RESEARCH ARTICLE

REVISED Post-Ebola Community Health Worker programme performance in Kenema District, Sierra Leone: A long way to go! [version 2; peer review: 1 approved, 1 approved with reservations]

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Abstract

Background: The devastating 2014-2015 Ebola outbreak in Sierra Leone could erode the gains of the health system including the Community Health Worker (CHW) programme. We conducted a study to ascertain if the positive trend in reporting cases of malaria, pneumonia and diarrhoea treated by CHWs in the post-Ebola period has been sustained 18 months post-Ebola.

Methods: We conducted a retrospective cross-sectional study using aggregated CHW programme data (2013-2017) from all Primary Health Units in Kenema district. Data was extracted from the District Health Information System and analysed using STATA. Data in the pre- (June 2013-April 2014), during- (June 2014-April 2015) and post-Ebola recovery (June 2016-April 2017) periods was compared and analysed for reporting completeness; Rapid Diagnostic Tests (RDTs) performed and cases of malaria, diarrhoea and pneumonia treated per month. Differences across periods were tested using two-sample t-test with significance set at 0.05.

Results: CHW reporting increased from pre-Ebola by 8% (p -value=0.29) intra-Ebola and 19% (p -value=0.012) post-Ebola. Compared to the pre-Ebola period, in the post-Ebola recovery period, there was a significant increase in the mean monthly reported RDTs of 35% (p -value=0.020); malaria treatments 66% (p -value<0.001); and pneumonia treatments increased by 80% (p -value=0.004). Conversely, the mean monthly diarrhoea cases treated decreased by 20% (p -value=0.16) in the post-Ebola period.

Open Peer Review

Approval Status

	1	2
version 2 (revision) 09 Apr 2020		 view
version 1 06 Jun 2019	 view	 view

1. **Palanivel Chinnakali** , Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Puducherry, India
2. **Joanna Raven** , Liverpool School of Tropical Medicine, Liverpool, UK

Any reports and responses or comments on the article can be found at the end of the article.

Conclusion: The resiliency demonstrated by the CHW programme during and immediately after the Ebola outbreak has been sustained in the post-Ebola recovery period. Continued programme investments in supportive supervision and financial incentives for CHWs will be critical to ensure uninterrupted contribution towards Sustainable Development Goal 3.

Keywords

Universal Health Coverage, Sustainable Development Goals, health systems, SORT IT, operational research

This article is included in the **Emerging Diseases and Outbreaks** gateway.

This article is included in the **TDR** gateway.

This article is included in the **Ebola Virus** collection.

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Author roles: **Thomas H:** Conceptualization, Data Curation, Formal Analysis, Investigation, Methodology, Validation, Writing – Original Draft Preparation, Writing – Review & Editing; **Hann K:** Conceptualization, Data Curation, Formal Analysis, Investigation, Methodology, Project Administration, Resources, Software, Validation, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing; **Vandi M:** Conceptualization, Investigation, Resources, Supervision, Writing – Review & Editing; **Sesay JB:** Data Curation, Investigation, Writing – Review & Editing; **Alpha KS:** Data Curation, Investigation, Writing – Review & Editing; **Najjemba R:** Data Curation, Formal Analysis, Methodology, Supervision, Validation, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing

Competing interests: No competing interests were disclosed.

Grant information: The programme was funded by the Special Programme for Research and Training in Tropical Diseases hosted at the World Health Organization (TDR).

The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

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First published: 06 Jun 2019, 8:794 <https://doi.org/10.12688/f1000research.18677.1>

REVISED Amendments from Version 1

We have amended the manuscript based on feedback from peer review. These amendments include additional descriptions of the following: lack of data availability on number of CHWs; definition of reporting completeness; trend analysis performed; specific details on CHW programme implementation; and study weaknesses.

