Original Article

Usability of Surveillance Outbreak Response Management and Analysis System for Coronavirus Disease among Epidemiology Officers in Delta State Nigeria

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Abstract

Introduction: Nigeria recently used electronic surveillance tools for epidemic diseases, one such tool is the Surveillance Outbreak Response Management and Analysis System (SORMAS); no readily available study has assessed the use of SORMAS in Nigeria. The title of this study is the usability of SORMAS for coronavirus disease among epidemiological officers in Delta State; it explored the ease of use, the effectiveness of SORMAS, its applicability, and the challenges with its use. **Materials and Methods:** This descriptive qualitative study involved disease surveillance and notification officers (DSNOs) and their assistants DSNOs in the year 2022; 25 of them were interviewed using two audio tape recorders after consent was obtained. Ethical clearance was obtained from the appropriate body. Thematic content analysis, with the help of Analysis of Qualitative Data software, was used to analyze data. **Results:** The findings showed that SORMAS was difficult to use for 100% of the respondents, particularly at the initial time, and subsequent use was relatively easy. About 100% of users found SORMAS to be effective for coronavirus disease 2019 surveillance and claimed it could be applied to other health diseases. About 100% of the respondents had challenges which included network problems, unavailability of adequate airtime, low technological know-how, software glitch, and hardware issues, among others. **Conclusion:** This study helped to outline the factors affecting SORMAS use, demonstrated that SORMAS was relatively easy to use after repeated training, was deemed effective by all respondents; applied to other health diseases, and its use was affected by several challenges.

Keywords: Coronavirus, epidemiology, surveillance, Surveillance Outbreak Response Management and Analysis System

Introduction

Disease surveillance entails regular investigation of the occurrence of diseases and health-related events, to ensure early intervention and subsequent control of diseases.[1] In surveillance, there is the continuous systematic collection, collation, analysis, and interpretation of data on disease occurrences and public health events, and the use of such information for public health action.[1] The notification of such diseases to appropriate health authorities is important. A disease outbreak is usually sudden; thus might overwhelm the health system that has no effective surveillance system. Therefore, an efficient surveillance system is of huge importance, particularly in the reduction of mortality that results from epidemics.

Globally, disease surveillance and notification entail electronic case reporting, electronic laboratory reporting, and integrated surveillance information systems.[2] Hard copy forms have a limited role and are commonly used to supply patients with health information. The World Health Organization (WHO) expects its members, to report events that might be a Public Health Emergency of International Concern. The country, after assessment of the public health event, is expected to report it to the WHO within 24 h.[2] This timely reporting can be facilitated through the use of electronic surveillance systems, and less so by paper-based format.

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Individual, local, national, and international levels of disease surveillance exist. In Nigeria, disease surveillance and notification began in 1988, following a major outbreak of yellow fever.[1] There are disease surveillance and notification officers (DSNO), tasked with the responsibility of investigating and reporting disease outbreaks, and are usually in the various local government areas (LGA) of the country, including Delta State. In Africa, in 1998, integrated disease surveillance and response (IDSR) was introduced as a strategy to re-invigorate the surveillance system in the region; since then, a significant progress has been made.[1]

Nigeria has a list of notifiable diseases, and they include epidemic-prone diseases, diseases targeted for eradication and elimination, and other diseases of public health importance. The list contains several diseases and is usually reviewed at intervals. The notification of diseases starts from the clinician in a health facility, then to the LGA DSNO, who will notify the state epidemiologist or DSNO, then the information gets to the epidemiology division of the Federal Ministry of Health.[1] The Federal Ministry of Health then notifies WHO. Reporting forms, also called IDSR forms, are used to collect data and notify relevant stakeholders. The overall target of disease surveillance is the early detection of diseases of importance, reduction in prevalence, and the prevention of mortality.[1]

The coronavirus disease 2019 (COVID-19) pandemic challenged various health surveillance systems across the globe. While some countries had no data, some were not sharing adequate data with respect to their own population.[3] This demonstrated the inadequacies in the health surveillance systems of many countries, and the need for real-time surveillance tools, as well as integrated disease surveillance. Since SARS-CoV-2 was noted to carry a high risk to the community, being put into risk group class three, epidemiologic surveillance was necessary.[4] Thus, the place for thorough and complete surveillance data becomes paramount.

