Staffing in public health facilities after the Ebola outbreak in rural Sierra Leone: How much has changed? [version 1; peer review: 3 approved with reservations]

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Abstract

Background: The 2014-2015 Ebola outbreak in Sierra Leone led the Ministry of Health and Sanitation to set minimum standards of staffing (medical/non-medical) at the district level for the provision of basic essential health services (BPEHS).

In one of the worst Ebola affected districts in Sierra Leone, we assessed staffing levels measured against these stipulated standards before, during, and 16 months after the Ebola outbreak.

Methods: The study population included all health workers in 83 health facilities. We assessed staffing levels at three points in time: pre-Ebola (April 2014); the end of the outbreak (November 2015); and 16 months post-Ebola (March 2017).

April 2014 was immediately prior to the Ebola outbreak and thus representative of the human resource situation before the outbreak. November 2015 was the month when Sierra Leone was declared Ebola-free, and thus reflects the end-situation after Ebola. March 2017 was two years since the launch of the BPEHS, and some progress should be expected.

Results: Against recommended medical staff numbers during pre-, intra- and post-Ebola periods, deficits were 67%, 65% and 60% respectively. Similarly, against recommended non-medical staff numbers during pre-, intra- and post-Ebola periods, the deficit remained at 92% throughout. In the post-Ebola period, there was a deficit of 73% against 1,389 recommended health worker positions.

Conclusions: Nothing has really changed in the state of human resources for health, and urgent measures are needed to rectify the situation and prevent a déjà vu in the advent of a new Ebola outbreak.

Keywords

Outbreak response, SORT IT, Sustainable Development Goals, Universal Health Coverage, Basic Package of Essential Health Services
This article is included in the TDR gateway.

This article is included in the Disease Outbreaks gateway.

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Author roles: Squire JS: Conceptualization, Data Curation, Formal Analysis, Investigation, Methodology, Project Administration, Resources, Software, Validation, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing; Hann K: Data Curation, Investigation, Methodology, Project Administration, Validation, Writing – Review & Editing; Denisiuk O: Formal Analysis, Methodology, Software, Supervision, Validation, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing; Zachariah R: Conceptualization, Formal Analysis, Funding Acquisition, Methodology, Resources, Supervision, Visualization, Writing – Original Draft Preparation, Writing – Review & Editing

Competing interests: No competing interests were disclosed.

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**Introduction**

The Ministry of Health and Sanitation of Sierra Leone has stipulated minimum staffing levels for all public health facility levels based on the Basic Package of Essential Health Services (BPEHS)\(^1\).

An observational study published in 2017 following the 2014–2015 Ebola outbreak reported alarming human resource deficits in public health facilities in Kailahun district of rural Sierra Leone\(^2\). Of 805 recommended medical staff, the deficit was 501 (62%) and hovered over 50% at all levels of health facilities. Similarly, of 569 recommended non-medical staff, the deficit was 524 (92%). The overarching message was that to meet the BPEHS\(^1\) standards, the Government would need to attract an additional 1,026 workers to Kailahun district over the period 2016–2020 (roughly 256 additional workers per annum).

Three years have now passed since the end of the Ebola outbreak and the operational question is “what has changed” in terms of progress towards achieving BPEHS standards.

Among all public health facilities in Kailahun district of Sierra Leone and in relation to BPEHS standards, we thus assessed staffing levels (medical and non-medical) one month before the onset of the Ebola outbreak, during the last month of the outbreak, and 16 months thereafter.

**Methods**

This was a comparative cross-sectional study using programme data. The study setting has been described before\(^3\). The study site was Kailahun district, the first district affected by the Ebola outbreak in Sierra Leone. It shares borders with the Republic of Liberia and Guinea. The health infrastructure is tiered into tertiary hospitals, district hospitals and Peripheral Health Units. The current study included all 82 functional public health facilities.

The study population included all health workers in these health facilities. We assessed staffing levels at 16 months post-Ebola (March 2017), and compared to previously reported staffing levels for pre-Ebola (April 2014) and the end of the outbreak (November 2015)\(^4\).

April 2014 was immediately prior to the Ebola outbreak and thus representative of the human resource situation before the outbreak. November 2015 was the month when Sierra Leone was declared Ebola-free, and thus representative of the end-situation after Ebola. March 2017 was selected because the revised BPEHS was launched two years prior to this date, and some progress should have been expected.

Data variables were sourced from the monthly district staff list (District Health Information Systems; DHIS2) and the Human Resource Management Information System. Deficits in staffing levels were derived by subtracting the actual levels from the stipulated levels.

