Family Planning During and After the Ebola Crisis: Evidence from Liberia and Sierra Leone

Kristin Bietsch, PhD and Jessica Williamson, MPH

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Significance/Background

The West African Ebola outbreak of 2013-2016 caused over 11,000 deaths[1] and devastated the already fragile health systems of Liberia, Sierra Leone, and Guinea. During the crisis, staffing shortages, quarantines, interruptions to supply chain, health facility closures and fear of health facilities and workers resulted in significant disruptions to the provision and utilization of a range of health services, including inpatient health services and surgery[2], malaria treatment[3], vaccinations[4], obstetric care[4,5], and family planning[4,5,6]. The UN released a Gender Alert in February 2015 noting that reduced access to contraceptives as a result of the Ebola crisis would put women at an increased risk of unintended pregnancy[5]. A study of the impact of Ebola on reproductive health care in one district in Guinea found a 50% decline in family planning visits during the height of the crisis[6]. Prior to the crisis, Liberia[7] and Sierra Leone[8] had seen gains in expanding contraceptive prevalence while Guinea's prevalence remained low and relatively constant[9]. Understanding the impact of the crisis on family planning provision is essential for future efforts to expand access to contraception in these countries.

Main question/hypothesis (100 words max)

Complex emergencies, like the West African Ebola crisis, can devastate a health system long after the immediate crisis ends. Our research sets out to answer two questions:

1. How much did family planning provision decrease during the Ebola crisis?
2. Did the Ebola crisis have a lasting negative impact on family planning provision?

Data

We examine monthly provision of family planning services from 6 months before the first Ebola case in each country to 24 months after the last case of the main outbreak. Weekly numbers of new confirmed Ebola cases over the time frame are taken from the World Health Organization[1] and are disaggregated to the first subnational administrative region. Sierra Leone and Liberia collect electronic, routine data (henceforth referred to as service statistics) on family planning monthly. These data were aggregated to the first subnational administrative region and provided to the authors by the Ministries of Health in each country. Both countries use the District Health Information System (DHIS2). Because Guinea's electronic routine data system was only implemented in 2015, and there have been challenges incorporating past data from paper records, we are unable to include it in this analysis. Due to family planning data being available monthly, and Ebola data available weekly, we aggregate Ebola data by month. For weeks that span two months, we linearly interpolate based on the level of Ebola the week before and after, to estimate the Ebola cases on a particular day and distribute these cases to the correct month.

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[1] http://apps.who.int/gho/data/node.ebola-sitrep.quick-downloads?lang=en

In the analysis of service statistics, we include contraceptive implants, injectables, oral contraceptive pills, and condoms, which make up more than 95% of contraceptive use in both countries[2]. To be able to discuss all methods simultaneously, and compare between them, we adjust for the duration of effectiveness of a single commodity or service by converting each district's service/commodity distribution numbers to Couple Years of Protection (CYPs). We assume that one implant is the equivalent of three CYPs, one injectable is a 1/4 of a CYP, one pill pack is 1/15 of a CYPs, and 1 condom is 1/120 CYPs[3]. We only report data that was entered into the DHIS2 system. Condoms and pills are also available in shops and from smaller, private providers.

Results are presented at the national and sub-national level. Liberia is divided into 15 counties, while Sierra Leone has 14 districts. For simplicities sake, this paper refers to both Liberian counties and Sierra Leonean districts as regions.

To establish a baseline level of family planning provision prior to the Ebola crisis, we calculate the average method distribution and CYPs for the 6 months before the first Ebola case in a country/subnational region. We then calculate the maximum decline in family planning service provision seen during the outbreak, as well as the average during the Ebola crisis. We also calculate average monthly distribution and 6 months averages for the 2 years following the last new case of Ebola. The months that make up the periods prior to, during, and following the Ebola crisis are country and region specific, depending on the analysis.

Additional comparisons are conducted by splitting regions based on the number of Ebola cases.

Comparison data comes from Demographic and Health Surveys (DHS), conducted in both countries in 2013, and Malaria Indicator Surveys, conducted in both countries in 2016 (though Sierra Leone's did not include family planning questions).

