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Completeness of Reporting in the Community-based Disease Surveillance and Notification System in Anambra State, Nigeria

Chijioke A Ezenyeaku[1], Chinomnso C Nnebue[1,2,*], Simeon A Nwabueze[1,2], Cyril C Ezenyeaku[3], Ifeanyi N Udedibia[1], Ifeoma C Iloghalu[1], Obiageli F Emelumadu[1,2]

[1]Department of Community Medicine, Nnamdi Azikiwe University Teaching Hospital Nnewi, Nigeria
[2]Department of Community Medicine, Nnamdi Azikiwe University Awka, Nigeria
[3]Department of Obstetrics and Gynaecology Chukwuemeka Odumegwu Ojukwu University University Teaching Hospital, Awka., Nigeria
*Corresponding author: nnebnons@yahoo.com

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Abstract **Background:** Community involvement in the disease surveillance and notification (DSN) systems aids in leveraging community structures for improved disease prevention and control. **Objective**: To determine the completeness of reporting in the CBSS in Anambra State, Nigeria. **Materials and methods:** This was a cross sectional descriptive mix method study of the CBSS in Anambra State. Quantitative data were obtained using pre-tested, semi-structured questionnaires, interview-administered on 360 community informants, selected by multistage sampling technique, while data on completeness of filling of the community registers were obtained using observation checklist. Analyses were with SPSS version 20 and associations were tested using Chi square, Fisher's exact and t tests as appropriate. Level of statistical significance was set at 5%. Key informant interviews (KII) were conducted among selected DSN key officers. Data from KII were transcribed verbatim, thematic content analysis done and key quotes noted. **Results:** The completeness of reporting in the system was 28.1%. Factors such as the source of information on detected disease, record of detected disease kept by community informant in the last one year, the number of times reports were sent in the last one year, feedback received by community informants given to community members, volunteer benefit and satisfaction with being a community informant had associations with completeness ($p < 0.05$). At the univariate level, keeping records, giving feedbacks to the community and being satisfied with the CBSS were significant predictors of completeness. The KII findings, showed that the commonest reason for sub-optimal functioning of the CBSS was poor funding. **Conclusions**: This study revealed low level of completeness of reporting of notifiable diseases and sub-optimal functioning of the CBSS in the State. We recommend improved supervision, record keeping, information transmission process and funding of the CBSS in Anambra State.

Keywords: *community-based surveillance, completeness, community informants, Nigeria*

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1. Introduction

It has been observed that the quality of disease surveillance, especially in developing climes can improve if a community-based approach is adopted [1]. The community-based surveillance system (CBSS) was initiated in Nigeria in 2010. This was following the recommendations of the technical consultation meeting on global eradication of poliomyelitis, that in areas with poor access to health facilities or low utilization rates, community-based activities should be integrated into surveillance for diseases of public health importance [2,3].

Completeness of reporting notifiable diseases is a key performance measure of public health surveillance systems [4]. It is an important indicator of effectiveness of reporting systems and is associated with the ability of the system to completely detect and respond to public health concerns [5]. Completeness of reporting measures the proportion of those diagnosed with a notifiable condition that were reported to the appropriate public health authorities [6]. It also measures the total number of sources of reporting that are expected to report notifiable diseases or conditions that actually reported [7] as well as the match between the expected minimum surveillance data requirement and what is reported [8,9]. Although the WHO recommends surveillance systems achieving targets

of 80% completeness as acceptable [4], missing or incomplete data compromises the quality and reliability of information and lead to inaccurate disease management. As a result, outbreaks may go undetected, and other opportunities to identify and respond to public health problems may be missed.

Studies had been carried out on DSN in Anambra State [7,10], nonetheless, there is a dearth of data on CBS to substantiate this claim in Nigeria and in most parts of the African sub-region. These studies were at the health facility level, lacked the community component and were limited in their representativeness [7,10,11,12,13]. Even though findings by Nnebue *et al.*, on the effectiveness of data collection and information transmission process for disease notification in Anambra State, Nigeria, showed that the completeness of reporting by health workers was 81.5% [7], it could still be improved for better performance.

The findings from this study are expected to contribute to bridging this knowledge gaps.

They are also expected to provide the information that will guide the policy makers in instituting reforms aimed at strengthening the existing CBSS in the State. This study was conducted to determine the completeness of reporting in the CBSS in Anambra State, Nigeria.

2. Methodology

2.1. Study Area

This study was carried out in Anambra State, South-Eastern Nigeria. According to the 2006 census, the State has a total population of 4,177,828 persons, comprising 2,117,984 males and 2,059,844 females, with a population density of approximately 868 persons per squared kilometres [14], with an annual population growth rate of 2.21 percent, while its current projected population is 5,527,809 persons [15].