Any further responses from the reviewers can be found at the end of the article

Introduction

The effect of the 2014–2015 West African Ebola outbreak on Community Health Worker (CHW) services in Kenema district, Sierra Leone, was assessed through a retrospective cross-sectional study comparing CHW reporting and services before (June 2013–April 2014), during (June 2014–April 2015) and post-outbreak (November 2015–April 2016)¹. The study found CHW reporting completeness and reported treatments for malaria increased post-Ebola, while those for pneumonia and diarrhoea returned to pre-outbreak levels. Results showed CHWs stopped performing Rapid Diagnostic Tests (RDTs) during the Ebola period and did not resume until after the outbreak. The study recommended additional investigations into preliminary positive trends in the early post-Ebola period to determine if these post-outbreak tendencies represent a resumption of pre-Ebola CHW programme performance or a continued progression. Therefore, we aimed to understand whether health system performance was sustained 18 months after the outbreak by reporting the trend and comparing CHW system performance (reporting completeness, reported diagnosis and treatment services among reports received) in Kenema district in the pre-, intra- and post-Ebola recovery periods for children under five years.

Methods

This was a retrospective cross-sectional study using aggregate CHW programme data from Kenema district, Sierra Leone. Details of Kenema and the CHW programme were previously described¹. The study population included all CHW programme reports from Kenema Peripheral Health Units (PHUs) during the pre- (June 2013–April 2014), intra- (June 2014–April 2015), and post-Ebola recovery (June 2016–April 2017) periods. Data during the month of May 2014 were excluded to prevent potential spill-over effects across periods. Consistent months were deliberately chosen to allow for seasonal comparison across the three periods.

CHW programme data were extracted from the electronic Ministry of Health and Sanitation (MoHS) District Health Information Systems (DHIS2), which is aggregated from monthly summary sheets submitted by PHU supervisors. Data on the following variables were extracted per month: facility reporting completeness; reported malaria RDTs; treatment for malaria, diarrhoea and pneumonia. The data available did not include variables on number of CHWs per facility. In this study we defined CHW reporting completeness as the proportion of facilities with fully (100%) complete submissions of CHW monthly summary sheets expected

for the time period. We imported data into STATA v14.2². We produced descriptive summary statistics and examined statistical differences between periods using two-sample t-test, with significance set at 0.05. We undertook a trend analysis for the periods pre- (June 2013–April 2014), intra- (June 2014–April 2015), and post-Ebola recovery (June 2016–April 2017) periods.

The national distribution of RDT and treatment supplies, which are distributed at the district level through the District Health Management Team's (DHMT) district store, are supported by the Global Fund. Each DHMT is expected to allocate 30% of the RDTs and drugs to CHWs in the district. Financial incentives for CHWs differ across different districts, depending on the partner supporting the programme in that specific district. In Kenema district, the Global Fund supports the programme and CHWs are provided with a financial incentive of SLL 100,000 per month, as per the National CHW Policy³.

While we do not have data on the number of CHWs in Kenema district, based on population data⁴ and estimates on CHWs⁵, we estimate that the district has roughly 1,250 CHWs.

Supervision across the CHW programme operates at different levels. CHW peer supervisors are identified out of every 10 CHWs, with the aim to offer supervision at the PHU level. At the district level, CHWs meet monthly with the PHU in-charges at the DHMT. Supportive supervision is provided from national level on a quarterly basis and which is supported by an assessment tool. During the Ebola outbreak period, the CHWs operated under the supervision of the District Social Mobilization Coordinators and were detecting suspected Ebola cases using the community case definitions⁶ and childhood illnesses using revised guidelines for the Integrated Community Case Management of Childhood Illnesses (ICCM)⁷.

The Sierra Leone Ethics and Scientific Review Committee (dated 18 December 2018) and the Ethics Advisory Group of the International Union against Tuberculosis Lung Disease (UAG number 65/18) provided ethics and institutional approval. Since aggregate programme data were used, participant consent was not sought.

Results

Proportion of PHUs reporting complete reports

Figure 1 shows the proportion of facilities with CHW complete reports monthly in the pre-, intra- and post-Ebola recovery periods. The number of PHUs submitting complete CHW reports ranged between 39–129 (27–89%) and 98–134 (68–92%) in the pre- and intra-outbreak periods respectively. However, there were some missing reports. Conversely, in the recovery period, 136 (94%) facilities consistently completed reports each month.

