Scientific African 3 (2019) e00050

Contents lists available at ScienceDirect

Scientific African

journal homepage: www.elsevier.com/locate/sciaf

Maternal mortality and the metempsychosis of user fees in Liberia: A mixed-methods analysis

Elsie G. Karmbor-Ballah[a,*], Mosoka P. Fallah[a], Jason B. Silverstein[b], Hannah N. Gilbert[b], Ishaan K. Desai[c], Joia S. Mukherjee[d], Paul E. Farmer[d], Eugene T. Richardson[e]

[a] National Public Health Institute of Liberia
[b] Department of Global Health and Social Medicine, Harvard Medical School
[c] Department of Global Health and Social Medicine, Harvard Medical School, Partners In Health
[d] Department of Global Health and Social Medicine, Harvard Medical School, Partners In Health, Brigham and Women's Hospital
[e] Department of Global Health and Social Medicine, Harvard Medical School, Brigham and Women's Hospital

ARTICLE INFO

Article history:
Received 1 November 2018
Revised 23 January 2019
Accepted 29 January 2019

Keywords:
Maternal mortality
User fees
Liberia
Structural determinants
Health equity

ABSTRACT

Liberia, a country recently afflicted by civil conflict and an epidemic of Ebola virus disease, has one of the highest rates of maternal mortality in the world. A biosocial analysis of this problem can help identify and address barriers impeding access to, and equitable delivery of, quality maternal health care. We analyzed 258 maternal death reviews reported to the National Public Health Institute of Liberia in 2017 and compared data with existing demographic and health statistics. Quantitative information on maternal death was contextualized with 44 in-depth interviews conducted among four groups of study participants. Forty percent of reported maternal deaths in 2017 occurred among women 25–34 years old; 36% were due to hemorrhage; 74% occurred at a health facility; and 29% occurred within 24 h after delivery. The number of deaths reported to the government of Liberia through maternal death reviews ($n = 258$) was substantially lower than the number expected based on the size of the population, crude birth rate, and the maternal mortality ratio. Qualitative findings highlighted inaccessible and unreliable transportation to health facilities; staff-related challenges, including staff attrition and burnout, inadequate training and clinical proficiency, staff absences, and neglect of patients; a lack of drugs and medical supplies; and the emergence of an inefficient and financially burdensome system of referrals by trained traditional midwives. Most notable was the finding that user fees for maternal health care in Liberia—eliminated in public facilities after the war—have resurfaced in the form of informal, out-of-pocket expenditures made by patients and their families.

© 2019 The Authors. Published by Elsevier B.V. on behalf of African Institute of Mathematical Sciences / Next Einstein Initiative.
This is an open access article under the CC BY license.
(http://creativecommons.org/licenses/by/4.0/)

* Corresponding author.
E-mail addresses: elsiegufa@gmail.com (E.G. Karmbor-Ballah), Jason_Silverstein@hms.harvard.edu (J.B. Silverstein), Hannah_Gilbert@hms.harvard.edu (H.N. Gilbert), idesai@pih.org (I.K. Desai), jmukherjee@pih.org (J.S. Mukherjee), paul_farmer@hms.harvard.edu (P.E. Farmer), eugene_richardson@hms.harvard.edu (E.T. Richardson).

https://doi.org/10.1016/j.sciaf.2019.e00050
2468-2276/© 2019 The Authors. Published by Elsevier B.V. on behalf of African Institute of Mathematical Sciences / Next Einstein Initiative. This is an open access article under the CC BY license. (http://creativecommons.org/licenses/by/4.0/)

Introduction

Despite increased global attention to maternal health since the launch of the Safe Motherhood Initiative over 30 years ago [1], one woman dies every one minute and 45 s from pregnancy-related causes [2]. Worldwide efforts to reduce the maternal mortality ratio (MMR) by 75% between 1990 and 2015 [3] fell far short, and a new target of reducing the global MMR to less than 70 per 100,000 live births by 2030 was set by the United Nations in 2015 [4].

Liberia has long had one of the highest rates of maternal mortality in the world. The most recent Demographic and Health Survey, conducted in 2013, estimated a national MMR of 1072 deaths per 100,000 live births, 8% higher than that reported in the 2007 survey (though the difference was not found to be statistically significant) [5]. Moreover, estimates of MMR as of 2013 do not account for the likely spike in maternal deaths during and after the 2013–2016 Ebola virus disease epidemic in West Africa [6–19].

Liberia's civil war, which took place from 1989 to 1997 and 1999 to 2003, decimated the national health infrastructure and workforce [20–22]. Other transnational forces, including structural adjustment and the neoliberal economic policies imposed by international financial institutions, have also weakened the health system, as have inadequate postwar commitments by international partners to strengthen government health services [23–27]. Nearly 39% of Liberia's population lives below the World-Bank-determined international poverty line of $1.90 per day; however, 93% of the population would be considered destitute when using the more humane threshold of $5.50 per day (2011 PPP) [28]. Such immiseration is linked in part to the high direct and indirect costs of seeking and receiving medical care in the absence of adequate social protection against catastrophic health expenditures [29–34].

The major causes of maternal death globally are hemorrhage, hypertensive disorders of pregnancy (e.g., pre-eclampsia, eclampsia), sepsis, unsafe abortion, and other direct causes, including obstructed labor [35,36]. Deaths from these causes are readily preventable with the delivery of evidence-based interventions during the antenatal, perinatal, and postpartum periods [37–39]. Nevertheless, all of these causes remain prominent contributors to maternal mortality in Liberia [40], broadly driven by poverty, gender inequity, and lack of access to quality health care, including its availability, accessibility, accommodation, affordability, and acceptability [41].

Given persistently high maternal mortality rates and substantial geographical disparities in access to health care in the years after the country's civil war [42], the structural barriers to optimal maternal health in Liberia need to be better understood. This task is especially important in the wake of the 2013–2016 Ebola epidemic, which had devastating impacts on Liberia's health workforce, delivery of essential health services, and trust between patients and the formal health sector [43–53]. This study draws on biosocial analysis and a mixed-methods approach to characterize recorded maternal deaths in Liberia, unveil the obstacles faced by pregnant women and their families to accessing quality antenatal and peripartum health services, and understand the perceptions of both traditional and professional health workers regarding the causes of such deaths. We then apply the quantitative and qualitative findings to recommend potential interventions to ameliorate this crisis.

Materials and methods

Ethics statement

Study protocols were approved by the Harvard Medical School Institutional Review Board (IRB17-0671) and the National Research Ethics Board of Liberia (NREB-SP-001-18). Informed consent was read verbatim by the first author, and all enrolled participants indicated consent through either a signature or thumb print. All procedures were done according to the Helsinki Declaration guidelines.

Study design and setting

We used a sequential explanatory mixed-methods design in which quantitative data were first collected and qualitative methods were then used to help explain the numeric results in greater depth (Fig. 1) [54]. The quantitative component of the study consisted of compiling and producing descriptive statistics from all maternal death reviews (MDRs) submitted to the National Public Health Institute of Liberia (NPHIL) in 2017 ($n = 258$). The MDR is a brief investigation of the causes of and circumstances concerning the occurrence of a maternal death at a health facility in Liberia and is thereafter submitted by county health officials to NPHIL.