The State hosts two tertiary health-care institutions, the Nnamdi Azikiwe University Teaching Hospital, Nnewi and the Chukwuemeka Odumegwu Ojukwu University Teaching Hospital, Awka. There are 33 secondary health facilities, 382 primary health centers (PHCs), 14 mission hospitals, 600 private hospitals, 186 maternity homes, 126 registered pharmaceutical premises, nine health training institutions, and 1500 licensed patent medicine vendors in the State [15].

The State has a functional M&E office with a trained M&E officer. Information on surveillance of notifiable diseases in the State are collected by the DSNOs at the LGAs through a network of health facility focal persons who collect and report information to them on all the targeted diseases using surveillance case definitions and designated reporting forms. The process is coordinated by the State Epidemiologist. After analysis of data at the State level, the information, is then sent to the Federal Ministry of Health and the WHO country office every month [17]. The WHO supports the surveillance structure in the State by conducting active surveillance and verifying reported cases as part of the monitoring obligations of WHO member states vis-à-vis the 2015 International Health Regulations requirements [18].

2.2. Study Design

This was a cross-sectional descriptive study of the completeness of reporting in the CBSS in Anambra.

2.3. Study Population

This comprised the community informants, the DSN focal persons in the health facilities, the DSNOs in the LGAs, the State DSNO, the State Epidemiologist, the State M&E Officer and the WHO Coordinator in Anambra State.

2.3.1. Inclusion Criterion

Having participated in CBSS in the state for at least a year. This is because they would have functioned long enough to have an opinion and contribute meaningfully to the study.

2.3.2. Exclusion Criterion

Being too sick to participate in the study. For the purpose of this study, severity of ill health was graded on a scale of 1(one) to 5 (five), with 1 (one) being the lowest severity and 5 (five) being the highest severity. Participants who reported 4 (four) or 5(five) were deemed as being too sick to participate and were excluded from the study.

2.4. Sample Size Determination

The sample size of community informants for this study was determined using the Cochran formula for descriptive studies with populations greater than 10,000 [19]:

$n = \frac{z^2pq}{d^2}$ where: n = the calculated minimum sample size; Z = Standard normal deviate at 95% confidence interval, set at1.96; p = proportion of respondents that sent in reports early (In a study carried out in the northern region of Ghana, 74% of the expected number of village monthly reports were received timely [20], so p= 0.74); q = the complementary proportion of p i.e. 1-p, and d = precision level set at 5% = 0.05. n=295.648 = 296.

However, the target population in this study was the community informants in Anambra State with an estimated population of 1320 [21]. Therefore, the final sample estimate (n*f*) was calculated using the formula [19]:

$nf = \frac{n}{1+\frac{n}{N}}$, where: n*f* = the desired sample size when the population is less than 10,000; n = the desired sample size when the population is more than 10,000; N = the estimate of the size of the target population = 1320; n*f* (the desired sample size when the population is less than 10,000) was thus - 241.7= 242.

An adjustment of the estimated minimum final sample size to cover for non-response was made by dividing the calculated minimum final sample size estimate (n*f*) by 1 - f, where f is the anticipated non-response rate. Therefore, anticipating a non-response rate of 10%. The adjusted sample size was $= \frac{242}{1-0.10} = \frac{242}{0.90} = 269$ respondents. The minimum sample size was increased to 360 in order to increase the power of the study.

2.5. Sampling Technique

2.5.1. Quantitative Aspect of the Study

Multi-stage sampling technique was used to enrol respondents into this study. Anambra State is made up of three senatorial zones (Anambra North, Anambra Central and Anambra South), 21 LGAs (7(seven) urban and 14 rural) and 330 wards (ranging from 10 - 20 wards per LGA). Each of these wards has 4 (four) community informants. *Stage1 - Selection of local government areas*: The 21 LGAs in the state were stratified into the 7(seven) urban and 14 rural LGAs, giving a ratio of 1: 2. Using proportionate allocation, 3(three) LGAs were selected from the urban stratum while 6(six) LGAs were selected from the rural stratum through simple random sampling technique by balloting procedure. Thus Onitsha South, Awka South, and Nnewi North LGAs were selected from the urban stratum while Oyi, Anambra East, Njikoka, Anaocha, Orumba North and Orumba South LGAs were selected from the rural stratum. *Stage 2 - Selection of Wards:* There are 20 wards in Awka South LGA, 17 wards in Onitsha South LGA, 10 wards in Nnewi North LGA, 15 wards in Oyi LGA, 15 wards in Anambra East LGA, 18 wards in Njikoka LGA, 19 wards in Anaocha LGA, 18 wards in Orumba North LGA and 18 wards in Orumba South LGA. Proportionate numbers of wards were selected from each of these selected LGAs using Bowler's proportional allocation formula stated below as follows [22]:

