Health worker Ebola infections in Guinea, Liberia and Sierra Leone

SUMMARY

This special WHO report is the first to summarize the impact of the Ebola epidemic on the health workforce of Guinea, Liberia and Sierra Leone. It investigates the determinants of infection and describes safe practices put in place to protect health workers during the epidemic. The report covers the period from 1 January 2014 to 31 March 2015.

In this report, the term "health worker" includes not only clinical staff, but all those who work in health services, including drivers, cleaners, burial teams, and community -based workers amongst others.

This preliminary report describes and characterizes health worker infection and infection outcomes, and quantifies the health worker infection risk. It summarizes the findings based on the 815 confirmed and probable cases for whom individual case reports (as opposed to aggregate data) were available through the Viral Haemorrhagic Fever (VHF) database. However, it should be noted that those were preliminary data, since the national VHF database is currently being revised and updated in Liberia and Sierra Leone. For this reason, our data might differ from those available within the countries.

Preliminary analysis shows that, depending on their occupation in the health service, health workers are between 21 and 32 times more likely to be infected with Ebola than people in the general adult population.

A large number of nurses and nurse aides have been affected, accounting for more than 50% of all health worker infections with occupation reported (n= 373/718).

Other categories of health workers affected include medical workers (doctors and medical students, 12%), laboratory workers and trade and elementary workers (janitors, maintenance staff, etc.) with 7% each.

Preliminary findings of a systematic review of the published literature on health-care workers' filovirus infections (both Marburg and Ebola viruses), including those in the current outbreak, show that identifying the precise risk factors and the situations in which health workers were exposed is very difficult. However, serious gaps in implementing infection prevention and control (IPC) standards were reported in the settings where transmission likely took place or where infected health workers were employed. Among these, the most frequently reported were deficiencies in administrative, engineering and environmental controls, inappropriate use or lack of personal protective equipment (PPE), defective IPC practice and behaviour, and poor employment conditions and social determinants.

It was also difficult to establish the setting where health workers acquired the infection. Exposure may have occurred in health facilities where triage may not have been effective and where health workers unknowingly provided care to Ebola-infected patients. It is also possible that the infection was acquired in the community with or without linkage to care provision. In addition to their official employment in governmental facilities, many health workers work in private clinics or outpatient offices or in their community.

This is another possible setting where exposure can happen. Finally, exposure risks exist for health workers working in Ebola treatment facilities.

The range of possible circumstances of health worker infections flags the importance of going beyond the supply of personal protective equipment to ensure better working conditions and practices.

Health worker infections can be prevented. WHO and partners have worked with ministries of health, partner managers and health workers to put in place IPC and Occupational Health and Safety (OHS) strategies and supplies to prevent health worker infections and improve patient safety. The reduction in the infection of health workers as a proportion of all cases from 12% in July 2014 to a low of 1% in February 2015 may be attributable to these preventive interventions. This Situation Report does not seek to establish causality, but highlights examples of key strategies implemented to prevent health worker infections.

The Ebola epidemic has taken a heavy toll on the already scarce health workforce in the three most affected countries. Among the health workers for whom final outcome is known, two-thirds of those infected have died (61% among hospitalised vs 74% for those not hospitalised). With higher risks of exposure in caring for others, health workers were disproportionately impacted and traumatized by Ebola. This has exacerbated the pre-existing shortage of health workers, high rates of attrition, uneven distribution, poor employment conditions and gaps in OHS in the three countries. Guinea, Liberia and Sierra Leone have developed investment plans to build health system resilience, including strategies to cultivate a needs-based health workforce. Health workers played a critical yet high risk role in responding to the Ebola epidemic and in working to meet the health needs of their communities during the epidemic. Many paid for this with their lives. Protection from Ebola infection and provision of psychosocial support is a critical priority to safeguard and support the health workforce, protect patients and preserve public trust in the response and in the reactivation of safe essential health services. There is no health care without a health workforce that is fit for purpose, protected and capable of meeting the needs of the population.

One lesson learnt from the Ebola epidemic is that health worker protection is key to the capability of health systems to respond to health emergencies and meet routine healthcare needs. Health worker protection and support must be at the core of emergency response, preparedness and efforts to build a resilient health system. Cementing this lesson learnt into practice can be a lasting tribute to all those who lost their lives and all those who fought in the epidemic.