The qualitative component involved semi-structured, in-depth interviews, which were conducted in 11 of Liberia's 15 counties (Bomi, Bong, Gbarpolu, Grand Bassa, Grand Cape Mount, Grand Gedeh, Lofa, Margibi, Maryland, Montserrado, and Nimba Counties). We used purposeful sampling to systematically ensure the inclusion of multiple perspectives [55]. These interviews involved four groups of study participants: 12 facility-based health workers, who deliver maternal health services to patients at government health facilities; 12 peripartum mothers; 11 trained traditional midwives (TTMs), who provide home-based maternal care to women in their communities; and nine family members of women who died from a pregnancy-related cause ($n = 44$). Facility-based health workers and peripartum mothers were recruited at health facilities, while TTMs and family members were recruited in the communities in which they lived through a listing provided by county health teams.

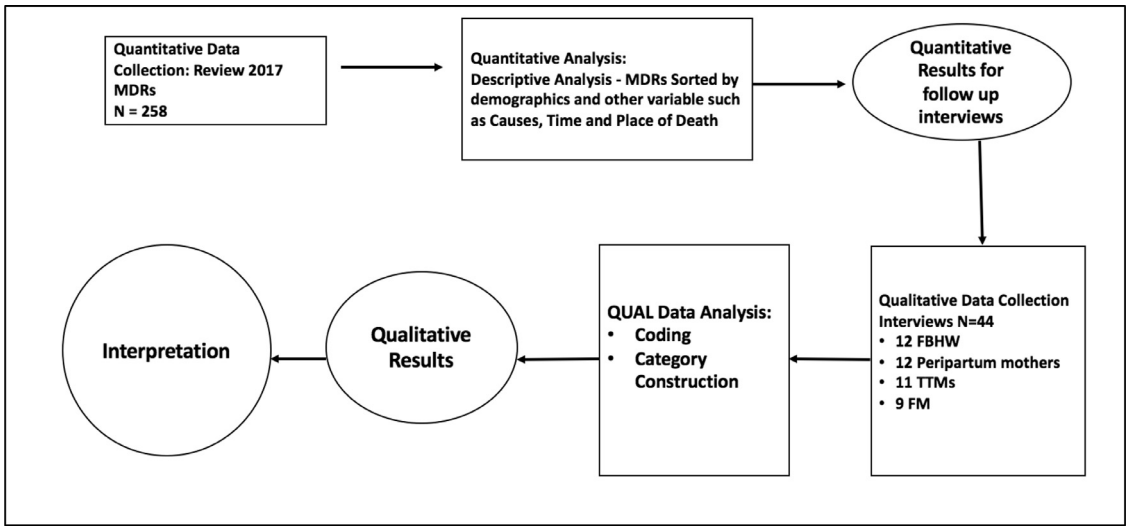

Fig. 1. Mixed-methods study design: sequential explanatory (MDR = maternal death review; FBHW = facility-based health worker; TTM = trained traditional midwife; FM = family member).

Table 1
Interview guide topics.

Study participant	Topics of discussion
Facility-based health worker	• Correlation between ANC attendance and number of deliveries at the health facility • Reasons for any non-correlation • The work environment in government health facilities, including availability of supplies and its effects on their work • Challenges encountered during work • Recommended solutions for such challenges
Peripartum mothers	• ANC attendance during pregnancy and/or reasons for nonattendance • Access to maternal health care both for ANC and delivery • Difficulties encountered
Trained traditional midwives (TTMs)	• Level of training in conducting delivery • Role in the community • Coordination with formal staff in health facilities • Motivations driving their work
Family members of deceased women	• Previous medical conditions of the deceased • ANC attendance and/or reason for nonattendance • Role of family members in the care-seeking practices of the deceased • Major events before and after death • Recommendations for improving maternal survival

Data collection

Data collection took place between July 2017 and January 2018. MDRs were collected from NPHIL and the World Health Organization Liberia office. The 44 qualitative interviews were conducted by the first author, audio-recorded, and transcribed. The transcripts were compared against the corresponding audiotapes to confirm accuracy and completeness, and the interview quotes were maintained in Liberian English. The goal of qualitative data collection was to arrive at detailed experiential accounts from each group that could help contextualize the quantitative data on maternal death in Liberia: the experiences of facility-based health workers in maternal health care provision; the experiences of peripartum mothers during pregnancy and/or delivery at health facilities, or during any past home delivery; the experiences of TTMs involved in home deliveries of pregnant women in their communities; and the experiences of women who died of a pregnancy-related cause, including the events leading to their death, as conveyed by the narratives of their family members. Interview guides were used to facilitate this process. Predetermined topics for the discussion are presented in Table 1.

Data analysis

Data from MDRs were sorted by age group, education level, cause of death, and place and time of death, among other variables. To help contextualize the data, the records were compared with demographic and health statistics from the Health Management Information System (data as of 2017) and from the most recent Demographic and Health Survey (data as of 2013) [5].

Qualitative analysis utilized an inductive content analytic approach [55,56]. Analysis began with multiple readings of transcripts after which we open-coded a select number of interviews in the data set. We then directly coded the entire data set using the Dedoose software package. Coded data were inductively analyzed to construct a set of thematic categories, which were elaborated and illustrated with excerpts from the data. Initial categories were examined interpretively and revised to formulate a final set of thematic concepts that shed light on participants' experiences of accessing maternal health services, providing health care, and/or other aspects of their lived experience.

Results

Characteristics of the women described in MDRs reported to NPHIL in 2017 are summarized in Table 2. Forty percent of the 258 reported maternal deaths occurred among women 25–34 years old. Thirty-six percent were due to hemorrhage, 11% to sepsis, 9% to hypertensive disorders, and 1.6% to obstructed labor. Over a quarter of women who died had no formal education, and various risk factors—including anemia, malaria, and hypertension—were documented during ANC visits. Close to three-quarters of deaths occurred at a health facility, while an additional 13% and 12% occurred in the community and en route to a health facility, respectively. Twenty-nine percent of reported deaths occurred within 24 h after delivery, and only 44% of women who died were documented to have been cared for by a professional/skilled birth attendant.

Analysis of MDRs submitted to NPHIL in 2017 also provided information about the subset of women who received referrals for maternal health care and obstetric emergencies ($n = 78$), summarized in Table 3. Although ambulances were used to facilitate transport in close to one-half of reported referrals, other modes were also used, including private or commercial transportation (32%), walking (9%), and motorbike (9%). Twenty-eight percent of referrals involved more than 12 h of travel time to reach the intended health facility.

Multiplying the 2017 population of Liberia (4731,906) [57] by the crude birth rate (34.4/1000) and MMR (1072/100,000) reported in the 2013 Demographic and Health Survey [5] yields a total of 1745 predicted maternal deaths in 2017. However, only 258 were documented in MDRs submitted to NPHIL in 2017, or about 15% of expected deaths. This suggests significant underreporting of the true number of maternal deaths at the national level.