$$Wn = \frac{n(n_i)}{N},$$

where Wn = Number of wards selected from each LGA; n = Minimum size for the study =360; ni = Population of each unit (i= 1- 4) i.e. (Total number of wards in the selected LGA); N =The total population i.e. (Total number of informants in all the selected LGAs) = 600. For Example, the number of wards selected for studying from Awka South LGA was $\frac{360(20)}{600}$ = 12 wards. *Stage 3 - Selection of* community informants: From each of these selected wards, all the community informants met the eligibility criteria and were thus recruited into the study. Therefore in Awka South LGA for example, 48 respondents (12 wards x 4 community informants) were studied.

2.5.2. Qualitative Aspect of the Study:

Twenty two KII sessions were conducted on nine health facility focal persons (one selected from each of the nine selected LGAs through convenience sampling), nine DSNOs in the nine selected LGAs, the State DSNO, the State Epidemiologist, the M&E Officer and the State WHO Coordinator.

2.6. Study Instruments

2.6.1. Quantitative Study Instruments

A 46-item semi-structured questionnaire adopted and adapted from the WHO's protocol for the assessment of national communicable disease surveillance and response systems (23), and available literature (24) were used to collect information from the respondents (community informants) on socio-demographic characteristics, completeness of reporting of CBSS among them and factors affecting completeness of reporting of CBSS. An observation checklist was used to collect data on the availability of surveillance tools, correctness and completeness of reporting.

2.6.2. Qualitative Study Instrument

A KII guide adapted from literature (20) was used to conduct the KII sessions on the i) health facility focal persons; ii). DSNOs; iii) M&E Officer; iv) State DSNO; v) State Epidemiologist and v) State WHO Coordinator.

2.7. Data Collection Methods

2.7.1. Quantitative Data Collection Methods

Questionnaires were administered to the community informants using face to face interviews conducted by trained research assistants. In order to ensure quality control, the researchers were present for in-process monitoring of data collection in most of the study sites. Collected data were entered into the computer. An observation checklist was also used.

2.7.2. Qualitative Data Collection Method

Key informant interview guides were used. The KII sessions were moderated by the principal researcher assisted by the note taker/operator of the audio recorder.

2.8. Data Management

2.8.1. Measurement of Variables

The main outcome / dependent variable for this study was completeness of reporting in the CBSS. The independent variables were factors affecting the completeness of reporting in the CBSS. Completeness of reporting was assessed using the proportion of expected reports received by the health facility focal persons or the DSNOs from the community informants within the last 3 months from the time of the survey. The proportion of the community informants registers with the minimum expected surveillance data within the last 3 months from the time of the survey served as proxy for the proportion of expected reports received by the health facility focal persons or the DSNOs from the community informants. Completeness of reporting $\geq$ 80% was considered optimal for the surveillance system while completeness of reporting < 80% was considered suboptimal [25]. For the purpose of this study, the system is assumed to be functioning optimally if completeness and one of other indicators (such as timeliness) are up to $\geq$ 80% and to be functioning sub-optimally if both or any of these two indicators is not up to 80%.

2.8.2. Statistical Analysis

2.8.2.1. Quantitative data: The collected data were inspected for any data collection or coding errors. It was then entered into and analysed with the International Business Machines-Statistical Package for Social Sciences

(IBM-SPSS) version 20 [26]. Frequency distribution of all relevant variables was developed. Means and proportions were calculated while associations between variables were tested using Chi square, Fisher's exact test and t tests as appropriate. Level of statistical significance was set at p-value ≤ 0.05 for all inferential analysis and standard deviations.

2.8.2.2. Qualitative data: The audio recordings obtained from the KII sessions were transcribed verbatim and compared with the written notes of the note-taker in order to improve the reliability of the data obtained. Coding and analysis of the transcripts were done using thematic content analysis [27]. Quotes from the participants that best described the various themes and sub-themes were stated.

3. Results

3.1. Results of the Quantitative Survey

A total of 360 questionnaires were administered to community informants in nine LGAs of the State. All the questionnaires were retrieved, giving a response rate of 100%. Table 1 summarizes the socio-demographic characteristics of the respondents. The mean age of the respondents was 40.5 ± 9.8 years. Majority of them were Ibos, females and traders, while only 3.1% of the respondents had no formal education.

