

## Health-Care Access during the Ebola Virus Epidemic in Liberia

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**Abstract.** The Ebola virus disease (EVD) epidemic, which began in West Africa in December 2013, claimed more than 11,000 lives, with more than 4,800 of these deaths occurring in Liberia. The epidemic had an additional effect of paralyzing the health-care systems in affected countries, which led to even greater mortality and morbidity. Little is known about the impact that the epidemic had on the provision of basic health care. During the period from March to May 2015, we undertook a nationwide, community-based survey to learn more about health-care access during the EVD epidemic in Liberia. A cluster sampling strategy was used to administer a structured in-person survey to heads of households located within the catchment areas surrounding all 21 government hospitals in Liberia. A total of 543 heads of household from all 15 counties in Liberia participated in the study; more than half (67%) of urban respondents and 46% of rural respondents stated that it was very difficult or impossible to access health care during the epidemic. In urban areas, only 20–30% of patients seeking care during the epidemic received care, and in rural areas, only 70–80% of those seeking care were able to access it. Patients requiring prenatal and obstetric care and emergency services had the most difficulty accessing care. The results of this survey support the observation that basic health care was extremely difficult to access during the EVD epidemic in Liberia. Our results underscore the critical need to support essential health-care services during humanitarian crises to minimize preventable morbidity and mortality.

### INTRODUCTION

The Ebola virus disease (EVD) epidemic that began in West Africa in December 2013 has claimed more than 11,000 lives to date. Liberia has been one of the countries hardest hit by this epidemic, with more than 10,000 cases of EVD reported and more than 4,800 lives lost<sup>1</sup>; more than 200 of these deaths were among health-care workers (HCWs) working on the frontlines of the epidemic. The EVD virus had a greater impact during this epidemic, since it was the first time that it had been introduced into a densely populated environment.<sup>2,3</sup>

EVD had the additional effect of paralyzing the health-care system in Liberia. At the height of the epidemic, nearly all government hospitals were closed or operating at a very limited capacity, making access to health care particularly challenging.<sup>4</sup> Little is known, however, about where patients sought care when these health-care facilities were closed, and the impact that this limited access to health care had on the general population.

We undertook a nationwide, community-based survey to determine the impact that EVD had on access to basic health care among both rural and urban communities during the recent EVD epidemic. Since this was the first time that EVD has been introduced into an urban setting, we were interested in examining the impact of EVD among residents of both urban and rural areas. Since health-care access was reportedly much less available in urban areas, we were interested in learning which particular subgroups of patients located within these areas were having difficulty accessing care. We examined changing patterns of health-care access, barriers to obtaining health care, and outcomes in various patient subgroups including patients seeking care for minor and serious illnesses, malaria treatment, and pediatric, prenatal, and obstetric care.

### METHODS

**Study population.** We used a cluster sampling strategy to collect data from communities located within the catchment populations surrounding all 21 government hospitals located in all 15 districts of Liberia (Figure 1). We randomly selected five communities located within a 1-hour drive from each of 21 government hospitals to survey. Within these communities, five households were randomly selected for participation in our in-person survey. This amounted to a total of 25 participants from each catchment area. We surveyed an additional 5% from each catchment area to account for any incompleteness of data or refusal to participate in the survey.

**Survey data collection.** A structured questionnaire survey was created to assess study participants health-care-seeking behavior. Our data collection instrument was piloted among a small group of Liberian individuals (drivers, office staff, and other team members involved in the project) who had varying degrees of literacy to assess the clarity of questions being asked. The survey included 110 questions which assessed community dwellers' knowledge, skills, and perceptions of EVD. It also contained questions which assessed health-care-seeking behavior both before and during the epidemic, and the family's ability to access care during the epidemic. Because there is a low literacy rate among adults in Liberia (61%)<sup>5</sup> the primary method of delivering this survey was by verbal interview. The survey took approximately 30 minutes to complete.