Qualitative data analysis unveiled several noteworthy barriers impeding access to, and equitable delivery of, quality maternal health care in Liberia. The four main themes that emerged from this analysis are summarized in Table 4 and described in greater detail below.

Inaccessible and unreliable transportation to health facilities

Transportation difficulties were found to be central barriers to peripartum care at two key points: from women's homes to the local clinic and from the clinic to the hospital during transfers. Many of the peripartum mothers interviewed explained that distance and bad road conditions posed a significant challenge to accessing and utilizing maternal services. Some communities can only be accessed via a foot path or bush road; no vehicle, and at times not even a motorbike, can be used to get to reach them. In most cases, then, women can only reach the facilities by foot. Women explained that this walk was strenuous for them, especially when in labor. Some, such as the village mother described below, explained that they preferred to deliver at home with a TTM rather than endure an hours-long walk to the health facility (all interview quotes in Liberian English):

> "From there to the hospital, it is too far. So, no need to walk from that far distance because as soon as I am ready, the old ma [TTM] can just deliver me." (Peripartum mother)

Other women who lived closer to accessible roads noted that they were often unable to summon a vehicle due to financial constraints; moreover, once a woman is in labor, even a short walking distance can prevent her from going to the health facility. A mother explained how such factors shaped her decision to deliver at home:

> "Motor bikes can go there, but you may not even have money. Two hundred dollars [~US $1.40]…you may not have money to take bike at that time and come there, so that's what can be the cause." (Peripartum mother)

In cases of obstetric emergency, patients should be provided an ambulance; however, interviews with most facility-based health workers showed that transportation of emergency patients by ambulance was unreliable. Some health workers explained that even when an ambulance was available, there was often no fuel for it, forcing patients to search for commercial vehicles. Furthermore, some interviewees reported that an ambulance's ground clearance was so low it could not travel off the main roads. In certain instances, a woman who develops a complication at a clinic distant from a main road and who requires hospital management is compelled to remain at the clinic. Alternatively, ambulance drivers often ask a patient's relatives to transport her to a main road for easier transport to the hospital:

> "We have two ambulances, but one is very low. It can't afford to go to rural areas, so we have some facilities on the main road. So, we can use it to go to the main road, or maybe the patient relatives can bring them to the main road, and then we go and pick them up. But that ambulance is so low it can't go to…those areas." (Facility-based health worker)

Such delays can have significant health consequences and, in some cases, lead to death.

Table 2
Characteristics of women described in MDRs reported to NPHIL in 2017 ($n = 258$).

Characteristic	*n*	Percentage
Age at death (years)		
<18	19	7.4
18–24	71	27.5
25–34	102	39.5
35+	66	25.6
Marital status		
Single	29	11.2
Living together	49	19.0
Married	43	16.7
Separation	4	1.6
Unknown/Missing	133	51.6
Level of education		
No formal education (never attended school)	69	26.7
Elementary	24	9.3
Junior high	18	7.0
Senior high	15	5.8
College diploma	5	1.9
Unknown	127	49.2
Occupation		
Student	34	13.2
Housewife	50	19.4
Subsistence farming	75	29.1
Business	21	8.1
Employment (formal or informal)	8	3.1
Unknown	70	27.1
Gravidity		
Gravida 1	49	19.0
Gravida 2–4	85	32.9
Gravida 5–10	83	32.2
Gravida 11+	15	5.8
Unknown	26	10.1
Parity		
Parity 0	35	13.6
Parity 1–4	131	50.8
Parity 5–10	57	22.1
Parity 11+	9	3.5
Unknown	26	10.1
Number of ANC visits		
None	27	10.5
1–4	103	39.9
5+	18	7.0
Unknown	110	42.6
Risk factors during ANC visits		
Anemia	13	5.0
Malaria	36	14.0
Hypertension	17	6.6
Others	55	21.3
Unknown	137	53.1
Time of death		
During pregnancy	54	20.9
During delivery	36	14.0
Immediately postpartum (within 24 h)	74	28.7
Between 1 and 42 days postpartum	27	10.5
Unknown	67	26.0
Place of death		
Health facility	192	74.4
Community	34	13.2
En route to health facility (from home or other)	30	11.6
Unknown	2	0.8
Cause of death		
Hemorrhage	93	36.0
Sepsis	29	11.2
Obstructed labor	4	1.6
Hypertensive disorders of pregnancy	24	9.3
Others	47	18.2
Unknown	61	23.6

(*continued on next page*)

Table 2 (*continued*)

Characteristic	*n*	Percentage
Neonatal outcome		
Dead	85	32.9
Alive	40	15.5
Unknown	133	51.6
Birth attendant		
Professional/Skilled birth attendant	113	43.8
Unknown	145	56.2
Mode of delivery		
Vaginal	67	26.0
Caesarean section	50	19.4
No delivery/still pregnant	54	20.9
Unknown	87	33.7
Referral		
Yes	78	30.2
No	57	22.1
Unknown	123	47.7

Table 3
Characteristics of referrals described in MDRs reported to NPHIL in 2017 ($n = 78$).

Characteristic	n	Percentage
Mode of transport to referral point		
Ambulance	36	46.2
Personal (private, commercial)	25	32.1
Foot (walking)	7	9.0
Motorbike	7	9.0
Hammock	2	2.6
Wheelbarrow	1	1.3
Duration of travel to referral point (hours)		
≤1	27	34.6
>1, up to 2	7	9.0
>2, up to 4	11	14.1
>4, up to 9	9	11.5
>9, up to 12	2	2.6
>12	22	28.2

Table 4
Themes derived from qualitative data analysis.

Main theme	Implications for maternal health care delivery
Inaccessible and unreliable transportation to health facilities	–Costs due to unavailability of ambulances –Distance to health facilities –Poor road conditions
Staff-related challenges	–Staff retention in rural areas –Insufficient staff training and qualification –Absence of staff at facilities –Delayed responses to urgent cases –Contemptuous treatment of patients
Lack of supplies	–No delivery materials; patients often must pay to supply them –Frequent stock-outs of drugs and medical supplies at government facilities; patients are given prescriptions to buy them from local pharmacies
Inefficiencies in the TTM system	–Informal fees paid to TTMs for referral –Care often delayed if money not available

Other interviewees reported that road terrain is so bad and fleet maintenance so poor that ambulances often break down while in transit. During interviews with facility-based health workers, several reported instances of ambulances breaking down and patients dying because of the resultant delays. One health worker narrated a story in which a woman gave birth at a local clinic that was very far from a hospital. After delivery, she had a retained placenta requiring hospital management, and an ambulance was thus requested from the hospital. The ambulance managed to reach the clinic to receive the patient, but as soon as it departed from the clinic, it broke down. A mechanic was called from town to repair the ambulance. As the mechanic was on his way, his motorbike also broke down, and he too called someone to repair his motorbike before he could reach the clinic to repair the ambulance. A medical doctor related the consequences of this series of breakdowns:

> "For a retained placenta! By the time they reached [the hospital], the patient died shortly after they arrived. She bled too much." (Facility-based health worker)

Staff-related challenges

Further barriers to the provision of quality maternal care concerned the health workforce tasked with staffing public facilities and caring for pregnant women and children. These included staff attrition and burnout, inadequate training and clinical proficiency, staff absences, and neglect of patients.

