



RESEARCH ARTICLE

**REVISED** Staffing in public health facilities after the Ebola outbreak in rural Sierra Leone: How much has changed? [version 2; peer review: 2 approved, 1 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

**Open Peer Review**

Reviewer Status ? ✓ ✓

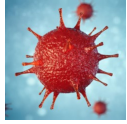
	Invited Reviewers		
	1	2	3
<b>version 2</b> (revision) 09 Jan 2020		✓	✓ report
<b>version 1</b> 06 Jun 2019	? report	? report	? report

- Wendemagegn Enbiale**, Bahir Dar University, Bahir Dar, Ethiopia
- Hayk Davtyan**, TB Research and Prevention Center, Yerevan, Armenia
- Armand Sprecher** , Médecins Sans Frontières, Brussels, Belgium

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



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



This article is included in the **Disease Outbreaks** gateway.

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**First published:** 06 Jun 2019, 8:793 (<https://doi.org/10.12688/f1000research.18566.1>)

**REVISED Amendments from Version 1**

We have amended the manuscript based on feedback from peer review. These amendments include additional descriptions of the following: investments in human resources for health by the Government of Sierra Leone; the implications of non-medical staff on maintaining infection prevention and control measures; processes related to training, hiring, and financing of health care workers; and barriers to increasing staff numbers. Finally, we included two additional references to support the above additions.

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

**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)<sup>1</sup>. 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<sup>2</sup>. 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<sup>1</sup> 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).

The post-Ebola period presented an opportunity for the Government of Sierra Leone to devise a health services investment plan. This included a robust investment in human resources for health with a 2020 target for scale up of the BPEHS<sup>3</sup>. Both medical and non-medical staff are essential to maintain service delivery standards, including infection prevention and control practices, and both these staff cadres are included. The shortage in non-medical staff was found to have major implications for maintaining essential services related to infection prevention and control (IPC), such as screening and triage, health facility and personal hygiene as well as waste management<sup>2</sup>.

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<sup>2</sup>. 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.

Pre-service training of health care workers is carried out by the Ministry of Tertiary and Higher Education. Upon completion of training, health workers are recruited by the Public Service Commission of the Government of Sierra Leone. Financing of health workers once recruited into the civil service is largely carried out by the Government of Sierra Leone through a consolidated fund. The Human Resource Directorate of the Ministry of Health and Sanitation has the responsibility of posting staff to health facilities across the country. However, due to budgetary limitations on paying salaries, many health care workers serve as volunteers in health facilities and are not on a regular payroll. The International Monetary Fund macro-economic restrictions on fiscal space, in particular the wage bill, hampers the recruitment and hiring of health workers<sup>4</sup>, and this has been a major barrier in increasing staff numbers in relation to the BPEHS.

The study population included all health workers in these health facilities. We disaggregated staff deficits by medical and non-medical staff (for a full list see Table 5 & Table 6 of Squire *et al.* 2017)<sup>2</sup>. 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)<sup>1</sup>.

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

**Table 1. Overall medical staffing<sup>1</sup> levels and gaps in relation to the recommended BPEHS standards assessed pre-, intra- and post-Ebola<sup>2</sup> in Kailahun district, Sierra Leone.**

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

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

<sup>1</sup> Includes staff such as specialist doctors, general practitioners, clinical officers, nurses and midwives

<sup>2</sup> Pre-Ebola – April 2014; Intra-Ebola – November 2015; Post-Ebola – March 2017

<sup>3</sup> The overall recommended numbers of staff as per the BPEHS increased from 805 during the pre- and intra-Ebola period to 815 in the post-Ebola period as one new facility was added in the post-Ebola period.

<sup>4</sup> Similarly, during the post-Ebola period, 5 MCHPs were upgraded to CHPs increasing the staffing requirement for the CHPs from 240 to 265.

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.”<sup>5</sup> 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<sup>2</sup>. Importantly the macro-economic restrictions on the wage bill imposed by the International Monetary Fund (IMF) hamper recruitment and adequate salary levels<sup>4</sup>.