Data were collected over a 3-month period between March and May 2015. Liberian psychosocial workers who were part of our infection prevention and control (IPC) teams, which were sent to all government hospitals to provide IPC training, administered the survey. These team members were given training in survey techniques and human subjects research before being deployed in the field. Quality control checks on our data collection efforts were ongoing throughout the study.

**Data management.** Survey data were directly entered into smartphones using the open source digital data collection

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platform MagPi<sup>®</sup>. Data were downloaded and analyzed using SPSS (IBM, Armonk, NY).

**Data analysis.** To analyze demographic data collected on both rural and urban populations, we used *t* tests to analyze continuous variables and  $\chi^2$  tests to analyze categorical variables. We used  $\chi^2$  goodness of fit to analyze categorical data related to barriers to health-care access for those patients seeking different types of health care such as care for minor and serious illnesses, malaria, and pediatric, prenatal, and obstetric care. A crosstabulation table was constructed to assess levels of difficulty in accessing care between rural and urban populations.

**Ethical considerations.** Permission to perform the survey was obtained from the village chief or community leader prior to entering the community. A verbal script for informed consent was then obtained from individual heads of household participating in the survey. In exchange for participation in the survey, communities received infection control materials (handwashing buckets) as compensation for their time. Institutional review board approval from both the University of Liberia and the University of Massachusetts Medical School was obtained.

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## RESULTS

During the period March to May 2015, a total of 543 heads of household from all 15 districts in Liberia were interviewed; 49% of these households were from urban areas. No one who was asked to participate in the survey refused.

**Study population characteristics.** The average age of survey respondents was 42 years and 50.2% were women. Approximately two-thirds were married and households had an average of four children. Greater than 45% of respondents had a secondary school or higher education, and 8% were HCWs. Most of those surveyed were of Christian faith. In terms of socioeconomic status, only 18% of respondents had electricity, 65% owned a cell phone, and 66% owned a radio.

In examining these data according to type of environment, persons surveyed from urban areas were younger, more likely to be female, had higher levels of education, and higher socioeconomic status. Urban respondents were also more likely to be used in comparison to persons surveyed from rural areas. Urban respondents were able to access hospital care more quickly, with average travel time of less than 30 minutes to reach a hospital, versus rural respondents who had average travel time of 30–60 minutes to reach a hospital ( $P < 0.001$ ). Motorbikes were the most common mode of transport to hospitals for both populations. Equal numbers of rural and urban respondents (23%) knew a close friend or relative who had been infected with EVD (Table 1).

**Access to health care.** The majority of households (57%) reported that it was very difficult or impossible to obtain health care during the epidemic. Health-care access was more difficult to find in urban versus rural communities. More than half, or 67% of the urban respondents reported that it was very

TABLE 1  
Demographic characteristics of survey respondents

Demographic characteristic (n, %)	Rural N = 282	Urban N = 266	P value
Age (mean, years)	<b>44.0 (±19.5)</b>	39 (±11.8)	< 0.001
Sex N, % female	124 (44.0)	154 (57.9)	0.00
Marital status N, % married	<b>249 (88.3)</b>	130 (48.9)	< 0.001
Number of children (mean)	<b>5.2 (±3.1)</b>	4.0 (±2.9)	< 0.001
Employed N, % employed	214 (76.0)	220 (82.7)	0.17
Education			
None	85 (30.1)	68 (25.5)	0.25
Primary	90 (31.8)	45 (16.9)	0.09
Secondary	92 (34.6)	<b>114 (42.9)</b>	< 0.001
Higher	9 (3.20)	<b>39 (14.7)</b>	< 0.001
Religion			
Christian	<b>230 (81.6)</b>	207 (77.2)	0.007
Muslim	36 (12.8)	<b>56 (21.1)</b>	0.011
Other	7 (2.48)	1 (0.00)	0.07
Socioeconomic status			
0	26 (9.21)	17 (6.39)	< 0.001
1	105 (42.9)	71 (26.7)	
2	151 (53.5)	85 (32.0)	
3	0 (0.00)	93 (35)	
Employed as HCW	15 (5.32)	<b>30 (11.3)</b>	0.019
Travel time to hospital			
0–30 minutes	75 (27.1)	<b>175 (69.4)</b>	< 0.001
30–60 minutes	<b>156 (56.3)</b>	62 (24.6)	
1–2 hours	44 (15.9)	12 (4.8)	
2+ hour	2 (1.0)	3 (1.2)	
Mode of transport			
Walk	59 (20.9)	76 (28.5)	0.008
Motorbike	189 (67.0)	149 (56.0)	
Car	27 (9.60)	41 (14.4)	
Friend or relative with Ebola	65 (23.0)	63 (23.7)	0.92