Staff attrition and burnout

Staff attrition is a common issue in rural Liberia. It has been difficult to retain health care workers in rural settings. Recently trained staff often accept rural assignments in public facilities, but after a couple years of service, they seek employment in urban areas where earnings are generally higher. In other cases, trained health care staff remain within rural settings but leave government facilities to work with a nongovernmental organization (NGO) that offers higher pay.

Health workers employed in the government system reported that their salaries were small and that monthly payments were frequently delayed, sometimes for over two months. Some rural health workers expressed wishes for "hardship pay" in exchange for their sustained work in remote areas. Specific suggestions included salaries that were commensurate with distance and terrain covered, even within the same county. An officer-in-charge of a rural government clinic, where she has worked for over eight years, noted that two certified midwives she knew were driven away due to this problem:

> "I just want for the central government to be able to categorize those people according to the distance. And even the kind of terrain you are working in…I am in the closest health facility [to the capital of a largely rural county of Liberia]. You don't expect me and the person in [the village] to get the same salary, where they have to walk about 20 to 25 hours before they reach. If even you in car, sometimes 10 hours before you reach." (Facility-based health worker)

Inadequate training and clinical proficiency

Smaller rural clinics are usually staffed by just two professional care providers: an officer-in-charge, who is typically a nurse or a physician assistant, and a certified or registered midwife responsible for providing maternal services. Facility-based health workers noted that inadequate training and proficiency were especially problematic when staff attrition led to gaps in care delivery. Positions vacated by trained staff were often filled by recent graduates who had not yet acquired necessary clinical skills or experiences, nor benefitted from the on-site mentorship that would help develop them. In such situations, interviewees explained, errors in patient management could lead to preventable maternal deaths. At the clinic level, patients were often misdiagnosed, treated tardily, or given care that was inappropriate altogether. Such mismanagement sometimes resulted in very late referral to a hospital, as noted by a medical doctor:

> "Some of the diagnoses that are made at the health facility, they [health workers] make the wrong diagnosis when the person gets there. When they realize that the diagnosis they have made is wrong, before they start calling for ambulance to carry the patient, it's late." (Facility-based health worker)

Staff absences

At hospitals especially, health care workers delegated with particular duties are not always available at their assigned workplaces. Interview data revealed several reported instances in which medical doctors and anesthetists either did not respond to colleagues or patients in time or were entirely unreachable. This led to serious delays for women requiring caesarean sections, many of whom were unable to obtain the surgery because a doctor or anesthetist was not present. Some interviewees reported that in such emergencies, a midwife often used her own money to purchase phone units to call specialists. One midwife, the supervisor of the maternity ward at a public hospital, described this scenario with frustration:

> "You will have to call the doctor on your own money, then you call the anesthetist, you call this other person, you call this other person, before every one of them getting together to do the surgery. It will be a waste…Sometimes the patient die[s] because these people are not there on time, and it can pain us, you the midwife that is on duty, but it giving us problem, a serious problem in the institution." (Facility-based health worker)

Neglect of patients

Peripartum mothers and family members of the deceased noted that, in many cases, health care workers often failed to approach them with care and courtesy. Several interviewees reported that many midwives often had no respect for their patients and spoke harshly to them. Patients were shouted at, and sometimes beaten, including during delivery at health facilities. Women explained that such harsh treatment from midwives discouraged them from seeking services at certain facilities. Some health workers admitted to engaging in this type of behavior. However, they argued that their mistreatment of patients stemmed from the frustration of lacking the requisite supplies and resources to fulfill their duties and from an overall feeling of burnout. Reflecting on staff attitudes, the mother of a woman who died in childbirth described her despair:

> "I will not go there no more, because the people who are there, they are not doing the work, ma. They can talk to you rough. When somebody is sick, they want for someone to pet them. When you sick, you can be just like baby. But when you sick, you go there, they say sit down over there we coming, don't make noise, that's not your one here…Is that how to comfort patient? That is not the way it supposed to be." (Family member of woman who died from pregnancy-related cause)

Another problem identified in the qualitative data was the indifference and lack of attention exhibited by some health workers toward their patients. Family members and peripartum mothers reported that they were often ignored at facilities while health providers attended to their personal needs. Patients noted that instead of "providing care," some health care workers used their phones to chat or engage with social media. Others saw that health care providers gathered at nursing stations to watch movies, noting that it was particularly prevalent during night shifts and left women in labor unattended. Consequently, in some cases, women delivered their babies on their own and reported that health care providers arrived late, hurrying to clean up so it would appear to their supervisors that they had attended the delivery. One patient recounts the experience of watching another woman who had been admitted with her to the hospital:

> "The girl start feeling pain. She [the midwife] left the girl there, she go put the show on. Before she go look now the child head get outside before people go call her say, "oh, the girl already born the child." She start hurrying up, putting things them together. So her people can't meet her there. So the boss lady can't meet her there. That how she finished quick. She put the girl on the bed." (Peripartum mother)

Lack of supplies

Birth preparedness kit

Peripartum mothers are frequently told by health care providers that in order to deliver at a facility, they must arrive with a kit of personal items, to be used by the mother and staff at the time of labor and delivery. This birth preparedness kit must contain bleach, Dettol (a surgical disinfectant), alcohol, and soap. Kits must also include personal items for the mother and baby, including swaddling clothes (or a *lappa*), a small towel, and some sanitary pads. Some expectant mothers reported that they were denied admission to a facility because they did not have a complete birth kit. Others said that while they were not denied admission, they were made to lie on the delivery bed unattended until all items were provided. A family member describes her experience carrying her sister to the hospital for delivery:

> "When I carry her, Dettol was lacking…and that was in the night oh…eight o'clock in the night. The nurse told us that when Dettol not there, just remain in that room until you can get the Dettol. And she [the patient in labor] was in the delivering room, and she [the midwife] was in her own office sitting down. I left her at the hospital, got on motor bike…and the motor bike carry me all the way to the drug store…I went and pay for the Dettol and carry the Dettol to them [at the hospital]." (Family member of peripartum mother)

Some health care providers reported that working in the absence of these materials was risky for them, because the birth preparedness kit contained materials that could protect them from exposure to bloodborne pathogens. Health workers also noted that cleaning materials brought by pregnant women to the facility were often rerouted and used to clean not only the obstetrics ward, but the entire health facility. They lamented that such materials should be provided by the government under its declared provision of free health care. One health care worker angrily emphasized a link between a lack of supplies and occupational risk:

> "The government not giving anything like soap, chloride, you know, and we playing with blood and you know blood, plenty things inside. So that's the Clorox at least we can use to disinfect the materials and ourselves…When the government say service free, the people should not pay anything. They are not willing to provide anything. So, it's not easy. So, we are at risk, let's be frank. We are at risk too." (Facility-based health worker)