Mean monthly RDTs, malaria, diarrhoea and pneumonia cases reported

Figure 2 shows trends across pre-, intra- and post-Ebola recovery periods for CHW programme performance indicators. Table 1 shows that the mean monthly reported RDTs had an increasing trend in the pre-, intra- and post-Ebola recovery periods, with increases of 11% intra-Ebola and 35%

Figure 1. Proportion of Health Facilities with complete Community Health Workers reports in the District Health Information System, Kenema District, Sierra Leone, in the Pre-, Intra-, and Post-Ebola Recovery Periods. CHW – community health worker. Pre-Ebola Period – June 2013 – April 2014, Intra-Ebola Period – June 2014 – April 2015, Post-Ebola Recovery Period – June 2016 – April 2017.

(p -value=0.012) post-Ebola compared to the pre-Ebola period. The mean monthly malaria treatments reported trends similar to RDTs with increases of 31% (p -value=0.026) and 66% (p -value=0.020) intra-Ebola and post-Ebola, respectively.

The mean monthly diarrhoea treatments reported exhibited a downward trend, in the pre- and intra-Ebola periods, followed by a small uptick in the post-Ebola recovery period. However, compared to the pre-Ebola period, overall monthly mean reported treatments significantly decreased by 42% (p -value=0.013) in the intra-Ebola, while the reduction in the post-Ebola recovery period was not statistically significant (p -value=0.16).

The mean reported monthly pneumonia treatments declined by 11% intra-Ebola but grossly increased by 80% (p -value=0.004) during the recovery period compared to the pre-Ebola period (Table 1).

Discussion

Our study results indicate a general trend of the CHW programme in Kenema district sustaining comparable performance levels into the post-Ebola recovery period as compared to pre-Ebola for reporting completeness and reported RDTs, malaria and pneumonia treatments. Comparable to results from the previous

study¹ and the region⁸, this may be due to sustained investment in key areas affecting supply and services. The Integrated Disease Surveillance and Response approach, which emphasises active community-based surveillance and completeness of reporting, was strengthened in the intra-Ebola period⁸. In addition, supportive supervision, a critical element to the success of CHW programmes⁹, was revived after the outbreak⁸. Finally, financial incentives for CHWs initiated during the outbreak were subsequently incorporated into the national policy in 2016³. Furthermore, the CHWs have reported increased community awareness of signs and symptoms of common childhood illnesses, translating into increased demand for services⁸.

We found fewer missing reports in the pre- and intra-Ebola periods compared to the previous study¹, most likely due to retrospective data entry into the DHIS2. While we found higher mean reported RDTs performed in the post-Ebola period, we still observed fewer in the intra-Ebola period corresponding with the enactment of the “no touch policy,” similar to the previous report^{1,7,8}.

Our results reveal an absolute decline in the reported diarrhoea treatments during the recovery period. The promotion of hygiene practices through community sensitization^{9,10} and institution of bye-laws by community stakeholders in the intra-Ebola

Figure 2A. RDT and malaria treatments reported monthly **Figure 2B. Diarrhoea treatment services reported monthly** **Figure 2C. Pneumonia treatment services reported monthly**

Figure 2. Community Health Worker programme performance indicators for children aged under 5 years in Kenema district, Sierra Leone, in the Pre-, Intra-, and Post-Ebola Recovery Periods. RDT - Rapid Diagnostic Test. CHW – community health worker. Pre-Ebola Period – June 2013 – April 2014. Intra-Ebola Period – June 2014 – April 2015. Post-Ebola Recovery Period – June 2016 – April 2017.

Table 1. Reported monthly mean values and differences across periods in reference to the Ebola outbreak for performance of Community Health Worker Programme in Kenema District, Sierra Leone.