HCW = health-care worker.

Bolded values are statistically significant. Socioeconomic status grading: 0 = none; 1 = has electricity; 2 = owns radio; 3 = owns motorbike or car.

difficult or impossible to access care during the EVD epidemic. For rural respondents, 46% reported that it was difficult or impossible to access care ( $P < 0.001$ ).

**Barriers to receiving care.** For those who sought care at government hospitals and were unable to receive it, the major barriers were closure of facilities (50%), HCWs refusing to see patients (42%), and fear of referral to EVD treatment units (2%).

Barriers to receiving care were different in rural areas versus urban areas. In rural areas, almost 60% of respondents cited fear of contracting EVD within the health-care facilities as the major barrier to accessing care. In urban areas, the largest barriers to care were closure of health-care facilities (35%) followed by HCWs refusing care to patients seeking it (32%), and fear of contracting EVD within the facility (24%) (Figure 2).

**Access to health care by type of care sought.** Overall, urban patients had much more difficulty accessing care versus their rural counterparts (Table 2). In urban areas, only approximately 25% of patients who sought care received it. Care for pediatric patients (20.7%) and prenatal (22.9%) and obstetric care (22.3%) was especially challenging in urban areas.

There was a shift in where care was accessed before and during the epidemic. Overall, there was a 20–50% decrease (depending on type of care sought) in the use of government hospitals. During the epidemic, 23% of those surveyed stated that no care was available for a family member. The largest group unable to find care was women seeking prenatal care (25%). There was an increased use of traditional birth attendants (10%) for Obstetrics and gynecological care during the epidemic, and more prenatal patients seeking care from



FIGURE 1. Map of Liberia showing location of 21 government hospitals supported and catchment areas surveyed. H denotes hospital T denotes teaching hospital. This figure appears in color at [www.ajtmh.org](http://www.ajtmh.org).

traditional healers. There were slight increases in the number of patients seeking care at pharmacies (4–6%), or using home treatments (4%), especially to treat malaria and pediatric illness.

#### DISCUSSION

The results of our in-person survey support the observation that access to basic health care was severely restricted during the EVD outbreak in Liberia. Living in an urban environment

was the risk factor most closely associated with difficulty accessing care, with 67% of urban survey respondents describing health care as very difficult or impossible to access during the epidemic. This finding fits well with the observation that many government hospitals in cities such as Monrovia were continually shutting down during the epidemic for purposes of decontamination after EVD patients were admitted.

Health care was difficult to access for patients with malaria and other serious illness or injury, such as trauma or respiratory distress. This is likely because these patients had

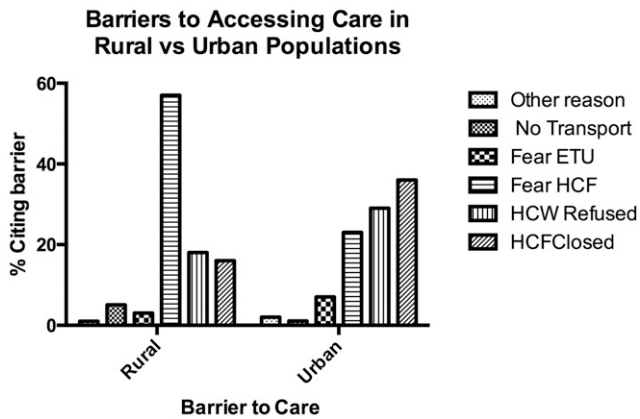


FIGURE 2. Barriers to receiving health care during the Ebola virus epidemic in rural vs urban environments in Liberia. Choices included: No transportation (no transport); fear of referral to an ETU (fear ETU), fear of contracting Ebola virus disease (EVD) in health-care facility (fear HCF), health-care worker refused to see patient (HCW refused); Hospital clinic or facility was closed, (HCF closed), or reason not listed (other reason).