EPIDEMIOLOGICAL SITUATION

INTRODUCTION

Since the first reported outbreaks of Ebola virus disease (EVD) in humans in 1976, infections acquired in health-carefacilities have been recognised as an important cause of morbidity and mortality, particularly in health workers. Two large hospital-based outbreaks reported in the Democratic Republic of the Congo in 1995 and Uganda in 2000 resulted in 80 and 29 health worker infections, respectively (1-3).

The current EVD outbreak in West Africa is unprecedented in many ways, including the high number of doctors, nurses, and other health workers who have been infected. This has had a devastating impact on the already fragile health workforces of Guinea, Liberia and Sierra Leone.

Although there have been a few country-specific publications on Ebola infections in health workers, none have yet provided an overview of findings in the three countries with widespread and intense transmission (4-6).

This special Situation Report focuses on the three countries with widespread and intense transmission. Its aim is:

- to describe and characterize health worker infections and infection outcomes; and
- to quantify the risk of infection in health workers.

METHODS

EVD cases are defined as either confirmed, probable, or suspected (Box 1). The analyses in this study only include confirmed and probable cases.

The Viral Haemorrhagic Fever (VHF) database, which was made available for these analyses by WHO headquarters, is comprised of the national VHF databases from Guinea, Liberia and Sierra Leone. It is important to note that the VHF database is different from the aggregate data presented in the weekly, public WHO Ebola Situation Report, which draws from MOH Situation Reports. The database contains information on each individual case of EVD and is regularly updated to include new cases and outcomes of previously reported cases. Obtaining completed case reports for every case was particularly challenging in the early phases and at the peak of the epidemic. Ongoing efforts are underway to update and triangulate case information about cases from multiple sources. For these reasons, the number of health workers in this report is preliminary and may differ from the MOH Situation Reports.

All information on individual patients is anonymized. Standard case-investigation forms are used to gather demographic, clinical, exposure, hospitalization and outcome data. In addition, information on selected occupa-

tional categories are recorded. If a case identifies him or herself as a "health-care worker", additional data on his or her position and workplace are collected.

For the purpose of these analyses, age was assigned as missing for those health workers whose age was reported as less than 15 (n=9 confirmed and probable). Eight cases were included in the analyses who were not recorded in the database as health workers but who held health worker positions. The final status of 14 cases was corrected. To take into account not only hospitalization at the time of reporting, but also previous hospitalizations, a new variable termed "ever hospitalized" was created. And finally, 12 duplicate cases were excluded from the analysis.

The denominator data used to calculate the cumulative incidence rate is based on the most recent health workforce data obtained from the three countries (Guinea: 2014[1], Sierra Leone: 2014[2], Liberia: 2015[3]). Workforce data from Liberia and Guinea were disaggregated by sex and age. Population figures for the cumulative incidence among the non-health worker population ≥ 15 years of age are based on estimates from the United Nations Department of Economic and Social Affairs, Population Division[4].

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1   Guinea: Recensement biométrique des personnels de santé du Ministère de la Santé, République de Guinée, December 2014
2   Sierra Leone: MOHS Human Resources for Health database, November 2014 (public sector only)
3   Liberia: MOH Personnel Unit and MOH Office of Financial Management, February 2015 (public sector only)
4   United Nations Department of Economic and Social Affairs, Population Division

Descriptive analyses were performed using STATA version 13 and EXCEL 2010. Demographic characteristics and outcomes of health workers versus non-health workers were compared using chi-square tests. P-values < 0.01 were considered significant.

Characteristics and case-fatality ratios were compared between health workers and non-health workers ≥ 15 years of age. Cumulative incidence was calculated using confirmed and probable cases from the beginning of the outbreak to 31 March 2015. Since the Human Resource databases of the countries are in the process of being updated, cumulative incidence rates were calculated for selected professions only, where data were more complete.