Drugs and medical supplies

All interviewees reported experiencing stockouts of medical supplies, as well. Patients are frequently given a prescription ("whitepaper") for necessary supplies or medications. Even TTMs reported that some of their patients refused to report to a facility for delivery because they did not have money to buy the drugs they knew would be prescribed. Peripartum mothers bemoaned the futility of spending limited funds on transportation to a health facility, only to be given a prescription for a common analgesic like paracetamol. Instead, they noted, it would be better to stay at home and save their money for other necessary expenses. A pregnant woman, for example, recalled that her husband refused to give her transportation money to attend an ANC visit because he knew that the clinics lacked medicine:

> "I told my husband, say this belly I get now, I want to be going to the hospital, so, he must give money. And he said, "that hospital that can't give medicine there. I don't have money to give. Sit down." (Peripartum mother)

Health workers also associated stockouts of medical supplies with poor maternal health outcomes, deploring that such stockouts constrained the execution of their daily tasks. Some intimated that stockouts of certain materials could last for six months and were particularly problematic in emergency cases, for without the tools to perform medical procedures or

gloves to protect themselves from possible infection, health workers could not safely and promptly provide emergency care to mothers. In such cases, many health care workers felt they could do nothing but painfully watch the patient die:

> "So, there was no oxygen, the same thing I telling you there was no cannula. The woman, all the money she brought, she spent it in [the clinic]. No cannula, it's late that hour, where I going get cannula from to even establish line at least to maintain her on some fluid?…Nothing! It was so frustrating. Nothing. So, I lee [left] looking at that girl until she died. So, that what can happen when you don't have the material." (Facility-based health worker)

Inefficiencies in the TTM system

After Liberia's civil war, in order to increase rates of facility-based delivery and reduce poor maternal outcomes, the government worked with NGOs to incentivize TTMs to refer their clients to health facilities. Since cash exchanges were initially discouraged, TTMs who referred patients were often provided with packages that included a *lappa*, rice, T-shirts, and other goods. From 2014 onwards, this program gradually ceased, as funding dried up and NGOs withdrew. However, recognizing the effectiveness of such TTM reimbursement systems, some county health systems restarted the program, this time offering TTMs cash payment for each woman referred for a facility-based delivery; in these counties, facility-based deliveries have increased. A medical doctor at a rural hospital lauded the scheme:

> "Yes, yes. They're coming. I will say they [pregnant women] are coming [to the facility], but we still have issues with it. Sometime they bring fully dilated, they bring them in their active stage of labor, but I think this is a process that we need to continue, and I think it will get better." (Facility-based health worker)

TTMs have come to expect cash payments in return for their referrals, but the county does not have an adequate budget for them. Consequently, referral compensation for TTMs has often become the responsibility of individual patients. Interviews unveiled a system of TTM payment predicated on an "internal enforcement system" by which clinic staff privately collaborate with TTMs to ensure that patients or their family members pay TTMs for their referrals. Participants explained that health workers ensure that TTMs are reimbursed by refusing to discharge the mother and baby until she or her family provides a cash payment. One TTM, for example, describes the enforcement strategy as follows:

> "But they [professional health worker] only told us that since you not on payroll, and you cannot sleep anytime when you bring someone, when that person deliver, we will compel the person to give you 500 dollars (~US $3.50) before they can carry their child home." (TTM)

The current system of TTM-facilitated referrals was found to operate largely with financial contributions from patients, rather than from public or NGO-based sources of funding. A TTM explained that some women who lack money to pay TTMs will go to such extremes as selling food and other property:

> "Sometime when they not get it, sometime, they will call us somewhere…they will call somebody in the clinic. They say, "stand my bond, when I go…I get my oil or I get so, so thing to satisfy my midwife." (TTM)

Discussion

Imperial legacies, structural adjustment, extractive industry, and enabled civil war are important macrosocial determinants of maternal mortality in West Africa [6]; however, this study aimed to achieve a more granular depiction of health systems dysfunction through studying characteristics of maternal deaths in Liberia, as well as barriers to accessing and delivering the health services needed to avert them. In-depth interviews revealed four thematic barriers to quality maternal care, including transportation difficulties; staff-related challenges (attrition/burnout, inadequate skill level, absence from work, and patient abuse); lack of materials and frequent stockouts (leading to the "whitepaper" phenomenon, whereby patients are given prescriptions to buy their own drugs and supplies from local pharmacies); and inefficiencies and inequities related to TTM-facilitated referrals to health facilities.

A prominent finding of this study was that user fees for maternal health care in Liberia—eliminated in public facilities after the war—have resurfaced in the form of informal, out-of-pocket expenditures made by patients and their families. User fees refer to a mechanism of health care financing whereby payment is made at the point of service in a system with no risk sharing; they can "entail any combination of drug costs, supply and medical material costs, entrance fees or consultation fees" [58]. In a 1987 report, *Financing Health Services in Developing Countries*, the World Bank promoted the use of user fees at government health facilities in order to generate increased revenue for health services, reduce overconsumption of health resources by shunting patients to lower cost primary care services, and subsidize rural health care by diverting money collected in urban areas [59]. This mode of cost recovery was enshrined in the 1987 Bamako Initiative, which committed many African ministries of health to establish universal access to primary care by decentralizing health decision-making and promoting user fees [60]. Such lofty goals were seldom realized, however. In fact, user fees tended to produce underconsumption of health care, and only recouped a mere 5% of health outlays for countries that implemented them [61]. Close to 20 years since adoption of the Bamako Initiative, James and colleagues estimated that the *elimination* of user fees could prevent approximately 233,000 under-five deaths annually in 20 African countries [62].

User fees were suspended in Liberia in 2006 and remained so in the Ministry of Health's Basic Package of Health and Social Welfare Services of 2008 [63]. Our findings demonstrate, however, that point-of-service costs have re-emerged in alternate forms for the most vulnerable of patients: poor, pregnant women. These forms include informal payments to TTMs for referral, purchase of medical supplies required for patient care, and drug costs. Health facilities with stockouts often force individual patients to pay for materials needed for delivery. Women in our study reported being denied admission or being neglected when just a single item of the required supplies was missing, undermining their capacity and inclination to pursue facility-based deliveries. Data from all four groups of interviewees demonstrated that these high financial costs, though not officially documented in national health policy, produce critical and even lethal delays in accessing and receiving essential maternal health care, including for obstetric emergencies. They may also explain concerning statistics found in our analysis of MDRs, such as the observation that large proportions of women experiencing maternal death do not complete the recommended number of ANC visits, die shortly after delivery, are not cared for by skilled birth attendants, and die in both health facilities (or en route). Recognizing and resolving the circumstances that have made informal user fees commonplace in the Liberian health system—even for maternal and child health services said to be publicly financed—is thus essential to reducing maternal mortality.

The emergence of the TTM-facilitated referral schemes documented in this study creates inefficiencies in the health system while disadvantaging patients. TTMs benefit from payments for referring patients to health facilities, theoretically leading more women to seek facility-based deliveries; however, the responsibility of making these payments falls on patients and their families. Such unforeseen expenditures may thus have the opposite effect and undermine the promise of leveraging TTMs' strong relationships with, and knowledge of, their communities to increase safe, facility-based deliveries in Liberia. In addition to the inequities it introduces, such a system is highly inefficient in a place like Liberia, where resources allocated for quality health care are already suboptimal. Rather than helping expectant mothers attend health facilities without the need to pay for their "referral," the current system depletes the already-limited resources patients can dedicate to other aspects of their care, from transportation to birth preparedness kits. It may therefore be worthwhile for the government and its private sector partners to better equip and remunerate TTMs and provide them with enhanced training in community health.