Ethics approval was obtained from the Sierra Leone Ethics and Scientific Review Board (dated 18 December 2018) and the Union Ethics Advisory Group (International Union against Tuberculosis and Lung Disease, Paris, France; UAG number 71/18). Since anonymized programme data were used, the requirement for informed consent was waived.

**Results**

**Table 1** shows the medical staffing levels in relation to BPEHS standards. Of 805 recommended medical staff during the pre-Ebola and intra-Ebola periods, deficits were 539 (67%) and 528 (65%) respectively. During the post-Ebola period, a total of 815 medical staff were recommended, but the deficit was 490 (60%; a 5% improvement over the intra-Ebola period). When stratified by health facility levels, human resource gaps ranged between 31% and 71%.

**Table 2** shows non-medical staffing levels in relation to BPEHS standards. The overall deficit remained the same at the three time-points. Of 569 recommended non-medical staff during pre- and post-Ebola, the deficits were 526 (92%) and 525 (92%), respectively. During the post-Ebola period, of 574 recommended non-medical staff, the deficit was 528 (92%).

By March 2017 and well into the post-Ebola period, a total of 1,389 health worker positions (medical and non-medical) were recommended by BPEHS, but only 371 (27%) were filled, resulting in an overall human resource deficit of 1,018 (73%).

**Discussion**

This is the first study assessing staffing levels (medical and non-medical) 16 months into the post-Ebola period and comparing the status with pre- and intra-Ebola periods. The situation remains alarming with a 60% deficit for medical and 92% deficit for non-medical staff.

We need to reiterate our earlier urgent call for bold policies and donor support that goes beyond “business as usual.”\(^5\) In addition to enhancing staff training, further action could include rapid mobilization of financial resources for employment of non-medical and support staff, including those currently out of public service and reinstatement of retired medical personnel still fit enough to work\(^5\). Importantly the macro-economic restrictions on the wage bill imposed by the International Monetary Fund (IMF) hamper recruitment and adequate salary levels\(^5\). These need to be boldly tackled. Whether or not the BPEHS standards are realistic and adaptation thereof may also need consideration.

The strengths of the study are that we included all district public health facilities, all human resource cadres and similar
Table 1. Overall medical staffing\(^1\) levels and gaps in relation to the recommended BPEHS standards assessed pre-, intra- and post-Ebola\(^2\) in Kailahun district, Sierra Leone.

<table>
<thead>
<tr>
<th></th>
<th>Pre-Ebola n (%)</th>
<th>Intra-Ebola n (%)</th>
<th>Post-Ebola n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total staff</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recommended</td>
<td>805</td>
<td>805</td>
<td>815(^3)</td>
</tr>
<tr>
<td>Actual</td>
<td>266</td>
<td>277</td>
<td>325</td>
</tr>
<tr>
<td>Human resource gap</td>
<td>539 (67)</td>
<td>528 (66)</td>
<td>490 (60)</td>
</tr>
<tr>
<td>Health facility levels</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>District Hospital</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recommended</td>
<td>256</td>
<td>256</td>
<td>256</td>
</tr>
<tr>
<td>Actual</td>
<td>66</td>
<td>77</td>
<td>74</td>
</tr>
<tr>
<td>Human resource gap</td>
<td>190 (74)</td>
<td>179 (70)</td>
<td>182 (71)</td>
</tr>
<tr>
<td>CHC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recommended</td>
<td>252</td>
<td>252</td>
<td>252</td>
</tr>
<tr>
<td>Actual</td>
<td>71</td>
<td>77</td>
<td>97</td>
</tr>
<tr>
<td>Human resource gap</td>
<td>181 (72)</td>
<td>175 (69)</td>
<td>155 (62)</td>
</tr>
<tr>
<td>CHP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recommended</td>
<td>240</td>
<td>240</td>
<td>265(^4)</td>
</tr>
<tr>
<td>Actual</td>
<td>104</td>
<td>101</td>
<td>125</td>
</tr>
<tr>
<td>Human resource gap</td>
<td>136 (57)</td>
<td>139 (58)</td>
<td>140 (53)</td>
</tr>
<tr>
<td>MCHP</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recommended</td>
<td>57</td>
<td>57</td>
<td>42(^1)</td>
</tr>
<tr>
<td>Actual</td>
<td>25</td>
<td>22</td>
<td>29</td>
</tr>
<tr>
<td>Human resource gap</td>
<td>32 (56)</td>
<td>35 (61)</td>
<td>13 (31)</td>
</tr>
</tbody>
</table>

BPEHS: Basic Package of Essential Health Services document for improving health service delivery in Sierra Leone; CHC: Community Health Center; CHP: Community Health Post; MCHP: Maternal and Child Health Post
\(^1\) Includes staff such as specialist doctors, general practitioners, clinical officers, nurses and midwives
\(^2\) Pre-Ebola – April 2014; Intra-Ebola – November 2015; Post-Ebola – March 2017
\(^3\) The overall recommended numbers of staff as per the BPEHS increased from 805 during the pre- and intra-Ebola period to 820 in the post-Ebola period as one new facility was added in the post-Ebola period.
\(^4\) Similarly, during the post-Ebola period, 5 MCHPs were upgraded to CHPs increasing the staffing requirement for the CHPs from 240 to 265.