Figure 1. Number of confirmed and probable health worker EVD cases over time (and proportion of health worker cases among all cases* reported) in the three countries combined (Guinea, Liberia and Sierra Leone), 1 January 2014 - 31 March 2015
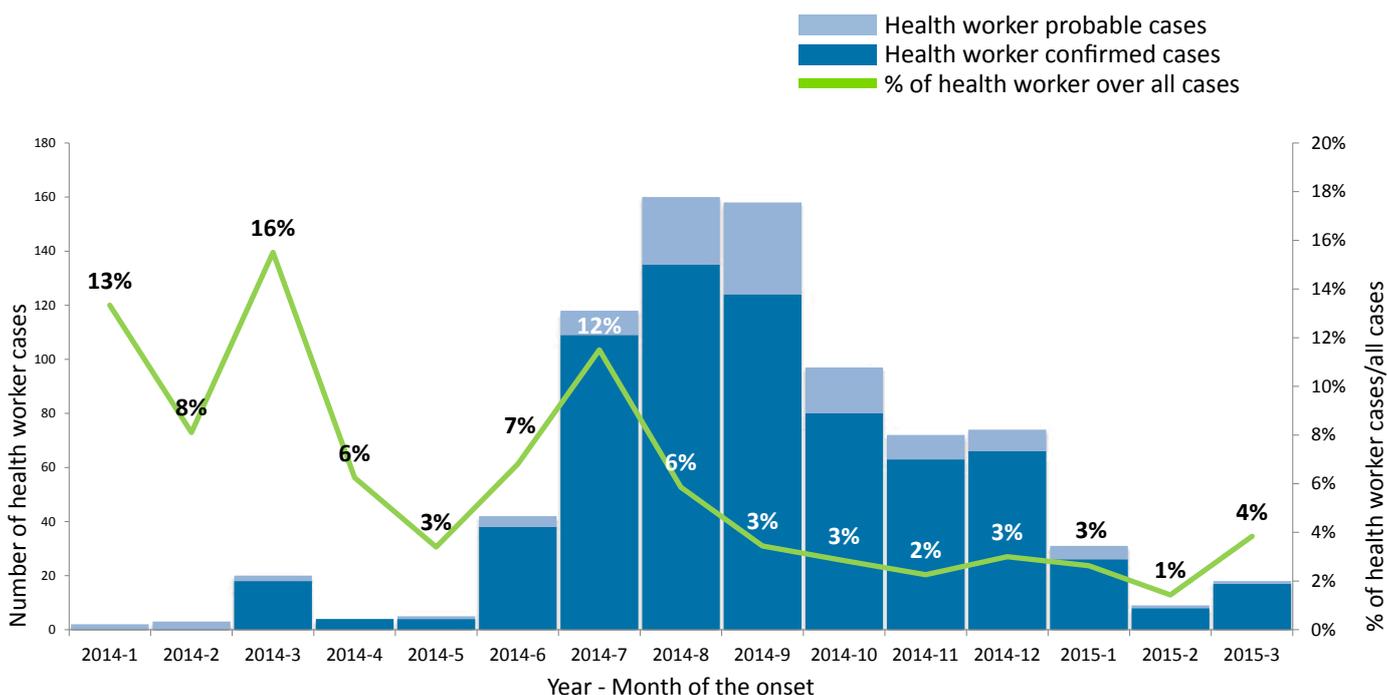
*All cases include health worker and non-health worker confirmed and probable cases.

KEY FINDINGS

From 1 January 2014 to 31 March 2015, 815 confirmed and probable health worker EVD cases were recorded in the VHF database, with 328 in Sierra Leone, 288 in Liberia and 199 in Guinea. An additional 225 suspected cases were reported, with 117 from Liberia, 108 from Sierra Leone and none from Guinea. Suspected cases are not included in these analyses.

From January 2014 to 31 March 2015, health workers accounted for 3.9% (815/20 955) of all confirmed and probable cases reported (all ages). However, this proportion fluctuated over time in each country. Except for the first few months, during which there were only a few reported cases, health worker infections as a proportion of all monthly number of cases peaked in July 2014 and decreased thereafter (Figure 1). The decrease from 12% in July 2014 to a low of 1% in February 2015 may reflect the implementation of preventive interventions.

61% of health worker infections were in males, representing a male: female ratio among affected health workers of 1.6:1. Among the four categories of health workers most affected, males represented 95% of the medical workers, 88% of the laboratory workers, 77% of the trade and elementary workers and 45% of the nurse workers. Based on the health workforce databases of Liberia and Guinea, it appears that males may have been disproportionally affected. This warrants further investigation. (Table 1).

Nearly 50% of all EVD infections in health workers occurred in those aged between 30 and 44 years old, 22% of all health workers infected were aged between 15-29 years old.