**Table 2. Overall non-medical<sup>1</sup> staffing levels and gaps in relation to the recommended BPEHS standards assessed pre-, intra- and post-Ebola<sup>2</sup> in Kailahun district, Sierra Leone.**

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

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

<sup>1</sup>Includes staff such as administrative staff, cleaners, cooks, maintenance workers, drivers and security personnel

<sup>2</sup>Pre-Ebola – April 2014; Intra-Ebola – November 2015; Post-Ebola – March 2017

<sup>3</sup>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.

<sup>4</sup>Similarly, during the post-Ebola period, 5 MCHPs were upgraded to CHPs increasing the staffing requirement for the CHPs from 288 to 318.

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 data prior to, during and after the outbreak. The main limitation is that we might have excluded some staff not on regular pay-rolls (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<sup>6</sup>. 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 *déjà vu* of high transmission among health workers and the community at large<sup>7</sup>. Ending the restrictive wage bill<sup>4</sup> 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.

## Data availability

### Underlying data

Open Science Framework: Squire J. Squire\_James\_SORTIT2\_HRH\_data 2019. <https://doi.org/10.17605/OSF.IO/QK5YG><sup>8</sup>.

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](mailto: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.

## 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 and the Centre for Operational Research, The Union, Paris, France. Mentorship and the coordination/facilitation of the SORT IT workshops were provided through the Centre for Operational Research, The Union, Paris, France; Alliance for Public Health, Ukraine; Institute of Tropical Medicine, Antwerp, Belgium; and Sustainable Health Systems, Freetown, Sierra Leone.

## References

1. MoHS: **The Basic Package of Essential Health Services, 2015–2020**. Freetown, Sierra Leone: Ministry of Health and Sanitation. 2015. Accessed 14th January, 2016. [Reference Source](#)
2. Sylvester Squire J, Hann K, Denisiuk O, *et al.*: **The Ebola outbreak and staffing in public health facilities in rural Sierra Leone: who is left to do the job?** *Public Health Action*. 2017; 7(Suppl 1): S47–S54. [PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
3. Govindaraj R, Herbst CH, Clark JP: **Strengthening Post-Ebola Health Systems: From Response to Resilience in Guinea, Liberia, and Sierra Leone**. Washington, DC; 2018. [Reference Source](#)
4. Marphatia A, Moussié R, Ainger A, *et al.*: **Confronting the contradictions: The IMF, wage bill caps and the case for teachers**. Action AID, 2007. Accessed 22 February 2019. [Reference Source](#)
5. Philips M, Markham A: **Ebola: a failure of international collective action**. *Lancet*. 2014; **384**(9949): 1181. [PubMed Abstract](#) | [Publisher Full Text](#)
6. Harries AD, Zachariah R, Tayler-Smith K, *et al.*: **Keeping health facilities safe: one way of strengthening the interaction between disease-specific programmes and health systems**. *Trop Med Int Health*. 2010; **15**(12): 1407–12. [PubMed Abstract](#) | [Publisher Full Text](#)
7. Dallatomasina S, Crestani R, Sylvester Squire J, *et al.*: **Ebola outbreak in rural West Africa: epidemiology, clinical features and outcomes**. *Trop Med Int Health*. 2015; **20**(4): 448–54. [PubMed Abstract](#) | [Publisher Full Text](#) | [Free Full Text](#)
8. Squire J: **Squire\_James\_SORTIT2\_HRH\_data**. *osf.io/qk5yg*. 2019. <http://www.doi.org/10.17605/OSF.IO/QK5YG>

# Open Peer Review

Current Peer Review Status:



## Version 2

Reviewer Report 31 January 2020

<https://doi.org/10.5256/f1000research.23802.r58463>

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**Armand Sprecher** 

Médecins Sans Frontières, Brussels, Belgium

This paper has not undergone many changes from the original version.

It has some added material in the introduction regarding the immediate post-Ebola period as an opportunity to fix the human resource deficit.