Table 2 highlights the completeness of disease notification among the respondents. Most of the respondents (67.8%) did not keep records of the notifiable diseases they detected. Only 28.1% of the respondents completed their registers (exercise books) within the last three months from the time of this survey. The completeness of reporting was 28.1%.

Table 3 highlights the association between socio-demographic and selected factors and completeness of disease case notification among the respondents. Factors such as the source of information on detected disease, record of detected disease kept by community informant in the last one year, the number of times reports were sent in the last one year, feedback received by community informants given to community members, volunteer benefit from being a community informant and volunteer satisfied with being a community informant were found to have associations with completeness of disease case notification ($p < 0.05$).

Table 4 shows the factors that were found to be significantly associated with completeness of disease case notification among the respondents at the univariate level. Keeping records of notifiable diseases in the last one year, giving feedbacks to the community and being satisfied with the CBSS were found to be significant predictors of completeness of reporting (Exact = 278.292, $p = 0.000$; $\chi^2 = 23.197$, $p = 0.021$; $\chi^2 = 13.131$, $p = 0.001$).

Table 5 shows the factors that were found to be significantly associated with completeness of disease case notification among the respondents at the multivariate level, Completeness of disease case notification was over 1000 times more likely to be carried out by community informants who kept records of notifiable diseases (OR = 1475.694, CI = 217.804-9998.329), 4.2 times more likely in those who gave feedbacks to the community (OR = 4.202, CI = 1.245-14.186) and 2.3 times more likely in those who were satisfied with being community informants (OR = 2.322, CI = 1.387-3.886). The other variables failed to achieve statistical significance with completeness of reporting at this level ($p > 0.05$).

Table 1. Socio-demographic characteristics of the respondents

Variable	Frequency (N) N = 360	Percentage (%)
Age at last birthday (years)		
20 – 29	76	21.1
30 – 39	124	34.4
40 – 49	114	31.7
≥ 50	46	12.8
Mean age ± SD	40.5 ± 9.8	
Minimum, Maximum	20 years, 67 years	
Gender		
Male	105	29.2
Female	255	70.8
Educational status		
No formal education	11	3.1
Primary	22	6.1
Secondary	193	53.6
Tertiary	134	37.2
Occupation		
Civil service	115	31.9
Trading	123	34.2
Farming	37	10.3
***[1]Others**	44	12.2
Unemployed	41	11.4
Religion		
Christianity	353	98.1
Traditional religion	7	1.9
Ethnic group		
Ibo	358	99.4
Yoruba	2	0.6
Length of service as a volunteer (years)		
1 - 3	252	70.0
4 – 6	76	21.1
7 – 9	12	3.3
≥ 10	20	5.6

*[1]Others – Nursing, patent medicine vendor, traditional birth attendant, artisan.

Table 2. Completeness of disease notification among the respondents

Variable	Frequency (N) N = 360	Percentage (%)
Records of detected notifiable disease kept by informant		
Yes	116	32.6
No	244	67.8
Mode of keeping records (N = 116)		
Using registers / Exercise books	116	100
Reasons for not keeping records (N = 244)		
Non-availability of registers (exercise books)	145	59.4
Lack of time	44	18.0
See no need for it	24	9.8
Inability to write	8	3.3
Others	23	9.4
Community register completed within the last three months		
Yes	101	28.1
No	259	71.9

Table 3a. Association between socio-demographic factors and completeness of disease notification among the respondents

Variable	Disease notified completely (Number, %)		Test statistic	p-value
	Yes (N, %)	No (N, %)		
Age at last birthday			t = - 0.265	0.79
Mean ± SD	40.3 ±10.0	40.6 ± 9.8		
Gender			χ^2 = 0.014	1.00
Male	29 (27.6)	76 (72.4)		
Female	72 (28.2)	183 (71.8)		
Highest educational level			Exact = 0.105	0.10
No formal education	3 (27.3)	8 (72.7)		
Primary	6 (27.3)	16 (72.7)		
Secondary	55 (28.5)	138 (71.5)		
Tertiary	37 (27.6)	97 (72.4)		
Length of service in the CBSS			t = 0.952	0.342
Mean ± SD	3.4 ± 2.7	3.1 ±2.4		
Occupation			χ^2 = 3.514	0.47
Civil service	32 (27.8)	83 (72.2)		
Trading	31 (25.2)	92 (74.8)		
Farming	13 (35.1)	24 (64.9)		
***[1]Others**	10 (22.7)	34 (77.3)		
Unemployed	15 (36.6)	26 (63.4)		
Total knowledge score			Exact = 2.167	0.35
Poor knowledge	0 (0.0)	6 (100.0)		
Fair knowledge	22 (26.8)	60 (73.2)		
Good knowledge	79 (29.3)	191 (70.7)		

*Statistically significant ($p \leq 0.05$), Exact = Fisher's exact, χ^2 = Chi square, t = t test
*[1]Others – Nursing, patent medicine vendor, traditional birth attendant, artisan.