Nurses, nurse assistants and nurse aides accounted for over 50% of all health worker infections with occupation reported (n= 373/718). They were followed by medical workers (12%), laboratory workers (7%) and trade and elementary workers (janitors, maintenance staff, etc) (7%). (Table 1) (See Appendix 1 for detailed description of positions included in each category)

When comparing affected health workers to non-health workers ≥ 15 years, health workers were more likely to be males and slightly older with a higher proportion of them aged between 30-44 (47% vs 35%) and conversely, a lower proportion in the 15-29 age-group (22% vs 36%). 77% of health workers were hospitalized compared to 62% of non-health workers ≥ 15 years of age (p <0.01). This may be a reflection of greater EVD awareness and access to care among health workers or simply a reflection of a higher proportion of missing data among non-health worker cases. And although the case-fatality ratio was slightly lower in health workers, the difference was not statistically significant (p= 0.02). (Table 1)

Figure 2. EVD confirmed and probable health worker infections by country and by week of onset, 1 Jan 2014 to 31 March 2015
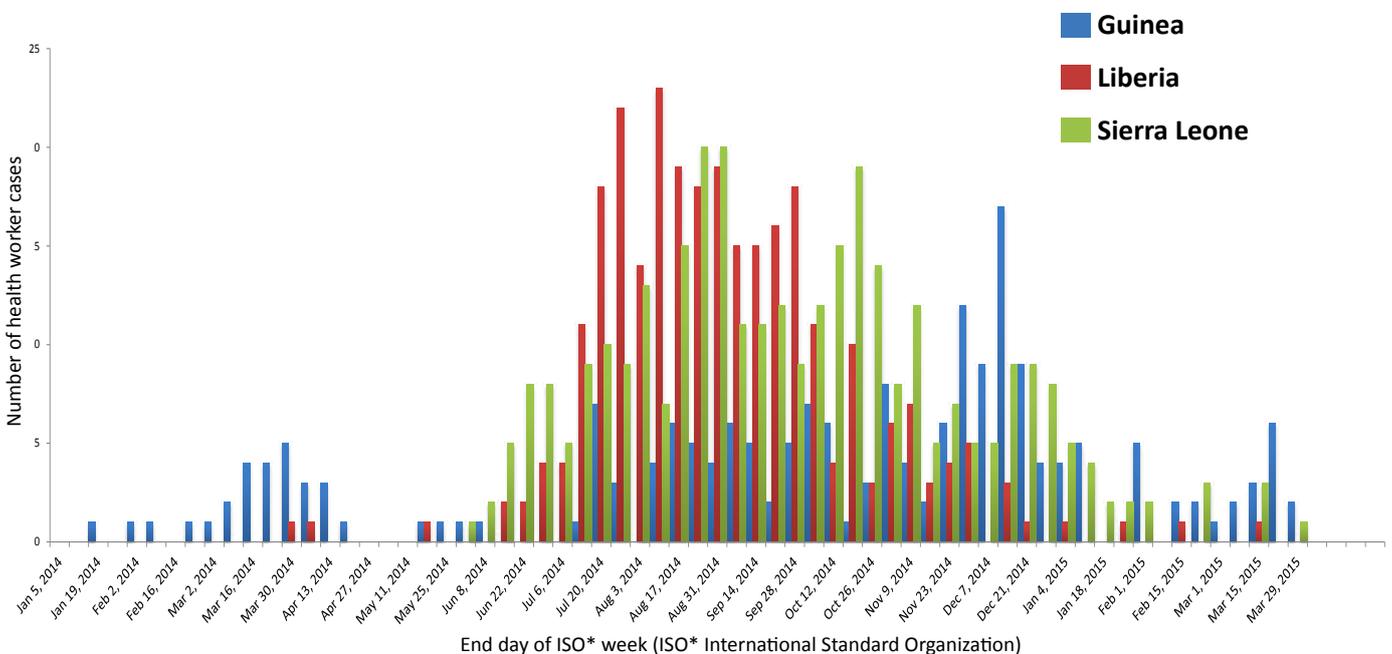
Table 1. Comparison of demographic, health and occupational characteristics of EVD confirmed and probable cases by health worker status (HW vs non-HW) and by country, 1 January 2014 - 31 March 2015