signs and symptoms similar to EVD virus, and were triaged away from the hospital to prevent spread of disease within the facility. Obstetric patients were highly likely to have difficulty accessing maternity care in urban and rural areas. Most hospitals in the country were not offering maternity services during the epidemic due to a lack of functional surgical facilities and the high risk of EVD exposure through bodily fluids associated with delivery. Our survey respondents reported an increase in nonfacility, in home births due to the epidemic.

Although hospital closures were a large factor in the inability to provide care, especially in urban areas, other factors were also involved. In rural areas, patients' fear of exposure to EVD in health-care facilities was a major barrier which prevented them from seeking care. In both rural and urban areas, HCWs refusal to admit patients to the hospital, likely due to fear of contracting or spreading EVD within the facility, caused patients to be triaged away. For these and other reasons, there was a shift away from normal health-care access patterns and facility use, which likely negatively impacted health related outcomes.

The impact that this restricted access to care had on the population is not fully known, but it is theorized that there has been more mortality and morbidity associated with the lack of basic health care than from the EVD outbreak itself.<sup>6</sup> The United Nations Population Fund estimates that as many as 120,000 deaths could have occurred due to a lack of primary health care, with untreated severe malaria and lack of basic obstetric care cited as two areas of particular concern.<sup>7</sup>

Malaria is endemic in Liberia, accounting for 31% of all inpatient deaths and 41% of inpatient pediatric deaths.<sup>8</sup> Models have predicted that as many as 10,000 additional malaria deaths may have occurred due to the lack of access to health-care facilities caused by EVD.<sup>6</sup> In a national cross-sectional study in Guinea in 2015, there was a 15% reduction in outpatient visits for fever during the EVD epidemic, a 24% decrease in oral antimalaria medications prescribed, and 30% decrease in injectable antimalaria medications prescribed at all health-care facilities that were surveyed. This translated into an estimated 74,000 fewer cases of malaria seen at health-care facilities during the EVD epidemic.<sup>9</sup>

TABLE 2

Health-care access during the EVD epidemic by type of care sought

Number seeking care (n)	Number who received care, n (%)			Rural vs. urban P value
	Overall	Rural	Urban	
Minor illness (385)*	289 (76)	204 (70.6)	85 (29.4)	< 0.001
Malaria (401)†	213 (53)	161 (75.5)	52 (24.4)	< 0.001
Pediatric (390)‡	241 (62)	191 (79.0)	50 (20.7)	< 0.001
Prenatal (361)	236 (66)	182 (77.1)	54 (22.9)	< 0.001
Obstetric (358)	238 (67)	185 (77.7)	53 (22.3)	< 0.001

EVD = Ebola virus disease.

\* Minor illness was defined as upper respiratory illness, diarrheal illness, minor injury, typically requiring outpatient care only, adult.

† Malaria was defined as suspicion of malaria by patient symptoms such as fever, prostration, weakness.

‡ Pediatric care was defined as primary health care, care of chronic illness, vaccination.