Reported monthly mean values	Period			Difference between pre- and intra-Ebola periods				Difference between pre- and post-Ebola recovery periods			
	Pre-Ebola	Intra-Ebola	Post-Ebola								
	n	n	n	n	%	95% CI	p-value	n	%	95% CI	p-value
Reporting completeness	79	85	94	6	8	(6, 19)	0.29	15	19	(4, 27)	0.012
RDTs	5877	6538	7963	661	11	(-1174, 2494)	0.46	2086	35	(369, 3802)	0.020
Malaria treatment	5338	6994	8882	1656	31	(222, 3092)	0.026	3544	66	(2029, 5060)	<0.001
Diarrhoea treatment	1083	627	866	-456	-42	(-106, -804)	0.013	-217	-20	(-528, 95)	0.16
Pneumonia treatment	699	625	1258	-74	-11	(-370, 223)	0.61	559	80	(197, 921)	0.004

CI: confidence interval; RDT: rapid diagnostic test. Pre-Ebola: June 2013 – April 2014; Intra-Ebola: June 2014 – April 2015; Post-Ebola Recovery: June 2016 – April 2017.

period may have had lasting effects on behaviour and thus contributing to the reduction in reported diarrhoea treatments during the post-Ebola period⁸. However, the difference in reported treatments between pre- and post-Ebola periods was not found to be significant, so this trend may warrant future investigation.

Utilising pre-Ebola service levels for comparisons, while useful, still reflect benchmarks of weak systems functioning, a factor which contributed to the impact of the Ebola outbreak itself¹¹. Therefore, it is imperative that such comparisons be evaluated in this light. Therefore, in order to achieve the vision of the Sustainable Development Goal (SDG) for good health and wellbeing beyond pre-Ebola-level benchmarks, sustained investments in supportive supervision and financial incentives for CHWs are essential for the programme.

A strength of the study is the use of complete district PHU data for the study period. Furthermore, we adhered to the Strengthening the Reporting of Observational Studies in Epidemiology guidelines for the reporting of observational data and sound ethical principles¹². Primary weaknesses of our study were the use of routinely collected data, which was influenced by reporting completeness. In addition, we defined reporting completeness per facility rather than per CHW due to availability of data. The use of routine data also led to a lack of data triangulation; inability to validate the electronic data base against the raw data and to generalise to the national CHW programme. In addition, we were not able to include data on the number of CHWs per facility, as they were not available.

In conclusion, although our study established a sustained trend towards the pre-Ebola CHW service levels 18 months after the outbreak, there is need for continued investment in the

CHW programme to continue gains in programme performance in order to contribute towards SDG 3.

Data availability

Underlying data

Open Science Framework: Thomas_Harold_SORTIT2_CHW_data 2019. <https://doi.org/10.17605/OSF.IO/2S83W>¹³.

Data are available under the terms of the [Creative Commons Zero “No rights reserved” data waiver](#) (CC0 1.0 Public domain dedication).

The Sierra Leone Health Management Information Systems, the District Health Information System 2 (DHIS2), is accessible with a Ministry of Health and Sanitation (MoHS) login through <https://sl.dhis2.org/>. The Directorate of Policy, Planning, and Information (DPPI) can be contacted to arrange access through Dr. Francis Smart (drfsmart@gmail.com), Director, DPPI, MoHS.

Acknowledgements

This research was conducted through the Structured Operational Research and Training Initiative (SORT IT), a global partnership coordinated by the Special Programme for Research and Training in Tropical Diseases at the World Health Organization (WHO/TDR) and implemented with partners. The training model is based on a course developed jointly by the International Union Against Tuberculosis and Lung Disease (The Union) and Médecins sans Frontières (MSF). The specific SORT IT programme which resulted in this publication was jointly developed and implemented by: WHO/TDR, the Sierra Leone Ministry of Health and Sanitation, WHO Sierra Leone, the Centre for Operational Research, The Union, Paris, France; the Alliance for Public Health, Ukraine; the Institute of Tropical Medicine, Antwerp, Belgium; and Sustainable Health Systems, Freetown, Sierra Leone.