Several European countries already use digital health tools; and tend to pursue interoperability, which refers to several systems being able to exchange information, and this was implemented during the COVID-19 pandemic.[5] Italy utilized online decision support systems, which helped them cope with and interpret their symptoms.[6] In Germany, the Surveillance Outbreak Response Management and Analysis System (SORMAS) was used in addition to other systems to facilitate contact tracing.[7] France utilized the Covidom program, a form of surveillance application that helps physicians stratify patients into risk groups, and offer appropriate care.[8]

Africa has made efforts to adopt electronic reporting of disease surveillance information. Sierra Leone was one of the first African countries, to fully adopt an electronic surveillance system across all her public health facilities.[9] Electronic IDSR was also used by Liberia's Emergency Operation Center, with positive outcomes.[10] Furthermore, Egypt has a web-based surveillance system, the National Egyptian Electronic Disease Surveillance System, which covers various communicable diseases.[11]

In Nigeria, paper-based IDSR forms are commonly used, but web-based surveillance system is gaining more acceptance; after it was found useful during the Ebola pandemic.[12] The IDSR forms are traditionally paper based, and demand movement from place to place; thus, the forms are subject to harsh weather conditions, which negatively affects reporting of cases. The forms may not be available in certain regions of the country, and where it is available, timely reporting is lacking. Because timely reporting is important in disease surveillance, an application that can report real-time public health events is vital; thus, electronic surveillance becomes necessary. Electronic surveillance entails the use of electronic systems to perform disease surveillance functions, which include detecting and responding to public health events.[13] Mobile health is an example of electronic surveillance; and uses the Internet to transmit data, and for telecommunication.

Sustainable Development Goals (SDGs) include good health and well-being, with the target to end epidemics of common conditions such as tuberculosis, malaria, as well as other communicable diseases such as coronavirus disease.[14] Thus, the use of digital health tools like SORMAS is useful to limit the COVID-19 epidemic; and help in the realization of SDG goal 3. This stresses the importance of improving the detection and notification of cases, and this will be improved once the DSNOs find SORMAS easy to use.

Usability involves the assessment of the quality of a user's experience when interacting with products or systems, such as websites, software, and applications. This study is guided by some theories, including the usability theory. Usability entails the combination of factors such as intuitive design, which involves ease of understanding how to navigate through a site; ease of learning, particularly for one who is not familiar with the user interface; efficiency of use, how fast a familiar user can accomplish tasks; memorability, if a user can sufficiently remember how to use the site in the future; error frequency and severity, how frequently do users make errors while using the system, how serious the errors are, and ease at which users recover from errors; and subjective satisfaction, if users enjoy using the system.[15]

Following the widespread use of mobile phones and tablets, the under-reporting of cases, as well as the need for real-time information, the need for a mobile health tool arose. This was necessary to determine the actual incidence of an epidemic in an area; as poor surveillance tools might give a false impression of a low incidence of such disease in an area. Such false impressions manifested during the COVID-19 pandemic, particularly in Africa, where few cases were reported due to poor surveillance tools. Nigeria was fortunate to utilize a mobile electronic surveillance tool, SORMAS, during the pandemic.

SORMAS is a mobile health tool, originally designed by a German company, used in detecting and reporting public health events; initially used during the West African Ebola epidemic.[16] It is also being employed in reporting COVID-19 cases, and other epidemic diseases. However, SORMAS needs a stable broadband network, quality or smart electronic device, and a technologically oriented user; these are not readily available. This mobile tool is yet to have widespread use for notifiable diseases in all parts of Nigeria.

Attempts made at searching online for studies on usability or user experience, elucidate the fact that there is almost no study done to ascertain the usability of SORMAS for COVID-19 by disease surveillance notification officers in Nigeria. A related study conducted in Nigeria; evaluated the knowledge gained before and after SORMAS training, and it showed a gain in knowledge after training on SORMAS.[13] No readily available study assessed the usability of SORMAS among surveillance officers in Nigeria; hence, this study is more or less novel.

This study is focused on epidemiology officers or personnel who use SORMAS in Delta State; this includes DSNOs, and their assistants DSNOs (ADSNOs). It demonstrates some factors limiting the implementation of an established electronic surveillance system in Nigeria. It shows why SORMAS, and related software, should be used for the surveillance of diseases in Nigeria.

Materials and Methods

This qualitative study was conducted across the various LGA of Delta State, and there are 25 LGA. The state has a total land area of 16,842 km^2; lies between longitudes 5°00 and 6°45'E, and latitudes 5°00 and 6°30'N; with the capital being Asaba. It involved those who used SORMAS for the COVID-19 outbreak: the various DSNO, and their ADSNO across the LGA in the state.