	GUINEA, LIBERIA AND SIERRA LEONE			HEALTH WORKERS		
	NON-HEALTH WORKERS ≥15 [1] % [95% CI] (n)	HEALTH WORKERS % [95% CI] (n)		GUINEA % [95% CI] (n)	LIBERIA % [95% CI] (n)	SIERRA LEONE % [95% CI] (n)
Sex	N=15976 Missing=256	N= 814 Missing= 1	p-value	N=199 Missing=0	N=287 Missing=1	N=328 Missing=0
Female	52% [51.1-52.7] (8296)	39% [35.2-42.0] (314)	<0.01	23% [17.0-29.1] (45)	42% [36.0-47.8] (120)	45% [39.9-51.0] (149)
Male	48% [47.3-48.8] (7680)	61% [58.0-64.8] (500)		77% [70.9-83.0] (154)	58% [52.2-64.0] (167)	55% [49.0-60.1] (179)
Age-group	N=15265 Missing=967	N=792 Missing=23	p-value	N=199 Missing=0	N=276 Missing=12	N=317 Missing=11
15-29	36% [35.5-37.1] (5541)	22% [18.8-24.6] (171)		29% [22.5-35.5] (57)	15% [10.6-19.2] (40)	23% [18.8-28.4] (74)
30-44	35% [34.1-35.6] (5323)	47% [43.8-50.9] (375)	<0.01	46% [39.2-53.4] (92)	51% [45.0-57.1] (141)	45% [39.2-50.5] (142)
45+	29% [28.1-29.6] (4401)	31% [27.9-34.4] (246)		25% [19.3-31.7] (50)	34% [28.8-40.4] (95)	32% [26.8-37.3] (101)
Hospitalization	N= 10946 Missing=5286	N=749 Missing=66	p-value	N=189 Missing=10	N=263 Missing=25	N=297 Missing=31
Yes	62% [60.8-62.6] (6754)	77% [73.4-79.6] (574)	<0.01	96% [92.5-98.5] (182)	71% [64.8-76.2] (186)	69% [63.8-74.6] (206)
No	38% [37.4-39.2] (4192)	23% [20.4-26.6] (175)		4% [1.5-7.5] (7)	29% [23.8-35.2] (77)	31% [25.4-36.2] (91)
Final outcome[2]	N=8474 Missing=7758	N=635 Missing=180	p-value	N=196 Missing=3	N=220 Missing=68	N=219 Missing=109
Alive	30% [28.8-30.8] (2523)	34% [30.5-38.0] (217)	0.02	44% [37.3-51.6] (87)	29% [22.8-35.1] (63)	31% [24.6-37.2] (67)
Dead	70% [69.2-71.2] (5951)	66% [62.0-69.5] (418)		56% [48.4-62.7] (109)	71% [64.9-77.2] (157)	69% [62.8-75.4] (152)
Health worker position category[3,4]	Not applicable	N=718* Missing=97	Not applicable	N=191 Missing=8	N=228 Missing=60	N=292 Missing=29
Medical workers		12% [9.3-14.1] (83)		30% [23.5-36.9] (57)	7% [4.1-11.1] (16)	3% [1.7-6.2] (10)
Nursing workers[5]		52% [48.2-55.7] (373)		45% [37.8-52.4] (86)	53% [45.9-59.3] (120)	57% [51.3-62.9] (167)
Midwifery workers		3% [2.0-4.8] (23)		4% [1.5-7.4] (7)	2% [0.7-5.0] (5)	4% [1.9-6.6] (11)
Ambulance workers		3% [1.9-4.6] (22)		6% [2.9-10.1] (11)	1 % [0.1-3.1] (2)	3% [1.4-5.8] (9)
Laboratory workers		7% [5.0-8.8] (48)		5% [2.2-8.8] (9)	7% [3.7-10.6] (15)	8% [5.3-12.0] (24)
Pharmacy workers		3% [1.8-4.4] (21)		1% [0.0-3.7] (2)	5% [2.7-9.0] (12)	2% [0.6-4.2] (7)
Community health workers		3% [2.2-4.9] (24)		1% [0.0-2.9] (1)	1% [0.3-3.8] (3)	7% [4.2-10.4] (20)
Trade and elementary workers		7% [4.8-8.6] (47)		5% [2.2-8.8] (9)	8% [4.7-12.2] (18)	7% [4.2-10.4] (20)
All others		11% [8.6-13.2] (77)		5% [2.2-8.8] (9)	16% [11.7-21.7] (37)	11% [7.33-14.7] (31)

1. Non-health worker population ≥ 15 years of age. 2. Final outcome only among those for whom final status was available. 3. For the purpose of this analysis, the numerous descriptive types of health worker positions were recoded into 14 groupings based on the International Classification of Occupations, 2008 revision. See Annex 1 for detailed descriptions of positions included in each category. However, all categories with fewer than 20 persons for the three countries were combined into a category entitled "All others". 4. Since the number of health workers by occupation by country is often small, the results should be interpreted with caution. 5. It should be noted that Nursing workers include the "Agents techniques de santé (ATS)" in Guinea. "Missing" refers to all the cases for which the data for this particular variable was missing or unknown. * Total equals to 101% due to rounding up.