Data prior to, during and after the outbreak. The main limitation is that we might have excluded some staff not on regular payrolls (those working on a volunteer basis), although we believe this is unlikely to offset or negate our study findings.

There are two key messages from this study. First, at the current rate of 5% improvement in the medical staff deficit over the 16-month post-Ebola period (65% intra-Ebola to 60% post-Ebola), it will take an additional 12 years to achieve BPEHS standards - too little, too slow!

Second, the persistent 92% gap for non-medical staff has major implications for future Ebola and infectious disease outbreaks\(^6\). Essential services for infection prevention and control at health facilities and the implementation of personal hygiene measures and effective waste management depend on non-medical staff. In the unfortunate event of a new Ebola outbreak, the current scenario would result in a \textit{déjà vu} of high transmission among health workers and the community at large. Ending the restrictive wage bill\(^4\) is vital to mobilize the needed financial resources and rapidly employ and deploy staff.

In conclusion, with an overall health worker deficit of 1,018, 16 months into the post-Ebola period compared to a deficit of 1,026 during the Ebola outbreak, “nothing has really changed.” We reiterate our call for strong political will, international collaboration, generous funding and a change in hiring restrictions imposed by the IMF.
Table 2. Overall non-medical\(^1\) staffing levels and gaps in relation to the recommended BPEHS standards assessed pre-, intra- and post-Ebola\(^2\) in Kailahun district, Sierra Leone.

<table>
<thead>
<tr>
<th></th>
<th>Pre-Ebola(n (%))</th>
<th>Intra-Ebola(n (%))</th>
<th>Post-Ebola(n (%))</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total staff</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recommended</td>
<td>569</td>
<td>569</td>
<td>574(^3)</td>
</tr>
<tr>
<td>Actual</td>
<td>43</td>
<td>44</td>
<td>46</td>
</tr>
<tr>
<td>Human resource gap</td>
<td>526 (92)</td>
<td>525 (92)</td>
<td>528 (92)</td>
</tr>
<tr>
<td><strong>Health facility levels</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>District Hospital</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recommended</td>
<td>88</td>
<td>88</td>
<td>88</td>
</tr>
<tr>
<td>Actual</td>
<td>31</td>
<td>31</td>
<td>34</td>
</tr>
<tr>
<td>Human resource gap</td>
<td>57 (65)</td>
<td>57 (65)</td>
<td>54 (61)</td>
</tr>
<tr>
<td><strong>CHC</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recommended</td>
<td>98</td>
<td>98</td>
<td>98</td>
</tr>
<tr>
<td>Actual</td>
<td>9</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>Human resource gap</td>
<td>89 (91)</td>
<td>89 (91)</td>
<td>90 (92)</td>
</tr>
<tr>
<td><strong>CHP</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recommended</td>
<td>288</td>
<td>288</td>
<td>318(^4)</td>
</tr>
<tr>
<td>Actual</td>
<td>3</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Human resource gap</td>
<td>285 (99)</td>
<td>284 (99)</td>
<td>314 (99)</td>
</tr>
<tr>
<td><strong>MCHP</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recommended</td>
<td>95</td>
<td>95</td>
<td>70(^5)</td>
</tr>
<tr>
<td>Actual</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Human resource gap</td>
<td>95 (100)</td>
<td>95 (100)</td>
<td>70 (100)</td>
</tr>
</tbody>
</table>

BPEHS: Basic Package of Essential Health Services document for improving health service delivery in Sierra Leone; CHC: Community Health Center; CHP: Community Health Post; MCHP: Maternal and Child Health Post

\(^1\) Includes staff such as administrative staff, cleaners, cooks, maintenance workers, drivers and security personnel

\(^2\) Pre-Ebola – April 2014; Intra-Ebola – November 2015; Post-Ebola – March 2017

\(^3\) The overall recommended numbers of staff as per the BPEHS increased from 569 during the pre- and intra-Ebola period to 574 in the post-Ebola period as one new facility was added in the post-Ebola period.