Our finding that prenatal care and obstetric care were extremely difficult to access during the epidemic has been previously reported by others.<sup>10,11</sup> Ivenyar and others surveyed health-care facilities at the peak of the EVD epidemic in two high-risk counties in Liberia, and noted a marked decrease in utilization of antenatal services (9–14% of peak utilization). They also noted a marked decrease in the number of births in these facilities. This decrease in births and access to cesarean sections undoubtedly caused an increase in maternal mortality. Prior to the epidemic, both Sierra Leone and Liberia, countries with fragile health-care systems caused by years of civil war, had made great strides to decrease the extremely high maternal mortality rates seen in this region. It is estimated that the maternal mortality rate in Sierra Leone increased from approximately 1,000 (per 100,000 population) preepidemic to double this rate after the EVD epidemic.<sup>12</sup>

Lack of access to prenatal health-care during the epidemic likely also translated to more pregnancy-related complications, preterm births, and increased neonatal morbidity and mortality. It has also been estimated that lack of access to family planning services will likely result in more than 1.2 million unplanned pregnancies as a result of this outbreak.<sup>13</sup>

The true impact of this shut down of primary health-care services will only be known over time. The lack of primary pediatric care during the epidemic has already been responsible for outbreaks of vaccine preventable diseases, such as measles and pertussis, which have been reported in Liberia and in other West African countries, due to the closing of essential health-care services for children.<sup>14–17</sup>

**Study strengths and limitations.** We were in a unique position to access both rural and urban populations from all counties in Liberia and to have high levels of participation in our questionnaire survey. The fact that we used Liberian psychosocial workers, who were familiar with the culture and language likely contributed to the high participation rate. The population sampled consisted of the catchment areas surrounding all government hospitals, so it is possible that our data may not have fully accessed rural populations. Our psychosocial teams extended their reach as far as a 1 hour drive from the government hospital. Although our survey sampled an equal mix of rural and urban participants in these catchment areas, we did not access rural populations far removed from the hospitals, so it is unclear how this extremely remote part of the population fared during the EVD epidemic with regard to health-care access. We would assume that access



to health care is a baseline challenge for those living in extremely remote areas.

Since no baseline data were available for the health outcomes examined, it is difficult to ascertain if difficulties in seeking health care can be solely attributed to the EVD epidemic. Since many patients were not able to receive facility based care, malaria is a presumptive diagnosis in the patients that we surveyed. We did not examine the impact that EVD had on chronic illness or on patient's ability to obtain prescription drugs for ailments such as human immunodeficiency virus or tuberculosis. Reports in the literature suggest that difficulty obtaining critically needed medications to treat chronic conditions further contributed to preventable morbidity and mortality.<sup>18</sup>

### CONCLUSIONS

Efforts by the Liberian Ministry of Health and Social Welfare have gone a long way to restoring essential health-care services in Liberia after the EVD outbreak. One important aspect of this response has been the creation of social mobilization teams who engage with persons from rural and urban communities to provide education about EVD and safe practices. These efforts have helped to prevent the spread of disease in many communities. Included in this community outreach should be strategies to educate the population about the safety of hospital facilities and encouragement to return to care, as this will help to rebuild trust in the country's health-care facilities. In addition, IPC training that has been put into place at all government hospitals will help to protect HCWs, and keep hospitals open and functioning. Education about triage mechanisms will help to alleviate HCW's fear of patients who present with suspected EVD. Implementation of EVD diagnostics and rapid diagnostic tests in facilities will also help to bolster the confidence of HCWs.<sup>19</sup>

The results of our survey underscore the critical need to support access to essential health-care services at the time of humanitarian crises. In addition to treating casualties of natural disasters or pandemics, it is also important for international aid agencies to help to maintain access to basic health-care services including prenatal and obstetric care and primary care and vaccination programs for children.

Experts and policy makers have begun to scrutinize the inadequate and delayed response to the EVD outbreak in West Africa. It is likely that the lack of an organized, comprehensive, and timely response caused many deaths due to the spread of the EVD virus.<sup>20</sup> It is also likely that even more deaths were caused by the lack of access to basic health care. Crucial questions are now being raised about what reforms are needed to mend fragile global systems for outbreak response. As strategies are put into place to bolster future responses, we must include parallel mechanisms to support basic and essential health-care services in countries with fragile health-care systems. In the event of similar epidemics or disasters in which health-care facilities are inaccessible on such a wide scale, systems and mechanisms should promptly be put into place to provide alternative means of accessing primary health care. Such interventions will help to minimize the preventable morbidity and mortality that results from lack of access to essential health care.

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