Table 3b. Association between selected factors and completeness of disease notification among the respondents

Variable	Disease notified completely (Number, %)		Test statistic	p-value
	Yes (N, %)	No (N, %)		
Source of information on detected disease			Exact = 14.805	0.003
Routine visit to the villagers	36 (41.9)	50 (58.1)		
Family of sick person	36 (23.7)	16 (76.3)		
Health committee	24 (42.1)	33 (57.9)		
Traditional healer	0 (0.0)	1 (100.0)		
TBA	5 (62.5)	3 (37.5)		
Person detected disease was reported to			Exact = 2.865	0.62
Community leader	3 (60.0)	2 (40.0)		
Health facility staff	40 (32.0)	85 (65.0)		
The DSNO	58 (33.9)	113 (66.1)		
The LGA chairman	0 (0.0)	2 (100.0)		
Nobody	0 (0.0)	1 (100.0)		
Means of notifying detected disease			χ^2 = 5.396	0.11
Phone call / SMS	223 (85.3)	38 (14.6)		
***[1]Others**	29 (69.0)	13 (31.0)		
Records of notified disease kept in the last one year			Exact = 278.292	0.000*
Yes	99 (85.3)	17 (14.7)		
No	2 (0.8)	242 (99.2)		
Number of times report sent in the last one year			χ^2 = 7.193	0.01*
0-2	71 (24.8)	215 (75.2)		
3 and above	30 (40.5)	44 (59.5)		
Number of feedbacks received in the last one year			χ^2 = 1.495	0.478
None	40 (34.2)	77 (65.8)		
1-2	37 (39.8)	56 (60.2)		
3 and above	15 (30.0)	35 (70.0)		
Received feedback given to community members			χ^2 = 23.197	0.00*
Yes	84 (36.7)	145 (63.3)		
No	17 (13.0)	114 (87.0)		

*Statistically significant ($P \leq 0.05$), Exact = Fisher's exact, X^2 = Chi square, t = t test
*[1]Others – Letter writing, fax, email, transport by bus.

Table 3c. Association between selected factors and completeness of disease notification among the respondents

Variable	Disease notified completely (Number, %)		Test statistic	p-value
	Yes (N, %)	No (N, %)		
Informant trained in CBSS			Exact = 1.313	0.45
Yes	100 (28.5)	251 (71.5)		
No	1 (11.1)	8 (88.9)		
Availability of supervisors			$\chi^2 = 2.765$	0.14
Yes	94 (29.5)	225 (70.5)		
No	7 (17.1)	34 (82.9)		
Frequency of supervisors visit in the last six months			$\chi^2 = 10.857$	0.09
None	13 (19.1)	55 (80.9)		
Once	16 (23.9)	51 (76.1)		
Twice	29 (42.6)	39 (57.4)		
Three times	14 (35.0)	26 (65.0)		
Four times	6 (26.1)	17 (73.9)		
More than four times	16 (30.19)	37 (69.81)		
Volunteer benefit from CBS			Exact = 4.346	0.05*
Yes	100 (29.2)	243 (70.8)		
No	1 (5.9)	16 (94.1)		
Challenges with carrying out CBS			$\chi^2 = 0.002$	1.00
Yes	79 (28.1)	202 (71.9)		
No	22 (27.8)	57 (72.2)		
Satisfied with CBS			$\chi^2 = 13.131$	0.00*
Yes	76 (34.23)	146 (65.77)		
No	25 (18.1)	113 (81.9)		

*Statistically significant ($P \leq 0.05$), Exact = Fisher's exact, χ^2 = Chi square, t = t test.