This study included 25 epidemiology officers, and used a purposive sampling technique; was carried out in the year 2022. The sample size was based on the number of LGA in Delta State, as the sample size for interview in qualitative study may vary between 20 and 30 people.[17] Inclusion criteria include those who were epidemiology officers before 2020; those who used SORMAS for COVID-19, and currently occupied those positions. Exclusion criteria included those who were employed in the year 2020, and beyond; those who did not use SORMAS for COVID-19; those who did not occupy the position at the time of this research; those who were involved in both pilot study and pretesting of my interview guide; and those officers who declined to partake in the study.

A semi-structured interview was conducted using an interview guide for all participants; after a pretest of the guide was done. A pretest of the interview guide, involving a few workers who used SORMAS in Delta State, guided the interview questions. These people were excluded from the research work. The duration of the interview was determined by the participant's explanatory ability. A telephone call was put across to the DSNO or ADSNO, and a meeting was arranged at the convenience of the participants. They were given the participation and consent form; and allowed to read through it. Once they agreed to participate, a consent/participation form was signed, and a face-to-face interview was conducted. Their facial expression and other nonverbal cues were noted. The audio recordings were diligently transcribed in a Microsoft Word document, to ensure accurate analysis.

The study protocol was submitted to the appropriate body. Permission to conduct the study was obtained from the appropriate ethics body. Participants were made to know the objectives of the study, that it was voluntary, not mandatory to participate, and that they could withdraw their participation at any time.

The analysis was carried out using the thematic content analysis, and aided by the software, Analysis of Qualitative Data (AQUAD) version 7.6.1.1 is a software for qualitative study, produced by Gunter Huber in Germany; this analysis was done in several phases. The first phase involved a review of the interview transcripts, and cross-checking with the original audio recordings; to ensure nothing was left out. The next was going back and forth among the transcripts to note emerging categories and relevant phrases were highlighted using AQUAD; subsequently, these useful phrases were coded. Thereafter, the codes were compared to establish any relationships or differences within the data. Finally, the codes were grouped under themes. The transcripts will be stored in the Department of Community Medicine.

Results

Twenty-five participants partook in this study and only three were male. The average duration of the interview was 21 min and 42 s; data saturation was noted at the 24th participant. It was observed that females mostly occupied the roles of DSNO and ASNO [Figure 1]. The only reason that could be deduced for the preponderant of females was related to the predominant profession among these officers; most had a nursing degree either from a school of nursing or from the university [Figure 2]. Most of the respondents were middle aged, i.e. between 40 and 60 years; 8 out of the 25 (32%) respondents were within the age group of 45–49 years; 7 (28%) were within 40–44 years; 5 (20%) of them fell between 50 and 54 years; 4 (16%) were between 55 and 59 years; and only 1 (4%) was within 35–39 years [Figure 3].

All the respondents understood that COVID-19 needed surveillance due to its highly infectious nature. Most who had difficulty with the initial use of the application improved over time, and this was after regular training. Respondent 7 said: "*Initially it was difficult, we were making mistakes; but what you do from time to time, you become master of it; even when I went to visit my facility, i wanted to use it and I couldn't, so I went back and it was settled.*" They all complained of unavailability of internet data, after the stoppage of free data by National Centre for Disease and Control. Respondent 10 said: "*NCDC have stopped giving us data; previously they gave us 101,500 worth of airtime. I could consume 40 gigabytes a month which is 10,000 naira worth of airtime particularly during the outbreak; I cannot afford that….*"

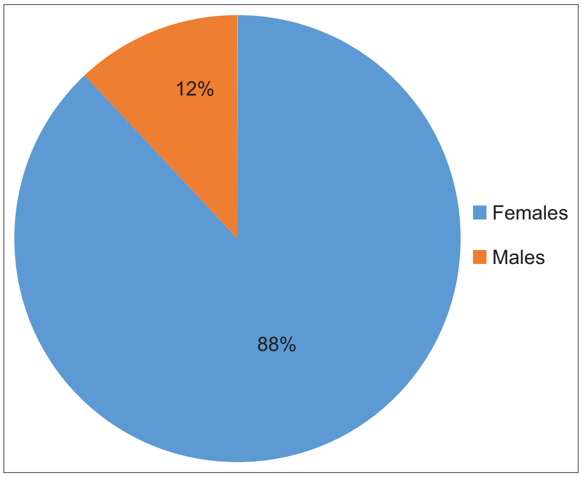

Figure 1: The gender distribution of the participants; females accounted for 88% and males for 12%