This study's qualitative data also show how user fees and the financial burden of pregnancy jeopardize more than a woman's health, often coercing her and her family into selling food and other goods and driving them deeper into poverty. The World Bank indicates that approximately 39% of Liberians live below the international poverty line, set at $1.90 per day (all analyses set to 2011 PPP) [28]. However, many have argued that this line is set far too low for basic human wellbeing and should be no less than $5 per day [64]. According to World Bank data, under a poverty line of $5.50 per day, at least 93% of Liberians would be considered poor and lack the minimum income needed to secure the necessities of life [28]. For the pregnant and non-pregnant, one such necessity is health care.

The remoteness of some of health centers in Liberia also undermines the desire of health workers to staff them, fueling a paucity of skilled care providers in rural settings. Facility-based health workers in our study lamented that they were not sufficiently compensated for working in the difficult conditions associated with serving in distant, rural communities. Those who are recruited to such sites often leave after a short time, and the quality of care provision in turn suffers. To elevate quality and improve health worker output, performance-based financing mechanisms have been implemented in several countries, including Liberia. In Zambia, for example, Shen and colleagues demonstrated that such a program can reduce staff attrition and boost job satisfaction [65]. Our interviews with health workers indicate that while performance-based financing may be helpful, it does not directly address the challenges they experienced in remote communities. One way to encourage service in hard-to-reach health facilities may be to increase monetary incentives for those opting to work in them—an approach recommended as a policy option for the Liberian Ministry of Health [66]. Our data support this option and suggest that a distance-based payment system could reduce staff attrition. Additionally, by incentivizing experienced practitioners to work in rural settings (as opposed to only recent graduates), this proposal could address the staff competency barrier identified in our study.

This study further emphasized the consequences of a scarcity of health professionals and a lack of specialists able to address obstetric surgical emergencies. As of 2016, Liberia had only 11.7 "core clinical health workers" (midwives, nurses, physicians, and physician assistants) per 10,000 people [67], well below the World Health Organization's minimum threshold of 23 health workers per 10,000 population [68]. This count is even lower in rural parts of the country. Of the estimated 16,064 health workers in Liberia, only 4756 of them were core clinical health workers. Physicians make up just 4.9% of this total in both public and private health facilities [67]. Liberia currently has no anesthesiologists and fewer than 50 nurse anesthetists. Given the small numbers of nurse anesthetists and medical doctors, and the high demand for their services (as in obstetric surgical emergencies), these specialists are often not afforded days off. With burnout a major concern, it is important to carefully manage and balance their workload, for their loss would further diminish the limited critical care available to women in remote regions. There is thus a strong need for human resource development in these cadres of health workers, not only to improve maternal health in Liberia, but also to build a "resilient health system" capable of addressing a large national burden of disease [69].

Neglect of and disregard for patients are under-described barriers to optimal maternal health. Results from this study illustrate that women in labor at health facilities are often left unattended, as some facility staff engage in personal activities. As a result of such attitudes, many women struggle and give birth on their own even while in a health facility. Such behavior

has also claimed attention in other settings, leading to lawsuits [70]. This is a serious concern that must be addressed, as it can both discourage facility-based delivery and increase litigation.

Lastly, this study's comparison of data from MDRs with national health statistics revealed a significant gap between reported ($n = 258$) and predicted maternal deaths ($n = 1745$). This has significant implications for health surveillance, not only in maternal health but also for pandemic threats: if readily identifiable phenomena such as maternal deaths are not captured, how can we expect unusual and less readily diagnosable cases of communicable disease to be detected?

Limitations

Due to limited time and poor road conditions, all 15 counties of Liberia were not visited for qualitative data collection. Counties excluded were Rivercess, Sinoe, Grand Kru and River Gee, all within the southeastern region; however, data from Maryland and Grand Gedeh Counties may provide representation of the southeast, as examined in this study.

In addition, we encountered a variety of different MDRs, due to their variability at the county level. Counties reported maternal deaths based on available forms that they had at their disposal. As a result, data for some variables are missing. For example, it was difficult to provide an accurate picture of the time of death for the 258 cases we examined; the time of death was unknown for 26% of the cases. To avoid such variability in data collection and quality across counties, we recommend that a single type of MDR form be adopted nationwide.

Finally, although this study provides in-depth insight into the barriers that may affect maternal mortality in Liberia, the results may not be generalizable beyond the study population.

Conclusions

This study contributes novel insights for understanding and mitigating the burden of maternal mortality in Liberia, and may help guide the Liberian health sector in its efforts toward and beyond the 2030 MMR target of 70 per 100,000 births [4]. It also identifies key areas in which increased attention and resources should be invested to improve maternal health outcomes. Its results can therefore inform NPHIL's and the Liberian Ministry of Health's programming of county reproductive health units, as well as the ministry's family health division. Recommendations drawn from the study findings include standardizing and promoting a consistent MDR form across all health facilities in the country; investing in the training and capacity-building of health care workers; improving and maintaining a transportation system for maternal health services (ambulances and motor bikes, with sufficient fuel and a maintenance budget); investing in the development of multi-sectoral roads through collaboration between the Ministries of Health, Public Works, and others, with rural settings prioritized; implementing programs to improve health workers' attitude toward patients; ensuring greater availability of essential drugs and medical supplies; and retooling, training, and compensating TTMs as community health workers.

The last two recommendations may help avert the hidden user fees for maternal health care that were uncovered in this study. While women are not charged directly for giving birth in public health facilities, they are nevertheless often responsible for payment for necessary equipment. From drugs and medical supplies to birth preparedness kits and TTM referral payments, our respondents showed that giving birth in a health facility is a costly endeavor. Those tasked with protecting and improving maternal health must ensure that health services are truly free and do not introduce hidden or informal costs to patients.

Acknowledgments

We are grateful to all participants of this study: facility-based health workers, including medical doctors, midwives, and nurses; patients (peripartum mothers); TTMs; and family members of women who died from pregnancy-related causes. Many thanks, as well, to the Department of Infectious Diseases and Epidemiology at NPHIL, the World Health Organization's Liberia office, and the Liberian Ministry of Health for review of secondary data.

Declaration of interests

None.

Role of funding source

This research was supported by the Department of Global Health and Social Medicine at Harvard Medical School and the National Public Health Institute of Liberia. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.sciaf.2019.e00050.

