Influence of Open Data Kit Application on Disease Surveillance and Notification

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Abstract

This project investigates the influence of Open Data Kit (ODK) on Disease Surveillance and Notification in Osun State, Nigeria. Descriptive research design was used and 90 respondents were engage through total enumeration sampling technique. Open Data Kit is an application that is used to capture data with designed template, allows the creation, distribution and filling of questionnaire on mobile phone or tablet running the Android operating system which has the following discovered influences on disease surveillance and notification: Facilitates adequate collection of morbidity and mortality data, enhances accurate processing of morbidity and mortality statistics, facilitates uniformity in data capturing, enables orderliness in data registration and contact tracing of contagious diseases, facilitates easy design of data collection tools. Descriptive survey research method was adopted for this study to evaluate the influence of open data kit application on disease surveillance and notification officer in Osun State. The findings show that a large proportion of DSNO and their assistance were strongly agreed and agreed that Open Data Kit is an application that is used to capture data with designed template, allows the creation, distribution and filling of questionnaire on mobile phone or tablet running the Android operating system and Real-time mapping of responses in Google Maps is possible with the use of Open Data Kit which is similar to what has been found by (Open data kit history, August 2019). There are positive influences of open data kit application on disease surveillance and notification in Osun State.

Keywords: Open Data Kit; Disease Surveillance and Notification; Morbidity; Mortality; Statistics; Application

Abbreviations: ODK: Open Data Kit; HMIS: Health Management Information System; DSNO: Disease Surveillance and Notification Officers; M&E: Monitoring and Evaluation; WHO: World Health Organization; NGO: Non-Governmental Organization.

Introduction

Open data kit (ODK) is a suite of an open source Android app that replaces paper forms used in health information data gathering. It supports a wide range of question and answers types, and is designed to work well without network connectivity [1]. ODK is a tool that helps organizations, author and hospital to collect and manage mobile data collection. Open data kit are to make open-source and standards-based tools which are easy to try, easy to use, easy to modify and easy to scale. ODK Collect renders forms into a sequence of input prompts that apply form logic, entry constraints, and repeating sub-structures [2]. Users work through the prompts and can save the submission at any point. Finalized submissions can be sent to recipients (and new forms downloaded from a server). It supports location, audio, images, video, barcodes, signatures, multiple-choice, free text, and numeric answers.

Surveillance is the continued watchfulness over the distribution and trends of incidence through the systematic collection, consolidation, and evaluation of morbidity and mortality reports and other relevant data, together with dissemination to those who need to know [3]. It is the Systematic ongoing collection, collation, and analysis of data and the timely presentation of information to those who need to know so that the action can be taken [2,3].

Disease surveillance is described as the continuous scrutiny of occurrence of diseases and health-related events to enable prompt intervention for the control of diseases [4,5]. It involves the ongoing systematic collection, collation, analysis and interpretation of data on disease occurrence and public health related events and presentation of the information obtained from such data for prompt public health action.

However disease notification involves the official and timely reporting of the occurrence of specific diseases and conditions to designated public health authorities by disease surveillance and notification officers (DSNO) and other health personnel for action using designated reporting tools and is an important source of data collection for effective and efficient disease surveillance is part of the Health Management Information System (HMIS) which comprises databases, personnel, and materials that are organized to collect data which are utilized for informed decision making.

Surveillance and notification of diseases involve the immediate reporting of epidemic prone diseases, diseases targeted for elimination and eradication and monthly notification of other diseases of public health interest.

Among the major tasks of Open Data Kit is the promotion of improved approaches and techniques for the collection of data on disease surveillance and notification, including record keeping and safety of data. The need for reliable and comprehensive statistics has always been extremely important, all more so at the present time, open date kit provides the essential basis for sustainable, reliable and dependable protection within a precautionary approach.

The Collection of basic data on disease for notification provides primary data for a wide variety of statistical applications. To help meet national needs for basic health data, ODK has been adopted by disease surveillance and notification officers in their data collection, processing and reporting system. In view of this, the effort is directed to examine the influence of Open Data Kit (ODK) application on disease surveillance and notification system in this project work.