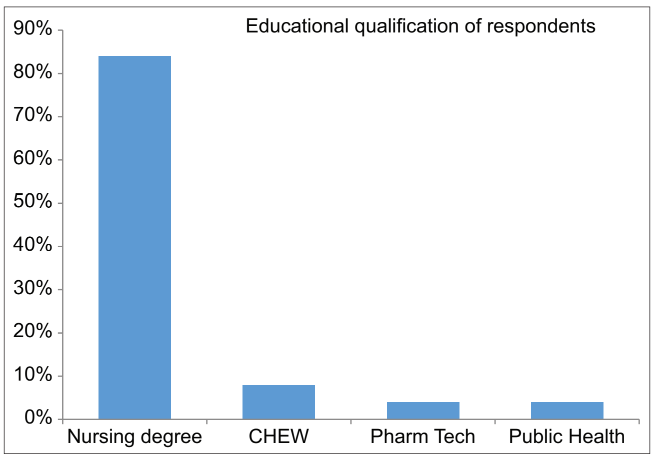

Figure 2: The qualification of the respondents; 84% of them had a nursing degree; 8% were Community Health Extension Workers; 4% were pharmaceutical technologists, and 4% had a Public Health degree. CHEW: Community Health Extension Workers

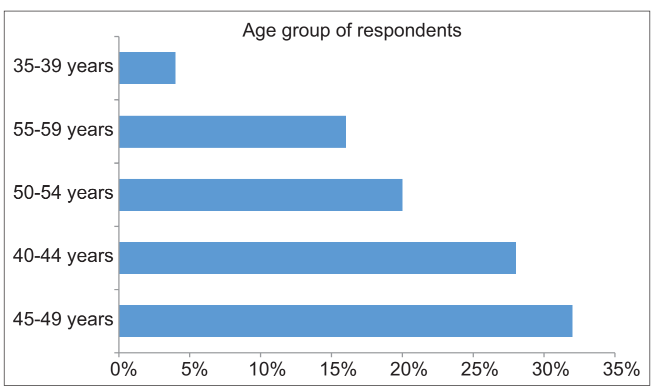

Figure 3: The age group of the respondents; 32% were between 45 and 49 years; 28% of corresponds to those aged 40–44; 20% of them were between 50 and 54 years; 16%, 55–59 years; and 4%, 35–39 years

SORMAS was deemed to be applicable to other infectious diseases of importance, and some suggested that its use may be extended to noninfectious diseases like obesity. Respondent 1 said: "…*It can be used for noninfectious diseases like hypertension, obesity; if the government wants to really do something about that, they can always try to use it, it is left for them to introduce it, and people will comply with it….*" All the respondents opined that it was effective in surveillance function, particularly in the notification, case reporting, and contact tracing. Respondent 22 opined: "*We use SORMAS to disseminate information. Also, with the address and phone number the person gives to you, it helps with contact tracing.*"

Various challenges were observed. Internet connectivity problems and airtime unavailability were major complaints; because the use of SORMAS largely depends on airtime and data, which if in shortage, will limit its use. Respondent 1 said: "*Em, the real challenge I really think we are facing with SORMAS is when you get to a community, where there is no internet connection; but there are some villages that you will get to, you cannot really (switch) on your data, and you cannot even get data, you cannot get anything….*" Poor technical know-how, software glitches, hardware problems, dishonest patients, lack of workforce, and lengthy variables were among other challenges noted. Inadequate financial support for transportation was another factor echoed by virtually all the respondents.

Discussion

Most of the respondents had difficulty using SORMAS at the first exposure, however after initial training most found it relatively easy to use; though very few still had difficulty with its use. However, they all agreed that prior training was necessary to facilitate ease of use. Respondent 24 said that the initial usage was not easy, as she lacked adequate computer knowledge, and could not use the application, as she kept losing information stored; but, after a series of training, her recent usage has been better. This supported the findings that end-user training correlates with improved performance in accepting technology.[18] It also showed that certain human characteristics affect the use of a product, as explained in the usability theory.