References

[1] Family Care International, Safe Motherhood: A Review, Family Care International, New York, 2007.
[2] World Health Organization, UNICEF, United Nations Population Fund, World Bank Group, United Nations Population Division, Trends in Maternal Mortality: 1990 to 2015, World Health Organization, Geneva, 2015.
[3] United Nations General Assembly, United Nations Millennium Declaration (Resolution 55/2), United Nations, New York, 2000 available from: http://www.un.org/millennium/declaration/ares552e.htm.
[4] United Nations General Assembly, Transforming Our World: The 2030 Agenda for Sustainable Development (Resolution 70/1), United Nations, New York, 2015 available from: https://sustainabledevelopment.un.org/post2015/transformingourworld.
[5] Liberia Institute of Statistics Geo-Information Services (LISGIS), Ministry of Health and Social Welfare (Liberia), National AIDS Control Program (Liberia), ICF International, Liberia Demographic and Health Survey 2013, LISGIS and ICF International, Monrovia, Liberia, 2014.
[6] E.T. Richardson, M.B. Barrie, J.D. Kelly, Y. Dibba, S. Koedoyoma, P.E. Farmer, Biosocial approaches to the 2013-2016 Ebola pandemic, Health Hum. Rights 18 (1) (2016) 115–128.
[7] J.S. Mukherjee, R. Marsh, Excess maternal death in the time of Ebola, Fletcher Forum World Affairs 39 (2) (2015) 149–160.
[8] J. Ly, V. Sathananthan, T. Griffiths, Z. Kanjee, A. Kenny, N. Gordon, et al., Facility-based delivery during the Ebola virus disease epidemic in rural Liberia: analysis from a cross-sectional, population-based household survey, PLoS Med. 13 (8) (2016) e1002096.
[9] K.J. Brolin Ribacke, A.J. van Duinen, H. Nordenstedt, J. Höijer, R. Molnes, T.W. Froseth, et al., The impact of the West Africa Ebola outbreak on obstetric health care in Sierra Leone, PLoS One 11 (2) (2016) e0150080.
[10] J.R. Lori, S.D. Rominski, J.E. Perosky, M.L. Munro, G. Williams, S.A. Bell, et al., A case series study on the effect of Ebola on facility-based deliveries in rural Liberia, BMC Pregnancy Childbirth 15 (1) (2015) 254.
[11] B.O. Black, S. Caluwaerts, J. Achar, Ebola viral disease and pregnancy, Obstetric Med. 8 (3) (2015) 108–113.
[12] P. Iyengar, K. Kerber, C.J. Howe, B. Dahn, Services for mothers and newborns during the Ebola outbreak in Liberia: the need for improvement in emergencies, PLOS Curr. Outbreaks 7 (2015).
[13] A. Delamou, R.M. Hammonds, S. Caluwaerts, B. Utz, T. Delvaux, Ebola in Africa: beyond epidemics, reproductive health in crisis, Lancet 384 (9960) (2014) 2105.
[14] C. Menéndez, A. Lucas, K. Munguambe, A. Langer, Ebola crisis: the unequal impact on women and children's health, Lancet Global Health 3 (3) (2015) e130.
[15] M.M. Dynes, L. Miller, T. Sam, M.A. Vandi, B. Tomczyk, Perceptions of the risk for Ebola and health facility use among health workers and pregnant and lactating women — Kenema District, Sierra Leone, September 2014, Morbidity Mortality Weekly Rep. 63 (51) (2015) 1226–1227.
[16] J.E. Deaver, W.R. Cohen, Ebola virus screening during pregnancy in West Africa: unintended consequences, J. Perinat. Med. 43 (6) (2015) 649–655.
[17] F. Shannon, E. Horace-Kwemi, R. Najjemba, P. Owiti, J. Edwards, K. Shringarpure, et al., Effects of the 2014 Ebola outbreak on antenatal care and delivery outcomes in Liberia: a nationwide analysis, Public Health Action 7 (1) (2017) S88–S93.
[18] E.C. Hayden, Maternal health: Ebola's lasting legacy, Nature 519 (7541) (2015) 24–26.
[19] A. Kenny, G. Basu, M. Ballard, T. Griffiths, K. Kentoffio, J.B. Niyonzima, et al., Remoteness and maternal and child health service utilization in rural Liberia: a population-based survey, J. Global Health 5 (2) (2015) 020401.
[20] M.E. Kruk, P.C. Rockers, E.H. Williams, S.T. Varpilah, R. Macauley, G. Saydee, et al., Availability of essential health services in post-conflict Liberia, Bull. World Health Organ. 88 (7) (2010) 527–534.
[21] K.R. Challoner, N. Forget, Effect of Civil War on medical education in Liberia, Int. J. Emerg. Med. 4 (1) (2011) 6.
[22] M.A. Clemens, G. Pettersson, New data on African health professionals abroad, Human Resour. Health 6 (1) (2008) 1.
[23] A. Benton, K.Y. Dionne, International political economy and the 2014 West African Ebola outbreak, African Stud. Rev. 58 (1) (2015) 223–236.
[24] S. Abramowitz, What happens when MSF leaves? Humanitarian departure and medical sovereignty in postconflict Liberia, in: S. Abramowitz, C. Panter-Brick, P. Piot (Eds.), Medical Humanitarianism: Ethnographies of Practice, University of Pennsylvania Press, Philadelphia, 2015, pp. 137–154.
[25] S. Keshavjee, Blind Spot: How Neoliberalism Infiltrated Global Health, University of California Press, Oakland, 2014.
[26] R. Rowden, The Deadly Ideas of Neoliberalism: How the IMF Has Undermined Public Health and the Fight Against AIDS, Zed Books, London, 2009.
[27] A. Kentikelenis, L. King, M. McKee, D. Stuckler, The International Monetary Fund and the Ebola outbreak, Lancet Global Health 3 (2) (2015) e69–e70.
[28] World Bank Group, Poverty & equity brief, 2018. Liberia http://povertydata.worldbank.org/poverty/country/LBR].
[29] P. Farmer, Who lives and who dies, London Rev. Books 37 (3) (2015) 17–20.
[30] J.G. Meara, A.J.M. Leather, L. Hagander, B.C. Alkire, N. Alonso, E.A. Ameh, et al., Global surgery 2030: evidence and solutions for achieving health, welfare, and economic development, Lancet 386 (9993) (2015) 569–624.
[31] A. Wagstaff, G. Flores, J. Hsu, M.-F. Smitz, K. Chepynoga, L.R. Buisman, et al., Progress on catastrophic health spending in 133 countries: a retrospective observational study, Lancet Global Health 6 (2) (2018) e169–ee79.
[32] K. Xu, D.B. Evans, G. Carrin, A.M. Aguilar-Rivera, P. Musgrove, T. Evans, Protecting households from catastrophic health spending, Health Aff. (Millwood) 26 (4) (2007) 972–983.
[33] K. Xu, D.B. Evans, K. Kawabata, R. Zeramdini, J. Klavus, C.J.L. Murray, Household catastrophic health expenditure: a multicountry analysis, Lancet 362 (9378) (2003) 111–117.
[34] R. Yates, Universal health care and the removal of user fees, Lancet 373 (9680) (2009) 2078–2081.
[35] N.J. Kassebaum, A. Bertozzi-Villa, M.S. Coggeshall, K.A. Shackelford, C. Steiner, K.R. Heuton, et al., Global, regional, and national levels and causes of maternal mortality during 1990-2013: a systematic analysis for the global burden of disease study 2013, Lancet 384 (9947) (2014) 980–1004.
[36] L. Say, D. Chou, A. Gemmill, Ö. Tunçalp, A.-B. Moller, J. Daniels, et al., Global causes of maternal death: a WHO systematic analysis, Lancet Global Health 2 (6) (2014) e323–ee33.
[37] T. Adam, S.S. Lim, S. Mehta, Z.A. Bhutta, H. Fogstad, M. Mathai, et al., Cost effectiveness analysis of strategies for maternal and neonatal health in developing countries, BMJ 331 (7525) (2005) 1107.
[38] R. Black, R. Laxminarayan, M. Temmerman, N. Walker, Disease control priorities, Reproductive, Maternal, Newborn, and Child Health, 3rd Ed., The World Bank, Washington, DC, 2016.
[39] O.M.R. Campbell, W.J. Graham, Strategies for reducing maternal mortality: getting on with what works, Lancet 368 (9543) (2006) 1284–1299.
[40] Liberia Ministry of Health and Social Welfare, Road Map for Accelerating the Reduction of Maternal and Newborn Morbidity and Mortality in Liberia, World Health Organization, Monrovia, Liberia, 2007.
[41] R. Penchansky, J.W. Thomas, The concept of access: definition and relationship to consumer satisfaction, Med. Care 19 (2) (1981) 127–140.
[42] I.N. Luginaah, J. Kangmennaang, M. Fallah, B. Dahn, F. Kateh, T. Nyenswah, Timing and utilization of antenatal care services in Liberia: understanding the pre-Ebola epidemic context, Soc. Sci. Med. 160 (2016) 75–86.
[43] R.S. Dhillon, J.D. Kelly, Community trust and the Ebola endgame, N. Engl. J. Med. 373 (9) (2015) 787–789.
[44] U. Pellecchia, R. Crestani, T. Decroo, R. Van den Bergh, Y. Al-Kourdi, Social consequences of Ebola containment measures in Liberia, PLoS One 10 (12) (2015) 1–12.
[45] J.W.T. Elston, C. Cartwright, P. Ndumbi, J. Wright, The health impact of the 2014-15 Ebola outbreak, Public Health 143 (2017) 60–70.
[46] K.J. Brolin Ribacke, D.D. Saulnier, A. Eriksson, J. von Schreeb, Effects of the West Africa Ebola virus disease on health-care utilization – a systematic review, Front. Public Health 4 (222) (2016).
[47] T. Jones, L. Ho, K.K. Kun, P. Milsom, J. Shakpeh, R. Ratnayake, et al., Rebuilding people-centred maternal health services in post-Ebola liberia through participatory action research, Global Public Health 13 (11) (2018) 1650–1669.