Table 4. Univariate analysis of factors affecting the completeness of disease case notification among the respondents

Variable	completeness of reporting		OR	95%CI	Test statistics	p-value
	Yes	No				
Source of information on detected disease					Exact = 14.805	
Routine visit to the villagers	36 (41.9)	50 (58.1)	1			0.446
Family of sick person	36 (23.7)	116 (76.3)	2.734	0.629 – 11.888		0.180
Health committee	24 (42.1)	33 (57.9)	1.165	0.293 – 4.630		0.828
Traditional healer	0 (0.0)	1 (100.0)	0.000	0.000 -		1.000
TBA	5 (62.5)	3 (37.5)	17.282	0.515 – 580.165		0.112
Record kept in the last one year					Exact = 278.292	
No	2 (0.8)	242 (99.2)				
Yes	99 (85.3)	17 (14.7)	1475.694	217.804 – 9998.329		0.000*
Number of times report sent in the last one year					$\chi^2 = 7.193$	
0-2	71 (24.8)	215 (75.2)				
3 and above	30 (40.5)	44 (59.5)	1.449	0.341 – 6.152		0.615
Feedback given to the community					$\chi^2 = 23.197$	
No	17 (13.0)	114 (87.0)				
Yes	84 (36.7)	145 (63.3)	4.202	1.245 – 14.186		0.021*
Volunteer benefits from CBS					Exact = 4.346	
No	25 (18.1)	113 (81.9)				
Yes	100 (29.2)	243 (70.8)	0.368	0.007 – 18.288		0.616
Satisfied with CBS					$\chi^2 = 13.131$	
No	25 (18.1)	113 (81.9)				0.006
Yes	76 (34.2)	146 (65.8)	2.322	1.387 – 3.886		0.001*

*Statistically significant ($p \leq 0.05$), Exact = Fisher's exact, χ^2 = Chi square, OR = Odds ratio, CI = Confidence interval.

Table 5. Multivariate analysis of factors affecting the completeness of disease case notification among the respondents

Variable	Completeness of reporting		AOR	95% CI	Test statistic	p-value
	Yes	No				
Record kept in the last one year					Exact = 278.292	
No	2 (0.8)	242 (99.2)	1			
Yes	99 (85.3)	17 (14.7)	820.817	168.429 – 4000.138		0.000*
Feedback given to the community					$\chi^2 = 23.197$	
No	17 (13.0)	114 (87.0)	1			
Yes	84 (36.7)	145 (63.3)	4.013	1.380 – 11.670		0.011*
Satisfied with CBS					$\chi^2 = 13.131$	
No	25 (18.1)	113 (81.9)	1			
Yes	76 (34.2)	146 (65.8)	0.563	0.165 -1.924		0.360

*Statistically significant ($p \leq 0.05$), Exact = Fisher's exact, χ^2 = Chi square, AOR = Adjusted odds ratio.

3.2. Results of the Qualitative Aspect of the Study

Consistent themes emerged from all the KII sessions. These include: the interactions of supervisors with the community informants, the contributions of the community informants to the success of CBSS, challenges faced generally, modalities for improving the CBSS and sustainability of the CBSS. The results with quotations include *"I used to supervise those people that are around me because I don't have much time as we lack staff here. But each time I have the time, I used to supervise those that are around me"* (focal person 5 in a rural area). Many of the focal persons affirmed that the community informants had contributed to the success of DSN in the State in general though this has been sub-optimal because of the non-active participation of many of the community informants in the system. *"Of course, the community informants have contributed to the success of disease surveillance and notification in the state. They have given us information on AFP cases in the community and within the last six months, they have given us not less than 18 confirmed cases of measles"* (focal person 3 in an urban area). *".....There is one that used to be punctual at Ifite. Each time he sees a case that he doesn't know about, he will call me on phone. I will then use my motorcycle to go and see the case. Only the same person has been sending reports to me often and on. He has sent in up to 3 or 4 measles cases but there has not been an AFP case. Others will begin to manage the case unless I visit them without notice. They will now say that this is what they think that they can do by themselves. They don't seem to care even though I told them that they should report the case immediately they see them"* (focal person 1 in a rural area). *"The informants have contributed to the success of DSN generally but some of them are complaining that the reason they don't report to me is because they don't have enough credit or they don't have transport fare to come and tell me"* (focal person 8 in a rural area).

Other challenges mentioned by the respondents included non - possession of phones by some community informants, lack of means of transportation, and poor attitude to CBS in general. However at the background of all these was still financial constraint. *"The main challenge is that of transport and some of them do not have phones. Even if they have phones, what of funds to make calls. But then it might just be all about commitment and altruism. If there is a way to help people, you will want these people to get that help. So it might not always be all about money"* (focal person 2 in a rural area). *"Financial constraint is the main problem or challenge. Even the state will always tell you that they don't have money. When you invite them to come and supervise us, they will tell you that they don't have money to come to supervise us in the field. If you call them for case verification, they will not come. At the end of the day, it is only WHO that will come to verify the case"* (DSNO 6 in a rural area)."*You know that these people are not being paid on a regular basis. They are just volunteering to do the job. This means that whenever they like, they report. This is unlike when you hope to get a reward for working"* (DSNO 5 in a rural area). *"If the state can help the disease cases by providing anything at all, e.g. drugs, it will go a long way in encouraging the system to work. If we have two or three donors like WHO put in place so that they will be sponsoring the programme both in cash and in kind and every other thing required to carry out surveillance, there will be a great improvement in the system"* (DSNO 5 in a rural area).