Most participants opined that they preferred and enjoyed using SORMAS, because of attributes such as faster reporting, good feedback, and being far less bulky. A respondent enjoyed using SORMAS and rated her usage to be 80%, and she could easily download it from Play Store and found the application to be straightforward. However, Respondent 2 said that she preferred the manual forms; because she felt that everything starts with writing down before entering it on SORMAS; but she recognized that the world has moved past manual forms, and she is willing to adjust. These different preferences buttress the finding that some people are early adopters and some are laggards, as explained in the innovation theory.[19]

In terms of applicability to other infectious diseases that are not COVID-19, most participants agreed that they used it for other diseases, with not many differences noted. When asked, respondent 17 used SORMAS for other diseases such as measles, yellow fever, cholera, and acute flaccid paralysis, and found no difference in usage when compared with COVID-19. This was corroborated by the fact that it was used for Ebola, a viral hemorrhagic fever.[13] Some respondents also believe that this software can be used for surveillance of noninfectious conditions such as obesity; Respondent 1 opined that if the government decides to use SORMAS for obesity or hypertension, it will be used. However, no literature or study showed the use of SORMAS for conditions such as obesity or hypertension.

Concerning the effectiveness of the software for surveillance of COVID-19, all the respondents agreed that SORMAS has helped with contact tracing, and better case reporting. This was supported by Respondent 21 who said that the software has significantly helped in the detection of cases, as well as in contact tracing, and all that is required is adequate data entry. This was in keeping with the finding that SORMAS improves the analysis of case reports, is timely, and SORMAS was valuable for outbreak detection.[13]

Challenges varied across the respondents, but all the participants complained of poor network connection. Respondent 1 complained that her major challenge is internet connection problems; there are some villages with no network signal at all, and it greatly limits her fieldwork, but she still appreciated the efforts of the state and relevant partners. This stressed the importance of internet connectivity, which is said to support applications used in public health.[20] This is related to the unavailability of adequate airtime after NCDC withdrew the free airtime, which ensures network connection.

Many had poor knowledge of using the technological device, and this was demonstrated when they were introduced to SORMAS. For Respondent 5, her challenge was difficulty using the application and could not sufficiently enter cases, which made her lag behind. Here, she expressed difficulty in able to navigate through the application or software, which limited her utilization of the software services. This agrees with the fact that a lack of knowledge of an online application, poses a challenge and limits the usage of such tools.[21]

Another common challenge noted was the slow speed of the initial device given to them by NCDC. The hardware problem was so significant that it had to be replaced. Respondent 16 stated that the initial device given to them was just too slow, but this improved when it was changed. Attempts to know the make and name of the initial device; showed that the RAM was 1 gigabyte (GB), which should be enough. According to a study on hardware requirements for SORMAS use, the minimum RAM was 1 GB and the battery was 2070 mAh.[16] However, this does not agree with the above finding of the slowness of the phone, as it met the minimum requirement. However, it is possible that the current one was an improved version of the initial version of the SORMAS app. Thus, there is a need for a device with faster speed, and Respondent 20 requested that the tablet device should be upgraded to a faster one, and opined that a good quality laptop be considered.

Transportation was another problem, as the cost of their movement was not adequately compensated for by the government or relevant partners. Respondent 13 said: *We need transportation, and we don't have vehicles. Our bikes, they supplied to us, is bad; it was supplied about 5 years ago or so by WHO, and since that time, transportation is difficult.* This challenge of transportation and inadequate financial resources was noted to affect surveillance and outbreak response in Nigeria.[13]

Conclusion

The study has shown the factors affecting ease of use, effectiveness, applicability, and challenges affecting the use of SORMAS in Delta State, Nigeria. All the users had difficulty using SORMAS, particularly at the initial time; but this improved with usage, though a few still find it difficult to use. They all stated that the software was effective; and applicable to other diseases. They all stated that SORMAS could be used for other disease conditions. The challenges include poor networks, inadequate technological knowledge, poor network, insufficient data, poor funding, and a few others. Some partook in the interview hastily, and this might have reduced the information gotten from them. There is a need to conduct more studies on SORMAS use, and its effectiveness; so as to know ways to improve for better disease surveillance.

The strengths of this study include the demonstration of the role of SORMAS in surveillance, the evaluation of its use by epidemiology officers, the importance of digital health tools in surveillance, and the provision of a template for larger studies. The limitations of this study include its objective nature and limited number of participants.

Recommendations include regular training of epidemiology officers on the use of SORMAS; provision of a good network and adequate data; increased government allocation to the health sector, and improved wages of epidemiology officers. Political enlightenment is needed; also in addition, NCDC should be appropriately funded, to improve overall surveillance activities.

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Conflicts of interest

There are no conflicts of interest.

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