While the first health worker infected by Ebola in this epidemic was from Gueckedou, Guinea in January 2014, the first one in Liberia occurred in March 2014 in Lofa and in June 2014 in Port Loko and Kailahun (1 day apart), Sierra Leone. The number of health worker cases peaked in August 2014 in Liberia and in Sierra Leone. In Guinea, the largest number of health worker infections occurred in December 2014, although this country experienced several smaller waves as opposed to one large peak. (Figure 2)

Health worker infections peaked 3 to 4 weeks before the reported peak for all cases (health workers and non-health workers combined) in Liberia and Sierra Leone. This pattern, though, was not observed in Guinea.

Health worker infections occurred in all but 12 of 56 districts/counties/"prefectures" affected by the Ebola epidemic (see Map 1). The highest number of health worker cases occurred, in decreasing order, in Montserrado (n=136), Kenema (n=80), Conakry (n=78) and Margibi (n= 53). On the other hand, they respectively represented 14.9% (80/537) of all cases in Kenema, 13.8% (78/566) in Conakry, 6.3% (53/839) in Margibi and 4.8% (136/2829) in Montserrado. Kenema was among the first districts affected and its relatively high number and proportion of health workers affected may reflect the lack of awareness and limited IPC measures early on in the epidemic.

Map 1. Geographic distribution of all health worker EVD infections, Guinea, Liberia and Sierra Leone, 1 January 2014 – 31 March 2015.
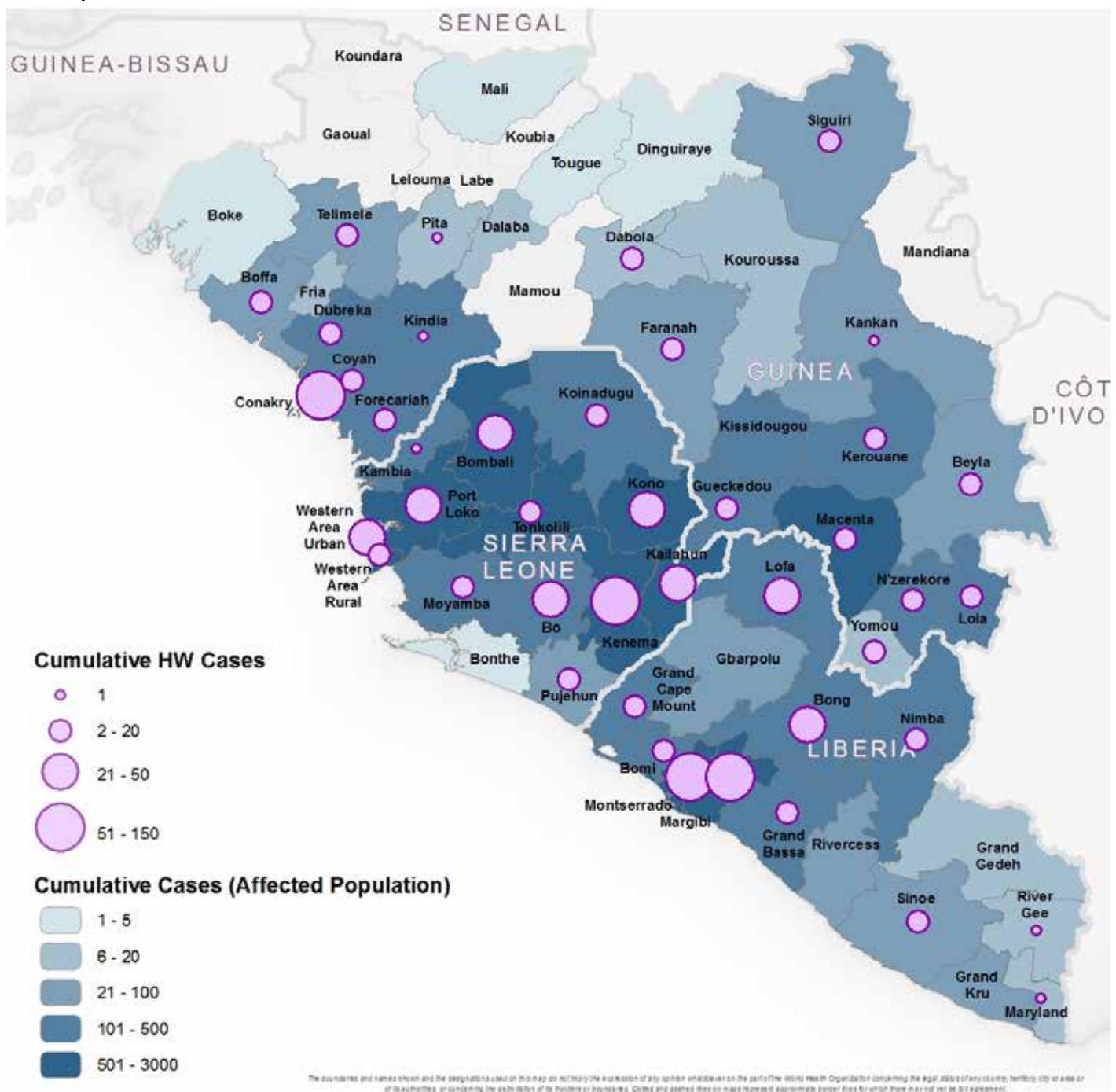
EBOLA INFECTION OUTCOMES