\(^4\) Similarly, during the post-Ebola period, 5 MCHPs were upgraded to CHPs increasing the staffing requirement for the CHPs from 288 to 318.

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Data availability

Underlying data


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 login through https://sl.dhis2.org/. The Directorate of Policy, Planning, and Information (DPPI) can be contacted through Dr. Francis Smart (drfsmart@gmail.com), Director, DPPI, MOHS, with an information request detailing the specific data request and purpose of use. Applicants will be asked to provide details of the reason for the request and details pertaining data request (such as data points, disaggregation, time period). In this case, data access would be granted to persons who request data for research purposes if they can provide appropriate ethical approval documentation.

Grant information

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

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

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References

Open Peer Review

Current Peer Review Status: ? ? ?

Version 1

Reviewer Report 17 September 2019

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Armand Sprecher
Médecins Sans Frontières, Brussels, Belgium

This study gives a simple, but clear, description of the gap between Sierra Leone's health structure staffing ambitions and the actual state of affairs in Kailahun over the last several years. By merely measuring the difference between what the ministry of health and sanitation has set as staffing objectives and what it has achieved, the study is no more complicated than it needs to be. As such, the methods and results sections are suitably short and to the point.

That being said, the paper would profit from going into greater depth in the discussion. This is hardly the first study to examine staffing shortfalls in Sierra Leone. The authors cite their own previous work, but there are other papers that merit mention in this domain. A quick PubMed search of "Sierra Leone Staffing" brings up a number of studies, some of which the authors may wish to include in their discussion of health structure staffing in Sierra Leone.

The reader is also left in the dark as to how the Basic Package of Essential Health Services was put together and whether the levels set in this standard were tailored to well assessed needs in Sierra Leone, imported from another context, or are aspirational. As such, it is difficult for the reader to guess at the impact of the measured gap.

The paper would benefit from some additional exploration of not meeting this standard. The authors speculate about the consequences of the severe non-medical under-staffing in terms of being unable to cope with infectious disease outbreaks because of insufficient hygiene staff, but at a 92% deficit of "administrative staff, cleaners, cooks, maintenance workers, drivers, and security personnel" (and this list should perhaps appear somewhere in the body of the paper and not just in a footnote to table 2), the day to day consequences should go well beyond this.

The reader might also profit from some information about why the gap has persisted. The recommendation to mobilize additional financial resources suggests that the underlying problem is insufficient funding, which seems reasonable, but the foundation for this recommendation is never laid by any mention of what has caused the gap to remain. Perhaps the money is available but the qualified people are in the middle of their training programs? Other problems could be at work as well, but the
authors do not explore this next logical step following from their findings.

This is a nice simple study, but the readers would profit from the authors shedding more light on the meaning of their findings.

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

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?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Not applicable

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

Are the conclusions drawn adequately supported by the results?
Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Epidemiology, filovirus outbreak management, public health

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.
hiring/staffing of the health facilities in the article. While the presentation of the problem is clear it will be really interesting and important to understand root-causes of the problems which may help to solve the issues discussed. Most importantly if there was a standard setting for minimum staff levels by the Ministry (so, assuming there is political will) then what are the constrains for not increasing number of human resources. The lack of qualified professionals may cause the under-staffing of medical resources but we observe no change in the number of non-medical staff so there should be other causes preventing the capacity increase in terms of human resources. If the data is not available researchers might want to address it in the limitations and call for further investigation of the topic.

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?
Yes

If applicable, is the statistical analysis and its interpretation appropriate?
Not applicable

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: Operational research, Tuberculosis, HIV

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.

Reviewer Report 04 September 2019
https://doi.org/10.5256/f1000research.20323.r53417

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Wendemagegn Enbiale
Department of Dermatovenerology, College of Medicine and Health Sciences, Bahir Dar University, Bahir Dar, Ethiopia
I have found the study very interesting and partially relevant in flagging the deficit for minimal staffing by label of care (based on the BPEHS standards) in Sierra Leone.

Some of my question and concerns are:
1. Health Workforce (HWF) staffing usually measured based on population and there are intentional standards for developing countries. Why the authors are not interested to use or at least mention that?

2. What is the catchment population of those health facilities and what is the health workforce staffing deficit based on the WHO criteria (for a developing country)?

3. Do you need the HWF just to fulfil the BPEHS standard or is there any evidence suggesting compromisation of the routine health care service because of the stated HWF deficit.

4. For prioritization and focused action, I would recommend the showing the dis-aggregated deficit from nurses, midwives and doctors which would be much more important for the policy maker for action.

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

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

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

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

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

Are the conclusions drawn adequately supported by the results?
No

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Human resource for health and Skin NTD

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.
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