References

1. Vandi MA, van Griensven J, Chan AK, *et al.*: **Ebola and community health worker services in Kenema District, Sierra Leone: please mind the gap!** *Public Health Action*. 2017; 7(Suppl 1): S55–S61.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
2. StataCorp: **Stata Statistical Software: Release 14**. College Station, TX: StataCorp LP. 2015.
[Reference Source](#)
3. Ministry of Health and Sanitation (MoHS): **National Community Health Worker Policy 2016-2020**. Freetown: MoHS. 2016.
[Reference Source](#)
4. Statistics Sierra Leone: **2015 Population and Housing Census**. Summary of Final Results. Freetown: Statistics Sierra Leone. 2016.
[Reference Source](#)
5. Ministry of Health and Sanitation (MoHS): **Human Resources for Health Strategy 2017-2021**. Freetown: MoHS. 2017.
[Reference Source](#)
6. Ilesanmi OS, Fawole O, Nguku P, *et al.*: **Evaluation of Ebola virus disease surveillance system in Tonkolili District, Sierra Leone**. *Pan Afr Med J*. 2019; 32(Suppl 1): 2.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
7. UNICEF and World Health Organization: **Guidelines for a revised implementation of Integrated Community Case Management of Childhood Illnesses (ICCM) during the Ebola outbreak**. UNICEF, WHO. 2014; 3.
[Reference Source](#)
8. Miller NP, Milsom P, Johnson G, *et al.*: **Community health workers during the Ebola outbreak in Guinea, Liberia, and Sierra Leone**. *J Glob Health*. 2018; 8(2): 020601.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
9. Ndima SD, Sidat M, Give C, *et al.*: **Supervision of community health workers in Mozambique: a qualitative study of factors influencing motivation and programme implementation**. *Hum Resour Health*. 2015; 13(1): 63.
[PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
10. FOCUS 1000, US Centers for Disease Control and Prevention, UNICEF: **Follow-up study on public knowledge, attitudes, and practices relating to Ebola virus disease prevention and medical care in Sierra Leone (Ebola KAP-4), Preliminary Report**. Freetown, Sierra Leone: FOCUS 1000. 2015; 21.
[Reference Source](#)
11. O'Hare B: **Weak health systems and Ebola**. *Lancet Glob Health*. 2015; 3(2): e71–2.
[PubMed Abstract](#) | [Publisher Full Text](#)
12. von Elm E, Altman DG, Egger M, *et al.*: **The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies**. *J Clin Epidemiol*. 2008; 61(4): 344–9.
[PubMed Abstract](#) | [Publisher Full Text](#)
13. Thomas H: **Thomas_Harold_SORTIT2_CHW_data**. *osf.io/2s83w*. 2019.
<http://www.doi.org/10.17605/OSF.IO/2S83W>

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Reviewer Report 26 May 2020

<https://doi.org/10.5256/f1000research.25602.r62169>

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Joanna Raven

Department of International Public Health, Liverpool School of Tropical Medicine, Liverpool, UK

I don't think the authors have really responded to my comment 2 (which is also linked to the response to comment 1). The CHW programme ie. the way that supervision and incentives were provided may affect how well the reporting was done and the overall performance of the programme. It is not clear how the programme was run in the three different phases and how this may influence the results. What role do supervision and incentives play in the overall performance should be discussed in the discussion?

Competing Interests: No competing interests were disclosed.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Version 1

Reviewer Report 13 August 2019

<https://doi.org/10.5256/f1000research.20451.r51795>

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Joanna Raven

Department of International Public Health, Liverpool School of Tropical Medicine, Liverpool, UK

This is an interesting study which investigates the CHW system performance pre, during and post Ebola periods looking at CHW reporting, reported diagnosis and treatment services. It particularly looks at sustained trends of performance 18 months after the end of Ebola. The article is well written and presented.

I suggest the following improvements to the paper:

1. In the introduction, a more detailed description of the CHW programme pre-Ebola, during Ebola and post Ebola is needed to provide context to the study and the findings. For example, who provided the supplies for the RDT and treatments, the financial incentives for the CHWs, and the supervision? How was this funded? Then in the discussion, this can be drawn upon to discuss the findings and offer recommendations.
2. Financial incentives for CHWs are included in the national CHW policy 2016-2020. However, there have been issues with getting the incentives to the CHWs, with many CHWs not receiving them. So, a discussion of the role of incentives in CHW performance should be discussed - is it the promise of money that motivates CHWs? How long will this willingness last, if the payments do not materialise?
3. The definition of the reporting completeness is unclear, and needs revision. It is unclear whether completeness indicates the reports from ALL the CHWs within the catchment area of the facility. If not, then how this affects the figures for reporting cases and treatment, needs to be discussed.
4. Reduction in diarrhoea treatment trend needs to be explored more, for example, comparisons made with diarrhoea treatment rates in other areas of Sierra Leone or national rates, and changes in availability of drugs.

Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Partly

If applicable, is the statistical analysis and its interpretation appropriate?

I cannot comment. A qualified statistician is required.

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Social science, health systems.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 31 Mar 2020

Katrina Hann, Sustainable Health Systems, Freetown, Sierra Leone

We have carefully read through the peer review and have revised our manuscript accordingly. We see the manuscript as improved as a result of this peer review process, and thank you for your support in taking the process to this stage.

Please find for your consideration the following:

1. A point-by-point response to the comments and suggestions of the reviewers in red font.
2. A new revised version of the manuscript, in tracked changes
3. A new, revised version of the manuscript, no tracked changes.

We hope that these modifications meet with your favourable review. Please do not hesitate to request any further changes.

Kind regards,

Harold Thomas
Directorate of Health Security and Emergencies
Ministry of Health and Sanitation (MoHS)
Freetown
Sierra Leone

Point-by-point response to the reviewer suggestions

Author Response to Reviewer Report for Version 1 from Joanna Raven 13 Aug 2019

Thank you for your thoughtful review of the manuscript and your suggestions. We have responded as below.

1. Reviewer comment: This is an interesting study which investigates the CHW system performance pre, during and post Ebola periods looking at CHW reporting, reported diagnosis and treatment services. It particularly looks at sustained trends of performance 18 months after the end of Ebola. The article is well written and presented.

I suggest the following improvements to the paper:

In the introduction, a more detailed description of the CHW programme pre-Ebola, during Ebola and post Ebola is needed to provide context to the study and the

findings. For example, who provided the supplies for the RDT and treatments, the financial incentives for the CHWs, and the supervision? How was this funded? Then in the discussion, this can be drawn upon to discuss the findings and offer recommendations.

Response:

We have added in a more detailed description of the CHW programme and its operations in the study setting section under methods.

2. Reviewer comment: Financial incentives for CHWs are included in the national CHW policy 2016-2020. However, there have been issues with getting the incentives to the CHWs, with many CHWs not receiving them. So, a discussion of the role of incentives in CHW performance should be discussed - is it the promise of money that motivates CHWs? How long will this willingness last, if the payments do not materialise?

Response:

We agree that the implementation of distribution of financial incentives for CHWs may be challenging. However, we see a discussion on the role of incentives in CHW performance as beyond the scope of this paper.

3. Reviewer comment: The definition of the reporting completeness is unclear. and needs revision. It is unclear whether completeness indicates the reports from ALL the CHWs within the catchment area of the facility. If not, then how this affects the figures for reporting cases and treatment, needs to be discussed.

Response:

We have revised our description of the definition of reporting completeness in the manuscript. In addition, we have added this point to our discussion section.

4. Reviewer comment: Reduction in diarrhoea treatment trend needs to be explored more, for example, comparisons made with diarrhoea treatment rates in other areas of Sierra Leone or national rates, and changes in availability of drugs.

Response:

We agree with these points, but do not have data in the context of this study by which to make such comparisons. We have, however, pointed to the need for future investigations that may further explain this finding.

Competing Interests: NA

Reviewer Report 24 June 2019

<https://doi.org/10.5256/f1000research.20451.r49603>

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Palanivel Chinnakali

Department of Preventive and Social Medicine, Jawaharlal Institute of Postgraduate Medical Education and Research (JIPMER), Puducherry, Puducherry, India

The manuscript is written well.