"If the state and the donor agencies can be giving them stipend on a monthly basis, it will encourage them further. Whenever they come around to sign off the stipend, they will remember that they have a job at hand. It will also give us the right to demand to see what they have achieved within the time limit. It will also be good to provide adequate numbers of IEC material e.g. posters with the case definitions, so that when they display them in their work places, they will be reminded of them constantly" (DSNO 2 in a rural area). "*CBS is working in the state and is contributing to the success of DSN in general because the recent LGA-based assessment done by WHO on IDSR revealed that most of the notifications came from the community to the LGA*" (state M&E officer). "*The engagement of community informants has contributed to the completeness of reporting in the state. They have been reporting cases which have been documented. At times even some parents report directly to the health facilities and these are recorded. We see all these when we analyze the pattern of reporting" (state WHO Coordinator). To strengthen the system, they need to give some encouragements to these community informants by if it is possible, giving them regular stipends so that they would now take it as a statutory function they need to fulfil. If they know that each month they are paid about ₦500, it becomes a commitment. You can say, every month call this person and tell him there's no case or there's a case. Giving them regular monthly stipend also gives you the moral justification to expect reports from them regularly. Otherwise it is you who will keep on calling them and asking them if they have cases*" (state WHO coordinator).

4. Discussion

This was a cross sectional descriptive mix method study that determined the completeness of reporting of the CBSS in Anambra State, Nigeria. The index research findings showed that the completeness of reporting of notifiable disease was 28.1%. An effective DSN system requires that there be completeness of reporting among other indicators. The sub-optimal completeness of reporting obtained in this study shows that the system lacks the capacity to provide a comprehensive and representative picture of the health situation in the communities. This finding is similar to those in a study by Kyei-Faried *et al.,* in Ghana [28]. It is however contrary to those from studies elsewhere where CBS achieved appreciable levels of completeness of reporting ranging from 59% - 95.6% [20,29,30,31]. This variation in findings could be linked to differences in study methodologies.

Completeness of reporting should ideally be assessed from records at the health facility level [29]. However, proxy data in the form of community informant registers with the minimum expected surveillance data within the last 3 months from the time of the survey was used. This

was done to contend the lack of clarity in the channel of reporting. This may have led to the low value obtained for completeness of reporting in this study since some community informants who detected and notified disease cases may not have recorded them in their registers. This however is the true picture as findings from the results of the KIIs in the index study confirm that many community informants were not committed to fulfilling their duties in the CBSS and that only few of them report the cases they detect. For instance, *".....There is one that used to be punctual at Ifite. Each time that he sees a case that he doesn't know about, he will call me on phone.... Only the same person has been sending reports to me often and on.... Others will begin to manage the case unless I visit them without notice. They will now say that this is what they think that they could do by themselves. They don't seem to care even though I told them that they should report the cases immediately they see them"* (focal person 1 in a rural area) The implication for such a low level of completeness of reporting as obtained in this study is the lack of reliability in the quality of generated data and the inaccuracies in disease evaluation and management accruing therefrom. If the desired quality of disease surveillance data is to be obtained at the community level, then there must be a reorientation of the community informants on the principles of CBSS as well as the need to streamline the channels of reporting in the system in the state as obtained in some other places [29].

This study also examined the influence of socio-demographic and some selected factors on the completeness of reporting of the CBSS in Anambra State. The age, gender, educational status and occupation of the respondents were found not to be significantly associated with completeness of reporting in this study. There was however a direct relationship between levels of knowledge of the respondents on CBSS with completeness of reporting in this study, a finding similar to those seen in other studies [32,33]. Even though no statistical significance was found, it posits that the community informants are knowledgeable about CBS and could successfully detect and report notifiable diseases as completely as expected.