The fundamental goals of a functional national disease surveillance and notification system is early recognition, detection and prompt notification of infectious diseases as it provides the opportunity for timely public health action and minimizes the number of people infected with the disease. There is thus, a need for reliable technology that facilitates the accomplishment of this set objective [6].

Though personal computers have been popular since the mid-1990s, and laptops have been common since the mid-2000s, few organizations have successfully integrated these technologies into remote field work because of infrastructure problems such as intermittent power and internet connectivity, cultural sensitivies, low education and literacy rates, and extreme environmental conditions such as heat, rain, and dust [7]. Of course, computing technology is no panacea, but with the growth of mobile phone usage in these regions, there has come opportunities to digitize and automate many of these data collection campaigns in a cost effective manner [7].

Battery powered mobile devices with wireless connectivity help alleviate some of the constraints caused by limited access to reliable electricity and wired internet connections. Proliferation of mobile phones and cellular coverage creates local familiarity and expertise with the devices. In this study, we investigated the influence of Open Data Kit Application used by mobile devices on the disease surveillance and notification in Osun State.

Materials and Methods

Research Design

Descriptive survey research was adopted for this study to evaluate the influence of open data kit application on disease surveillance and notification officer in Osun State.

Population

The target population for the study was 90 disease surveillance and notification officers across the 30 local governments in Osun state.

Sample and Sampling Technique

Total enumeration technique was adopted to capture all 90 disease surveillance and notification officers across the 30 local government in Osun State.

Research Instrument

A structured questionnaire was used as a research instrument to gather data from the users of Open Data kit application, on the influence of ODK on disease surveillance and notification in Osun State.

Reliability and Validity

The questionnaire was prepared and validated by the authors after proper assessment and correction to modify the questionnaire for the aims of the research.

Data Collection

The authors visited the nearest local government (Ife Central) to make enquiry on the meeting date of the DSNOs (Disease Surveillance and Notification Officers) in Osun State. The questionnaires were administered personally by the authors to the respondents before the commencement of their meeting. Following the instruction on the instrument, the questionnaire were filled and returned by the respondent.

Statistical Analysis

The data collected were grouped and were subjected to descriptive statistics with use of Statistics Package for Social Sciences version 20.0 (SPSS) with simple percentage.

Results and Discussion

Analysis of Socio-Demographical Characteristics of the Respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
	18-27years	3	3.3	3.3	3.3
	28-37years	18	20	20	23.3
Valid	38-47years	48	53.3	53.3	76.7
	48-57years	21	23.3	23.3	100
	Total	90	100	100	

Table 1: Shows the Distribution of the respondents by age.

Table 1 above shows that 3.3% (3) of the respondents are 18-27 years, 20.0% (18) is between ages 28-37 years while 53.3% (48) are between ages 38-47 years and 23.3% (21) are 48-57 years and above.

		Frequency	Percent	Valid Percent	Cumulative Percent
	Male	24	26.7	26.7	26.7
Valid	Female	66	73.3	73.3	100
	Total	90	100	100	

Table 2: Shows the Distribution of the respondents by gender.

Table 2 above shows that 26.7% (24) of the respondents are male while 73.3% (66) are females.

It was also deduced from Table 3 regarding marital status of the respondents, 3.3% (3) of the respondents were single while the 98.7% (87) were married.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Single	3	3.3	3.3	3.3
	Married	87	96.7	96.7	100
	Total	90	100	100	

Table 3: Shows the Distribution of the respondents by marital status.

The Table 4 shows that 33.3% (30) of the respondents were DSNO, while 33.3% (30) were ADSNO 1, also 33.3% (30) were ADSNO 2.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	DSNO	30	33.3	33.3	33.3
	Assistance DSNO 1	30	33.3	33.3	66.7
	Assistance DSNO 2	30	33.3	33.3	100
	Total	90	100	100	

Table 4: Shows the Distribution of the respondents by Office/rank.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Below 10years	33	36.7	36.7	36.7
	11-20yers	39	43.3	43.3	80
	21-30years	18	20	20	100
	Total	90	100	100	

Table 5: Shows the Distribution of the respondents by year of working experience.