Table 2. Case-fatality ratio (CFR)[1] by demographic, health and occupational characteristics of confirmed and probable health worker EVD cases by country, 1 January 2014 - 31 March 2015

HEALTH WORKERS CHARACTERISITICS	ALL HEALTH WORKERS % [95% CI] (n)	GUINEA % [95% CI] (n)	LIBERIA % [95% CI] (n)	SIERRA LEONE % [95% CI] (n)
Sex (n, %)	**N=634 Missing=181**	**N=196 Missing=3**	**N=219 Missing=69**	**N=219 Missing=109**
Female	**68% [61.1-73.5]** (N=158/234)	**56% [39.9-70.9]** (N=24/43)	**73%[63.3-82.0]** (N=63/94)	**67% [56.7-76.2]** (N=65/97)
Male	**65% [59.8-69.4]** (N=259/400)	**56% [47.3-63.6]** (N=85/153)	**70% [60.7-77.5]** (N=87/125)	**71% [62.4-79.1]** (N=87/122)
Age-group	**N=621 Missing=194**	**N=196 Missing=3**	**N=213 Missing=75**	**N=212 Missing=116**
15-29	**56% [46.8-64.2]** (N=74/133)	**40% [27.6-54.2]** (N=23/57)	**62% [42.3-79.3]** (N=18/29)	**70% [55.1-82.7]** (N=33/47)
30-44	**63% [57.3-68.8]** (N=182/288)	**55% [44.2-65.4]** (N=50/91)	**67% [54.7-75.9]** (N=74/110)	**67% [55.7-76.4]** (N=58/87)
45+	**76% [69.5-81.7]** (N=152/200)	**75% [60.4-86.4]** (N=36/48)	**81% [70.3-89.3]** (N=60/74)	**72% [60.5-81.4]** (N=56/78)
Hospitalization	**N=583 Missing=232**	**N=186 Missing=13**	**N=203 Missing=85**	**N=194 Missing=134**
Yes	**61% [56.3-65.4]** (N=281/461)	**51% [43.8-58.9]** (N=92/179)	**68% [60.0-75.3]** (N=104/153)	**66% [57.0-74.0]** (N=85/129)
No	**74% [65.0-81.3]** (N=90/122)	**100% [59.0-100]** (N=7/7)	**76% [61.8-86.9]** (N=38/50)	**69% [56.6-80.1]** (N=45/65)
Health worker position category[2,3]	**N=562 Missing=253**	**N=188 Missing=11**	**N=173 Missing=115**	**N=201 Missing=127**
Medical workers	**47% [35.6-59.3]** (N=35/74)	**42% [28.7-55.9]** (N=23/55)	**46% [16.7-76.6]** (N=5/11)	**88% [47.3-99.7]** (N=7/8)
Nursing workers[4]	**68% [62.0-73.1]** (N=193/285)	**59% [47.6-69.4]** (N=50/85)	**82% [72.1-88.9]** (N=75/92)	**64% [53.7-72.6]** (N=68/107)
Midwifery workers	**67% [41.0-86.7]** (N=12/18)	**71% [29.0-96.3]** (N=5/7)	**100% [29.2-100]** (N=3/3)	**50% [15.7-84.3]** (N=4/8)
Ambulance workers	**78% [52.4-93.6]** (N=14/18)	**73% [39.0-94.0]** (N=8/11)	**100% [15.8-100]** (N=2/2)	**80% [28.4-99.5]** (N=4/5)
Laboratory workers	**71% [54.4-83.9]** (N=29/41)	**44% [13.7-78.8]** (N=4/9)	**69% [38.6-90.9]** (N=9/13)	**84% [60.4-96.6]** (N=16/19)
Pharmacy workers	**88% [61.7-98.4]** (N=14/16)	**100% [15.8-100]** (N=2/2)	**75% [34.9-96.8]** (N=6/8)	**100% [54.1-100]** (N=6/6)
Community health care workers	**52% [29.8-74.3]** (N=11/21)	**100% [0-100]** (N=1/1)	**33% [0.8-90.6]** (N=1/3)	**53% [27.8-77.0]** (N=9/17)
Trade and elementary workers	**65% [46.5-80.3]** (N=22/34)	**11% [0.3-48.2]** (N=1/9)	**85% [54.6-98.1]** (N=11/13)	**83% [51.6-97.9]** (N=10/12)
All others	**76% [63.0-86.8]** (N=42/55)	**78% [40-97.2]** (N=7/9)	**71% [51.3-86.8]** (N=20/28)	**74% [48.8-90.9]** (N=14/19)