[48] P. Schwerdtle, V. De Clerck, V. Plummer, Survivors' perceptions of public health messages during an Ebola crisis in Liberia and Sierra Leone: an exploratory study, Nurs. Health Sci. 19 (4) (2017) 492–497.
[49] G.P. Jacobs, P. Bhat, P. Owiti, J.K. Edwards, H. Tweya, R. Najjemba, Did the 2014 Ebola outbreak in Liberia affect HIV testing, linkage to care and ART initiation? Public Health Action 7 (Suppl 1) (2017) S70–SS5.
[50] B. Morse, K.A. Grépin, R.A. Blair, L. Tsai, Patterns of demand for non-Ebola health services during and after the Ebola outbreak: panel survey evidence from Monrovia, Liberia, BMJ Global Health 1 (1) (2016) e000007.
[51] R.A. Blair, B.S. Morse, L.L. Tsai, Public health and public trust: survey evidence from the Ebola virus disease epidemic in Liberia, Soc. Sci. Med. 172 (2017) 89–97.
[52] D.K. Evans, M. Goldstein, A. Popova, Health-care worker mortality and the legacy of the Ebola epidemic, Lancet Global Health 3 (8) (2015) e439–ee40.
[53] World Health Organization, Health Worker Ebola Infections in Guinea, Liberia and Sierra Leone: A Preliminary Report, World Health Organization, 2015.
[54] J.W. Creswell, A Concise Introduction to Mixed Methods Research, SAGE Publications, Thousand Oaks, CA, 2015.
[55] M.Q. Patton, Qualitative Research & Evaluation Methods, 3rd ed., SAGE Publications, Thousand Oaks, CA, 2002.
[56] H.-F. Hsieh, S.E. Shannon, Three approaches to qualitative content analysis, Qual. Health Res. 15 (9) (2005) 1277–1288.
[57] Worldometers. Liberia Population, 2018. available from: http://www.worldometers.info/world-population/liberia-population/].
[58] M. Lagarde, N. Palmer, The impact of user fees on health service utilization in low- and middle-income countries: how strong is the evidence? Bull. World Health Organ. 86 (11) (2008) 839–848.
[59] J.S. Akin, N. Birdsall, D.M. De Ferranti, Financing Health Services in Developing Countries: An Agenda For Reform, The World Bank, Washington, DC, 1987.
[60] B. McPake, K. Hanson, A. Mills, Community financing of health care in Africa: an evaluation of the Bamako initiative, Soc. Sci. Med. 36 (11) (1993) 1383–1395.
[61] M. Basilico, J. Weigel, A. Motgi, J. Bor, S. Keshavjee, Health for all? Competing theories and geopolitics, in: P. Farmer, J.Y. Kim, A. Kleinman, M. Basilico (Eds.), Reimagining Global Health: An Introduction, University of California Press, Berkeley, CA, 2013, pp. 74–110.
[62] C. James, S.S. Morris, R. Keith, A. Taylor, Impact on child mortality of removing user fees: simulation model, BMJ 331 (7519) (2005) 747–749.
[63] Liberia Ministry of Health and Social Welfare, Basic Package of Health and Social Welfare Services for Liberia Monrovia, Liberia Ministry of Health and Social Welfare, Liberia, 2008.
[64] J. Hickel, The Divide: Global Inequality from Conquest to Free Markets, W.W. Norton & Company, New York, 2018.
[65] G.C. Shen, H.T.H. Nguyen, A. Das, N. Sachingongu, C. Chansa, J. Qamruddin, et al., Incentives to change: effects of performance-based financing on health workers in Zambia, Human Resour. Health 15 (1) (2017) 20.
[66] M. Vujicic, M. Alfano, M. Ryan, C.S. Wesseh, J. Brown-Annan, Policy Options to Attract Nurses to Rural Liberia: Evidence from a Discrete Choice Experiment, The World Bank, Washington, DC, 2010.
[67] Liberia Ministry of Health, Joint Annual Health Sector Review Report 2016: National Health Sector Investment Plan for Building a Resilient Health System, Liberia Ministry of Health, 2016.
[68] World Health Organization, Strengthening health workforce to strengthen health systems, 2018. available from: http://www.who.int/hrh/resources/strengthening_hw/en/].
[69] Government of Liberia, Investment Plan for Building a Resilient Health System in Liberia, 2015-2021, Ministry of Health, Monrovia, Liberia, 2015.
[70] S. Brink, Kenyan Woman Abused by Nurses During Childbirth Wins Landmark Case, National Public Radio, 2018 available from: https://www.npr.org/sections/goatsandsoda/2018/04/10/600833683/kenyan-women-abused-by-nurses-during-childbirth-wins-landmark-case].