The methods section has some material describing the healthcare human resources development pathway and states that the major obstacle is insufficient financial resources largely due to restriction imposed by the IMF. The cited reference, which, in fairness, did appear in the previous version as well, does support this, though it dates from 2007, and so the reader must assume that the current fiscal policy environment has not changed. As the paper's major recommendation is a reversal of IMF policy, some confirmation that this is still the major obstacle to Sierra Leone's healthcare human resources meeting the country's goals would be welcome if such a reference is available.

The paper now has a sentence directing readers to the authors' previous work for more information on the details of the staffing shortfalls. A quick examination of the two tables mentioned does prove interesting. For example, the 92% of the 92% non-medical staff shortfall comes from just the cleaners and security officers. As the authors mention the consequences of insufficient waste management staff, and it would help the reader to have presented at least the quantification of the shortfall for this category to support their argument in this paper, as it would seem quite relevant.

**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.**

Reviewer Report 09 January 2020

<https://doi.org/10.5256/f1000research.23802.r58464>

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**Hayk Davtyan**

TB Research and Prevention Center, Yerevan, Armenia

**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.**

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### Version 1

Reviewer Report 17 September 2019

<https://doi.org/10.5256/f1000research.20323.r53202>

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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.**

Author Response 03 Dec 2019

**Katrina Hann**, Sustainable Health Systems, Freetown, Sierra Leone

**Dear Armand Sprecher,**

Thanks for reviewing the manuscript and your insightful comments. We have provided responses to each of your comments below. Your comments are highlighted in bold and our responses follow using normal font.

**Reviewer comment 1. 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.**

- Response: Thanks for the comment. We do agree that other studies have looked at staffing issues in Sierra Leone. However, this is the first study that has assessed the implementation of the BPEHS in relation to the Ebola outbreak and the references we have included in the paper relate to this theme. We thank you for your understanding.

**Reviewer comment 2: 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.**

- Response: The BPEHS is the national standard that stipulates the minimum staffing for each type of public health facility level, which is critical to maintain service delivery standards. The BPEHS has been described before and we have included its details and justification for its use in the introduction. The standards are not aspirational but a necessary requirement.

**Reviewer comment 3: 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.**

- Response. Thank you for this important comment. In the related article that was already published and duly referenced entitled "The Ebola outbreak and staffing in public health facilities in rural Sierra Leone: who is left to do the job?", we disaggregated the staffing deficit by cadre. We cited this article in the current study. Since there were no significant changes in the staffing levels, we decided not to duplicate the same result in the current study. We have included a reference to the full list of medical and non-medical staff.

**Reviewer comment 4. 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.**

- Response: In the discussion we have mentioned the possible reasons (which are multiple) and actions that needs to be taken to address some of the root causes and why corrective action has not been forthcoming. In future research, we hope to consider determining the root causes

**Reviewer comment 5: This is a nice simple study, but the readers would profit from e authors shedding more light on the meaning of their findings.**

- Response: In the related article that was already published and duly referenced entitled “The Ebola outbreak and staffing in public health facilities in rural Sierra Leone: who is left to do the job?” we already touched the issues around IMF restrictions and retention issues and tried to avoid duplication in this current paper. We thank you for your kind consideration.

**Competing Interests:** No competing interests were disclosed.

Reviewer Report 11 September 2019

<https://doi.org/10.5256/f1000research.20323.r53419>

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**Hayk Davtyan**

TB Research and Prevention Center, Yerevan, Armenia

The article is very well written with clearly defined aim/research question and methodology designed to answer it.

The question of interest is of high importance as it relates to Ebola (highly contagious and dangerous virus) which could become a threat for the whole world. The problem discussed in the article (under-staffing) is worrisome and calls for an urgent actions.

It seems there is a need for more information on settings. Particularly regarding financing and 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.**

Author Response 03 Dec 2019

**Katrina Hann**, Sustainable Health Systems, Freetown, Sierra Leone

**Dear Hayk Davtyan**

**Many thanks for reviewing the manuscript and your insightful comments and contributions. We have provided responses to each of your comments below. The review comments are in bold font and we have responded using bullet points and normal font.**

**Reviewer comment 1: It seems there is a need for more information on settings. Particularly regarding financing and hiring/staffing of the health facilities in the article.**

- Response: Thank you for this important comment. As suggested, we have included more information on the settings specifically addressing your concerns.