*1. Case-fatality ratio (CFR) was calculated only among those for whom final outcome was available. "**Missing**" refers to all the cases for whom the data for this particular variable was missing or unknown. 2. For the purpose of this analysis, we recoded the numerous descriptive types of health workers positions into 14 groupings based on the International Classification of Occupations, 2008 revision. See **Annex 1** for detailed description of positions included in each category. However, all categories with less than 20 persons for the 3 countries were combined into a category entitled "All others". 3. Since the CFR by occupation is often based on small numbers, the results should be interpreted with caution. 4. It should be noted that Nursing workers include "Agent technique de santé (ATS)" in Guinea.*

Case-fatality ratio (CFR) was calculated among infected health workers for whom the final outcome was available (n=635). Among those, two-thirds (418/635) died from the disease. While the CFR was slightly lower in health workers compared to non-health workers, it varied considerably from one country to another, and was significantly lower in Guinea than in the other two countries which has the most complete data for this variable (Table 2). Health workers who died from EVD may be more likely to have the final outcome of their case recorded in their files over health workers who survived. As a result, it is possible that the CFR may be overestimated where the final outcome was not routinely recorded in the case report.

Among health workers, the CFR was slightly higher for females (68%) than for males (65%), but the difference was not statistically significant (p=0.5). As in the general population, increased age was associated with higher CFR (p <0.01). The CFR was lower in hospitalized cases (61%) compared with non-hospitalized health workers (74%) (p <0.01). (Table 2)

When comparing the CFR of the affected health workers to non-health workers, there were no statistically significant differences except for CFR in males. Since the final outcome variable is needed for the calculation of CFR, it should be noted this information was missing in more than 48% of the non-health worker cases. Therefore, the results for non-health workers should be interpreted with caution. (Table 3)

Table 3. Comparison of CFR[1] by demographic and health characteristics of confirmed and probable Ebola cases, by health worker status (HW vs non-HW) and country, 1 January 2014 - 31 March 2015.

	HEALTH WORKERS CFR [95% CI] (N)	NON-HEALTH WORKERS ≥ 15[2] CFR [95% CI] (N)	RR [95% CI] (HW vs non-HW)	p-value
Sex (n, %)	N=634 Missing=181	N=8401 Missing=7831		
Female	68% [61.1-73.5] (N=158/234)	68% [66.6-69.4] (N=2967/4360)	0.99 [0.91-1.09]	0.87
Male	65% [59.8-69.4] (N=259/400)	73% [71.1-73.8] (N=2928/4041)	0.89 [0.83-0.96]	<0.01
Age-group	N=621 Missing=194	N=8220 Missing=8012		
15-29	56% [46.8-64.2] (N=74/133)	60% [58.2-61.9] (N=1683/2801)	0.93 [0.79-1.08]	0.33
30-44	63% [57.3-68.8] (N=182/288)	70% [68.7-72.0] (N=2040/2899)	0.90[0.82-0.98]	0.02
45+	76% [69.5-81.7] (N=152/200)	80% [78.8-81.9] (N=2025/2520)	0.95 [0.87-1.02]	0.17
Hospitalization	N=583 Missing=232	N=6486 Missing=9746		
Yes	61% [56.3-65.4] (N=281/461)	57% [55.0-58.0] (N=2419/4280)	1.08 [1.00-1.17]	0.06
No	74% [65.0-81.3] (N=90/122)	84% [82.7-85.8] (N=1859/2206)	0.88 [0.79-0.97]	0.015

1. Case-fatality rate (CFR) was calculated only among those for whom final outcome was available. 2. Non-health worker population over the age of 15 years. "Missing" refers to all the cases for whom the data for this particular variable was missing or unknown.