1. It will be better to provide some more background about the scale of involvement of CHWs during Ebola outbreak. How CHWs were involved, time points when the Ebola cases came down, post outbreak responsibilities for CHWs related to Ebola
2. Impact/severity of Ebola outbreak in the study district Kenema compared to others.
3. Study design: Instead of retrospective cross sectional study, I suggest this 'We performed trend analysis using routinely reported aggregate CHW programme data'
4. Methods: Provide information on the total population of the district, malaria and diarrhea statistics, number of health facilities, number of CHWs present during the pre-Ebola period, how they report (paper based/electronic).
5. Missing reports: present the facts in the results section and then can be brought under 'discussion' section
6. Reporting on number of CHWs would be good in the results section. Were there any deaths among CHWs due to Ebola?
7. What could be the possible reasons for 80% increase in reporting of Pneumonia during post Ebola period? It would be good to discuss the possible reasons

Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Partly

If applicable, is the statistical analysis and its interpretation appropriate?

Yes

Are all the source data underlying the results available to ensure full reproducibility?

No source data required

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Operational Research (Implementation Research), Tuberculosis, HIV/AIDS

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Author Response 31 Mar 2020

Katrina Hann, Sustainable Health Systems, Freetown, Sierra Leone

RE: Post-Ebola Community Health Worker programme performance in Kenema District, Sierra Leone: A long way to go! [version 1; peer review: 1 approved, 1 approved with reservations]

We have carefully read through the peer review and have revised our manuscript accordingly. We see the manuscript as improved as a result of this peer review process, and thank you for your support in taking the process to this stage.

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1. A point-by-point response to the comments and suggestions of the reviewers in red font.
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We hope that these modifications meet with your favourable review. Please do not hesitate to request any further changes.

Kind regards,

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Directorate of Health Security and Emergencies
Ministry of Health and Sanitation (MoHS)
Freetown
Sierra Leone

Author Response to Reviewer Report for Version 1 from Palanivel Chinnakali 24 June 2019

Thank you for your thoughtful review of the manuscript and your insightful suggestions. We have responded as below.

1. Reviewer comment:

The manuscript is written well. It will be better to provide some more background about the scale of involvement of CHWs during Ebola outbreak. How CHWs were involved, time points when the Ebola cases came down, post outbreak responsibilities for CHWs related to Ebola.

Response:

Thank you very much for your comments. We agree that additional comment on the CHW programme will be useful to the reader. We have added further details the methods study setting section.

2. Reviewer comment: Impact/severity of Ebola outbreak in the study district Kenema compared to others.

Response:

Thank you for your comment. Your suggestion is interesting, However, this is beyond the scope of our study as we did not employ comparative methods.

3. Reviewer comment: Study design: Instead of retrospective cross sectional study, I suggest this 'We performed trend analysis using routinely reported aggregate CHW programme data'.

Response:

Thank you for your suggestion. We agree with your point and have added in the methods section a description of the trend analysis over the stipulated periods.

4. Reviewer comment: Methods: Provide information on the total population of the district, malaria and diarrhea statistics, number of health facilities, number of CHWs present during the pre-Ebola period, how they report (paper based/electronic).

Response:

Thank you for your comment. We do not have data on the number of CHWs operating during the period under study. However, we did estimate the number of CHWs based off of population data for the district from the 2015 Census and an estimate of the total number of CHWs nationwide from the Human Resources for Health Strategy 2017. We have clarified this in the manuscript, with associated references.

5. Reviewer comment: Missing reports: present the facts in the results section and then can be brought under 'discussion' section.

Response:

Thank you very much for your comment. We appreciate this and we have clarified this in the results section. We already mentioned reporting completeness as a weakness of the study in the discussion section, and, therefore, have not made adjustments.

6. Reviewer comment: Reporting on number of CHWs would be good in the results section. Were there any deaths among CHWs due to Ebola?

Response:

Thank you for your comments. Whilst we appreciate your comments, we have addressed the issue of data availability with regards to number of CHWs, and the mortality of CHWs is outside the scope of our study.

7. Reviewer comment:What could be the possible reasons for 80% increase in reporting of Pneumonia during post Ebola period? It would be good to discuss the possible reasons.

Response:

Thank you for your comments. We have addressed that in the discussion section in the paragraph where we introduce possible reasons for increase in service demand.

Competing Interests: NA

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