors contributed to the writing and review of the manuscript.

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Data Availability Statement

All necessary Nahuche HDSS data necessary to replicate result are available on request

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