The Table 5 above shows that 36.7% (33) of the respondents have less than 10 years working experience, while 43.3%(39) have between 11 years and 20 years working experience, also 20.0% (18) have 21 years and 30 years and above of working experience.

Also the educational level of the respondents shows that 53.3% (48) are Technicians/OND, holders, and about 30.0% (27) of the respondent have higher national diploma (HND) while 16.7%(15) have B. Sc. Certificates Table 6.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Technician/OND	48	53.3	53.3	53.3
	HND	27	30	30	83.3
	B.Sc	15	16.7	16.7	100
	Total	90	100	100	

Table 6: Shows the Distribution of the respondents by Highest Educational Qualification.

Analysis of Research Questions

S/N		S A (%)	A (%)	DK (%)	D (%)
1	Open Data Kit is an application that is used to capture data with designed template	63(70.0)	24(26.7)	3(3.3)	
2	Open Data Kit allows the creation, distribution and filling of questionnaire on mobile phone or tablet running the Android operating system	72(80.0)	15(16.0)	3.(3.3)	

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S/N	Statement				
3	Real-time mapping of responses in Google Maps is possible with the use of Open Data Kit	54(60.0)	30(33.3)	6(6.7)	
4	Open Data Kit allows capturing of data in the rural areas which shall be uploaded to the server whenever the DSNO secure access to the internet	75(83.3)	15(16.7)		
5	Open Data Kit users work through the prompts and can save the submission at any point.	60(60.7)	30(33.3)		
6	Open Data Kit Build is a drag-and-drop form designer that defines the presentation, navigation logic, and data configuration used by the tools	48(53.3)	21(23.3)	18(20.0)	3(3.3)
7	Open Data Kit build provides users a web-based drag-and-drop graphical interface that allows even novice users the ability to create electronic forms	54(60.0)	21(23.3)	15(16.7)	
8	The easiest way to get data from Aggregate is by using Open Data Kit's 'Export' feature.	45(50.0)	18(20.0)	27(30.0)	
9	Open Data Kit supports the manipulation of data types that include text, location, images, audio, video, and barcodes	69(76.7)	15(16.7)	6(6.7)	
10	Open Data Kit Collect renders forms into a sequence of input prompts that apply form logic, entry constraints, and repeating sub-structures	63(70.0)	15(16.7)	12(13.3)	

Table 7: The Open data kit operations.

The Table 7 above reveals that 70.0%, 80.5%, 60.0%, 26.7%, 16.0%, 33.3%, of the participants strongly agreed and agreed that Open Data Kit is an application that is used to capture data with designed template, allows the creation, distribution and filling of questionnaire on mobile phone or tablet running the Android operating system and Real-time mapping of responses in Google Maps is possible with the use of Open Data Kit while 3.3%, 3.3%, 6.7% did not know respectively. And 83.3%, 60.7%, 16.3%, 33.3%, of the participants strongly agreed and agreed that Open Data Kit allows capturing of data in the rural areas which shall be uploaded to the server whenever the DSNO secure access to the internet, users work through the prompts and can save the submission at any point respectively, 53.3%, 23.3% of the participants strongly agreed and agreed that Open Data Kit Build is a drag-and-drop form designer that defines the presentation, navigation logic, and data configuration used by the tools, build provides users a web-based drag-and-drop graphical interface that allows even novice users the ability to create electronic forms while 20.0%, 3.3%, don't know and disagreed respectively. Also 60.0%, 50.0%, 76.7%, 70.0%, 23.3%, 20.0%, 16.7%, 16.7% of the participants strongly agreed and agreed that Open Data Kit build provides users a web-based drag-and-drop graphical interface that allows even novice users the ability to create electronic forms, the easiest way to get data from Aggregate is by using Open Data Kit's 'Export' feature, supports the manipulation of data types that include text, location, images, audio, video, and barcodes, Open Data Kit Collect renders forms into a sequence of input prompts that apply form logic, entry constraints, and repeating sub-structures respectively.