**Reviewer comment 2. 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.**

- Response: The current study's aim and objectives were to identify what is the deficit (the gap) in the health workforce in relation to Basic stipulated standards and not to address root-causes of the deficit.
- In the discussion we mentioned the possible reasons and actions that needs to be taken to address some of the root causes. In future research, we hope to consider determining the root causes.

**Reviewer comment 3: 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.**

- Response: The BPEHS is the national standard that stipulates the minimum staffing for each type of public health facility, which is critical to maintain service delivery standards. The BPEHS target is to be achieved by 2020. However, with the current pace of implementation, this target will not be achieved by 2020. The constraints in increasing the

health workforce are multiple and include limited available funds, availability of trained manpower, IMF restrictions etc. We have already highlighted the constraints and the urgent measures that need to be implemented to address the underlying staffing deficits.

**Reviewer comment 4: 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.**

Response: We have already discussed the underlying factors contributing to the observed deficits in both medical and non-medical staffing levels. We agree with the reviewer that more research is needed and have suggested areas that merit further research and investigation (in the Discussion).

**Competing Interests:** No competing interests were disclosed.

Reviewer Report 04 September 2019

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### Wendemagegn Enbiale

Department of Dermatovenereology, 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.**

Author Response 03 Dec 2019

**Katrina Hann**, Sustainable Health Systems, Freetown, Sierra Leone

Dear Dr Wendemagegn Enbiale, Thank you for your review and insightful comments on the manuscript. We have responded to each of your points below. 1. Reviewer comment 1. Health Workforce (HWF) staffing usually measured based on population and there are international standards for developing countries. Why the authors are not interested to use or at least mention that? Response: Thank you for this comment. The Basic Package for Essential Health Services (BPEHS) is the national standard used to guide health workforce requirements in Sierra Leone. Despite the existence of global methods usually using a population-based measure the BPEHS has been adapted to the Sierra Leone content and thus more appropriate to measure health workforce gaps. In particular, the BPEHS allows us to quantify the real gap between the Government's commitment and the actual status in terms of staffing. In addition, the international standard for staffing measures focus only on clinical staff. However, in the Ebola and post-Ebola context, non-clinical staffing are equally essential, especially in terms of infection prevention and control measures. Therefore, the use of the BPEHS is more appropriate as it allows assessment of both medical and non-medical staff cadres. In the introduction, we have added more explanation and references to clarify our stand to use the BPEHS as the yardstick in the introduction. We have also added more information of the BPEHS standard in the methods section. 2. Reviewer Comment 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)? Response: This study is focused on a specific district, Kailahun and all health facilities in the district was included.

Details of the Study setting and population was already reported in the previous paper for which this study is a follow up. We have referenced this paper and its contents in case the reader might wish for more information. As justified in point 1 above, since we utilised the BPEHS national standards, we do not see applying the WHO criteria as relevant to this study. 3. Reviewer comment 3: Do you need the HWF just to fulfil the BPEHS standard or is there any evidence suggesting compromiation of the routine health care service because of the stated HWF deficit. Response: Ensuring basic standards of Human resources for health, is one of the WHO health systems building blocks. It is essential to achieve this requirement if health facilities are to have the “hands on deck” to ensure proper and effective functioning of health systems to support the delivery of care to the population. The 2014-2016 Ebola outbreak with the resulting decline in the health workforce resulted in the collapse of even the most basic of routine health services. The BPEHS is the national standard that stipulate the minimum staffing for each type of public health facility, which is critical to maintain service delivery standards and our study shows that we are far from these standards. This gap will need to be filled. We have now added references to support the evidence on the health workforce deficit and its detrimental effect on health service delivery. 4. Reviewer comment 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. Response: Thank you for this important comment. In the already published article “The Ebola outbreak and staffing in public health facilities in rural Sierra Leone: who is left to do the job?” which has been referenced in the current study, we disaggregated the staffing deficit by cadre. Since there were no significant changes in the staffing levels, we decided not to duplicate the same results in the current study. We thank you for your kind understanding.

**Competing Interests:** No competing interests were disclosed.

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