Providing adequate training increases the awareness and knowledge of the community informants and enables them to report cases to the appropriate authorities in a more complete manner [29,34,35,36,37]. Almost all the respondents in this study have been trained at least once on the principles and practice of CBSS. This could be an explanation for the high level of knowledge exhibited by the respondents in this study. This explanation is buttressed by the findings from the results of the KIIs which affirmed that the informants receive trainings at least once a year. This finding in the index study is similar to those from several other studies which showed that providing trainings for community informants enhanced their knowledge base and resulted in improvement in their diagnostic abilities [29,37,38]. Providing training for community informants however had no statistically significant association with completeness of notifying diseases in this study. In the same vein, supportive supervision for the volunteers helps to strengthen their motivation, It also reinforces the knowledge they have gained as well as ensures that the right skills are used appropriately, that the necessary logistics are in place and that planned activities are implemented according to schedule [20,28,35,39,40]. This study has shown there was no statistically significant association between means through which diseases were notified and completeness of reporting in this study. Keeping of records by the community informants was found to be a sign of completeness of reporting in this study. This is consistent with findings from some other studies [20,41]. After adjusting for potential confounders, keeping of records was found to be an independent predictor of completeness of reporting in this study. This finding is comparable to the 33.8% reported by Ababa in the pastoralist and semi-pastoralist communities in Ethiopia [30] and could indicate that adequate number of detected diseases may not have been reported from the community and is as shown in this study where the completeness of reporting was only 28.1%.

The low rate of record keeping observed in this study may be because majority of the respondents (59.4%) mentioned that they do not possess registers. The findings from the KIIs in this study show that this is rarely done probably because of the lack of the moral justification to demand any performance output (record keeping) from individuals who are not provided with regular stipends. Moreover, findings from the KIIs in the index study also show that some supervisors rarely interact with the community informants or encourage them to be more active. This situation could however be ameliorated by proper accreditation of the volunteers.

This study also revealed a statistically significant association between volunteer satisfaction with being a community informant and completeness of disease notification. This is because a worker satisfied with his job is more likely to be motivated to be more productive. Several studies report that providing incentives which may be financial or non-financial has been shown to keep volunteers satisfied [20,35,36,39,42,43,44]. Findings from the results of the KIIs across all the levels of the CBSS in this study emphasize the need to provide regular monthly stipend to the community informants and to increase the stipend attached to notifying diseases. This they said will boost the morale of the community informants and encourage them to participate more actively in CBS. It has been said that an individual's real motivation results from their personal accomplishments through the challenge of work itself and not necessarily from the working conditions in the environment. However, for the individual to function optimally, the working conditions must be made adequately enabling [45]. Therefore the government should make provisions for adequate amounts of stipends or incentives to be given to the community informants in order to make the system more functional.

Strength and limitations: The strength of this study derives from the fact that it employed a mix method survey to provide detailed information on the characteristics and perceptions of the participants. The study is however limited in that completeness of reporting by the community informants should ideally be assessed from the records at the health facility level. However, due to lack of clarity in the channel of reporting in the CBSS, proxy data in the form of community informant registers with the minimum expected surveillance data within the

last three months from the time of the survey was used to assess completeness of reporting. This could be subject to information bias.

5. Conclusions

This study has shown that the completeness of reporting of notifiable diseases in the CBSS in Anambra State is very low, and implies that the system is functioning sub-optimally. The age, gender, educational status and occupation of the respondents were found not to be significantly associated with completeness of reporting in this study but there was a direct relationship between levels of knowledge of the respondents on CBSS with completeness of reporting in this study. The commonest reason given for the sub-optimal functioning of the CBSS in the State from the KII was lack of funds. Other important factors influencing the completeness of the CBSS in this study were the means through which detected diseases were notified, the availability of supervisors for community informants, keeping of records by community informants and giving feedback to the community. Based on the above findings, the researchers recommend as follows: The logistics needed for adequate record keeping by the community informants should be fully provided by the organizers of the programme. This will motivate them to keep proper records of all the notifiable diseases. Mandatory weekly reporting to nearby health facilities, including zero reporting, should also be demanded from the community informants. This will make for a more complete and representative data reporting from the CBSS. The channels of reporting in the CBSS in the state, especially at the peripheral level, should be properly streamlined, and at least all the government-owned health facilities should be involved in the CBSS so that the community informants could have easy access to them. Adequate amounts of stipends or incentives should also be provided by the government and other relevant authorities across all the levels of the CBSS. This will motivate all players in the system and make for a more functional CBSS.

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Competing Interests

The authors declare that they have no competing interests.

Ethics Approval and Consent to Participate

Ethical approval for this study was obtained from the Nnamdi Azikiwe University Teaching Hospital Ethics Committee. Permission to conduct the study was obtained from the State Ministry of Health and the selected Local Government PHC Departments. In addition, verbal and written informed consents were obtained freely and without coercion from all the respondent.

Authors' Contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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