S/N		SA (%)	A (%)	DK (%)
11	Disease surveillance involves collection of morbidity and mortality data	81(90.0)	9(10.0)	
12	Disease surveillance involves processing of morbidity and mortality reports	78(86.7)	12(13.3)	
13	The goal of surveillance of diseases encompasses elimination immunizable diseases	84(93.3)	6(6.7)	
14	Disease surveillance is an important component of Health Management Information System (HMIS)	63(70.0)	27(30.0)	
15	Disease surveillance utilize various forms and registers to capture health related data	84(93.3)	6(6.7)	
16	Disease surveillance must use uniformed template to capture data across all the data collection centers	84(93.3)	6(6.7)	

17	Active case detection involves searching for cases within the community or household level by DSNO on regular or occasional visits.	90(100.0)	0(0.0)	
18	Passive case detection is the regular or periodic collection of data from case reports or registers in health care facilities at which patients seek care at their discretion.	57(63.3)	27(30.0)	6(6.7)

Table 8: Shows the Practice of disease surveillance.

The Table 8 above shows that 90.0%,86.7%, 70.0%, 93.3%, 93.3%, 100%, 63.3%, 10.0%, 93.3%, 30.0%, 6.7%, 6.7%, 30.0% of the participants strongly agreed and agreed that Disease surveillance involves collection of morbidity and mortality data, the operation of Disease surveillance involves processing of morbidity and mortality report, The goal of surveillance of diseases encompasses elimination ofimmunizable disease, Disease surveillance is an important component of Health Management Information System (HMIS), Disease surveillance utilize various forms and registers to capture health related data, Disease surveillance must use uniformed template to capture data across all the data collection centers, Active case detection involves searching for cases within the community or household level by DSNO on regular or occasional visits, and Passive case detection is the regular or periodic collection of data from case reports or registers in health care facilities at which patients seek care at their discretion while 6.7% participants did not know don't know respectively,

S/N		SA (%)	A (%)	DK(%)
19	Outbreak of contagious/priority diseases must be reported to the appropriate quarters immediately by the Disease Surveillance and Notification Officer (DSNO)	78(86.7)	12(13.3)	
20	Routine diseases must be reported on monthly basis to the appropriate health authorities by the DSNO	90(100)		
21	All local government levels in Nigeria have DSNO that notify government about the happenings in the health facilities within their jurisdiction	90 (100)		
22	Nongovernmental agencies and philanthropist also make use of health morbidity and mortality reports	60(66.7)	24(26.7)	6(6.7)
23	The effectiveness of the decision in the health sector depends on the quality of reported health data	45(50.0)	42(46.7)	3(3.3)
24	The timeliness of government and nongovernmental agencies' response to the health problem depend on the promptness of the diseases notification system	51(54.7)	39(43.3)	

Table 9: Shows the Practice of notification.

The Table 9 above shows that 86.7%, 100%, 100%, 13.3% of the participants strongly agreed and agreed that Outbreak of contagious/priority diseases must be reported to the appropriate quarters immediately by the disease surveillance and notification officer (DSNO), routine diseases must be reported on monthly basis to the appropriate health authorities by the DSNO, all local government levels in Nigeria have DSNO that notify government about the happenings in the health facilities within their jurisdiction. Also 66.7%, 50.0%, 26.7%, 46.7% of the participants strongly agreed and agreed that Nongovernmental agencies and philanthropist also make use of health morbidity and mortality reports, the effectiveness of the decision in the health sector depends on the quality of reported health data while 6.7%, 3.3%, of the respondents didn't know. Finally, 54.7%, 43.3% of the participants strongly agreed and agreed that the timeliness of government and nongovernmental agencies' response to the health problem depend on the promptness of the diseases notification system respectively.

S/N		SA (%)	A (%)	DK (%)
25	Open Data Kit enables adequate collection of morbidity and mortality data	66(73.3)	24(26.7)	
26	Open Data Kit enhances processing of morbidity and mortality data	63(70.0)	24(26.7)	3(3.3)
27	Open Data Kit facilitates uniformity in data capturing.	66(73.3)	24(26.7)	

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28	Open Data Kit enables orderliness in data registration and contact tracing of contagious diseases	72(80.0)	18(20.0)	
29	Open Data Kit facilitates easy design of data collection tools. E.g. forms, registers, etc.	63(70.0)	24{26.7)	3(3.3)
30	Open Data Kit enables editing and correction of mistakes in data recording	60(66.7)	30(33.3)	

Table 10: Shows Influence of open data kit application on disease surveillance.

The Table 10 above shows that 73.3%, 70.0%, 26.7%, 26.7% of the participants strongly agreed and agreed that Open Data Kit enables adequate collection of morbidity and mortality data, enhances processing of morbidity and mortality data and 3.3% of the participants don't know, and 73.3%, 80.0%, 70.0%, 26.7%, 20.0%, 26.7%, of the participants strongly agreed and agreed that Open Data Kit facilitates uniformity in data capturing, enables orderliness in data registration and contact tracing of contagious diseases, Open Data Kit facilitates easy design of data collection tools. E.g. forms, registers, etc while 3.3% didn't know finally 66.7%, 33.3% of the participants strongly agreed and agreed that Open Data Kit enables editing and correction of mistakes in data recording respectively.

S/N		SA (%)	A (%)	DK (%)
31	Open Data Kit enhances timely reporting of morbidity and mortality data	63(70.0)	27(30.0)	
32	Open Data Kit reduces the cost of disseminating health data/information	63(70.0)	24(24.7)	3(3.3)
33	Open Data Kit enables distribution of report to as many as possible number of users of morbidity and mortality data	60(66.7)	27(30.0)	3(3.3)
34	Open Data Kit reduces the risk of life of disease notification officers on travelling for notification/reporting	69(76.7)	21(23.3)	
35	Open Data Kit supports the presentation of data in the appropriate tables, charts or graph	57(63.3)	33(36.7	

Table 11: Shows Influence of open data kit application on disease notification.

Table 11 above revealed that 70.0%, 70.0%, 66.7%, 30.0%, 24.7%, 30.0%, of the participants strongly agreed and agreed that Open Data Kit enhances timely reporting of morbidity and mortality data, reduces the cost of disseminating health data/information, enables distribution of report to as many as possible number of users of morbidity and mortality data while 3.3%, 3.3% of the respondents don't know, and 76.7%, 63.3%,23.3%,36.7% of the participants strongly agreed and agreed that Open Data Kit reduces the risk of life of disease notification officers on travelling for notification/reporting, supports the presentation of data in the appropriate tables, charts or graph respectively.

The findings on Table 7 shows that a large proportion of DSNO and their assistance were strongly agreed and agreed that Open Data Kit is an application that is used to capture data with designed template, allows the creation, distribution and filling of questionnaire on mobile phone or tablet running the Android operating system and Real-time mapping of responses in Google Maps is possible with the use of Open Data Kit which is similar to what has been found in Open data kit history [8].

The Table 8 revealed that the respondents strongly agreed and agreed that Disease surveillance involves collection of morbidity and mortality data, processing of morbidity and mortality report, which is in support of the findings of CDC 1996 [9] and Eylenbosch and Noah [10].

The Table 9 identified that the DSNOs agreed that Outbreak of contagious/priority diseases must be reported to the appropriate quarters immediately by them, routine diseases must be reported on monthly basis and all local government levels in Nigeria have DSNO that notify government about the happenings in the health facilities within their jurisdiction.

The Table 10 showed that the participants agreed that Open Data Kit enables adequate collection of morbidity and mortality data, enhances processing of morbidity and mortality data, facilitates uniformity in data capturing, enables orderliness in data registration and contact tracing of contagious diseases, Open Data Kit facilitates easy design of data collection tools and enables editing and correction of mistakes in data recording respectively. This is in line with the discoveries of some researchers among whom are: Thacker [11].

Table 11 revealed that Open Data Kit enhances timely reporting of morbidity and mortality data, reduces the cost of

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disseminating health data/information, enables distribution of report to as many as possible number of users of morbidity and mortality data, reduces the risk of life of disease notification officers on travelling for notification/reporting, supports the presentation of data in the appropriate tables, charts or graph respectively. This confirmed the discoveries of Thacker SB, et al. [11] and Yaw A, et al. [12].

Conclusion

The study has established that there are positive influences of open data kit application on disease surveillance and notification in Osun State.

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