Analysis is conducted using R.

Family Planning before Ebola: 2013 Demographic and Health Surveys

Both Liberia and Sierra Leone had a DHS conducted in 2013. The percent of all women of reproductive age using any modern method of contraception (mCPR) was 21% in both countries, 19% of married women were using a modern method in Liberia, compared to 16% in Sierra Leone. Among married women, more women had an unmet need for family planning than were using, with 31% in Liberia and 25% in Sierra Leone. For sexually active, unmarried women mCPR was 35% in Liberia and 56% in Sierra Leone. mCPR increased in both countries from their previous DHS and 2013- Liberia saw an increase from 12 to 21% between 2007 and 2013, while Sierra Leone grew from 8 to 21% between 2008 and 2013 (Figure 1).

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[2] Based on modern methods (excluding lactational amenorrhea) in the Liberia 2013 DHS and Sierra Leone 2013 DHS

[3] Note: most injectables distributed are Depo Provera, thus the choice of 4 doses per CYP. We are unable to differentiate the type of injectable, whose CYPs range between 2.5 and 3.8, and thus assume a CYP of 3 in our calculations //www.usaid.gov/what-we-do/global-health/family-planning/couple-years-protection-cyp

Family Planning Before and After Ebola in Liberia and Sierra Leone

For married and unmarried, sexually active women in both countries, the most commonly used method was injectables. Injectable prevalence has grown in both countries: from 4% of married Liberian women in 2007 to 11% in 2013, and 3% of married Sierra Leonean women in 2008 to 8% in 2013. For unmarried, sexually active women the growth in prevalence was even more striking- from 5% to 22% in Liberia and 7% to 26% in Sierra Leone. Implant use, which was not recorded in earlier surveys, was reported by 2% of married women in both countries in 2013, for unmarried women the numbers were even higher: 4% in Liberia and 12% in Sierra Leone. Pills still maintain popularity in both 2013 DHS: 5% of married Liberian women, 4% or married Sierra Leonean women, and 6% and 14% respectively for unmarried, sexually active women. Condoms were used by 3% of unmarried, sexually active women in both countries.

Family Planning before Ebola: Service statistics

From January to December 2013, the average monthly distribution of contraception, converted into CYPs, was 10400 in Liberia, increasing by an average of 275 CYPs per month, and 15800 in Sierra Leone (Figure 1), increasing by an average of 340 CPYs per month. Figure 1 shows the distribution of family planning methods as CYPs from service statistics compared to mCPR from DHS. Implants appear larger in service statistics than in surveys because we assign all their CYPs to the year of insertion, while in the DHS they are looking at women currently using a method, regardless of time since insertion. Therefore

a women who received an implant last year may still be a user in the DHS, but we do not pick them up in service statistics. Conversely, clinics need to distribute four injectables for it to count as one CYP, while the DHS may interview a women who just received her first injectable, and she counts as a current user when calculating mCPR. Even though the two data sources differ in terms of method allocation, we can see they are similar in terms of which methods are reported, and growth (as shown by the Liberian 2013 and 2016 surveys, and 2013 and 2016 service statistics which will be discussed in more detail later in the paper).

To determine the baseline level of family planning distribution before Ebola, we take the average distribution for the six months before the Ebola outbreak began (September 2013 to February 2014 in Liberia, and November 2013 to April 2014 in Sierra Leone), 11,540 CYPs in Liberia and 15,050 CYPs in Sierra Leone. Note that this does not mean mCPR was higher in Sierra Leone, there are about 66% more women of reproductive age in Sierra Leone compared to Liberia (United Nations World Population Prospects estimates 1.0 million 15-49 year old women in 2013 in Liberia, and 1.67 million in Sierra Leone), therefore Sierra Leone must distribute more CYPs to have the same mCPR as Liberia.

Based of monthly averages for the 6 months before the Ebola outbreak, in 12 of the 15 Liberian regions and 6 of 14 Sierra Leonean regions, the most common method in use (based on CYPs) was injectables. In three counties in Liberia, injectables accounted for over 60% of distributed CYPs.
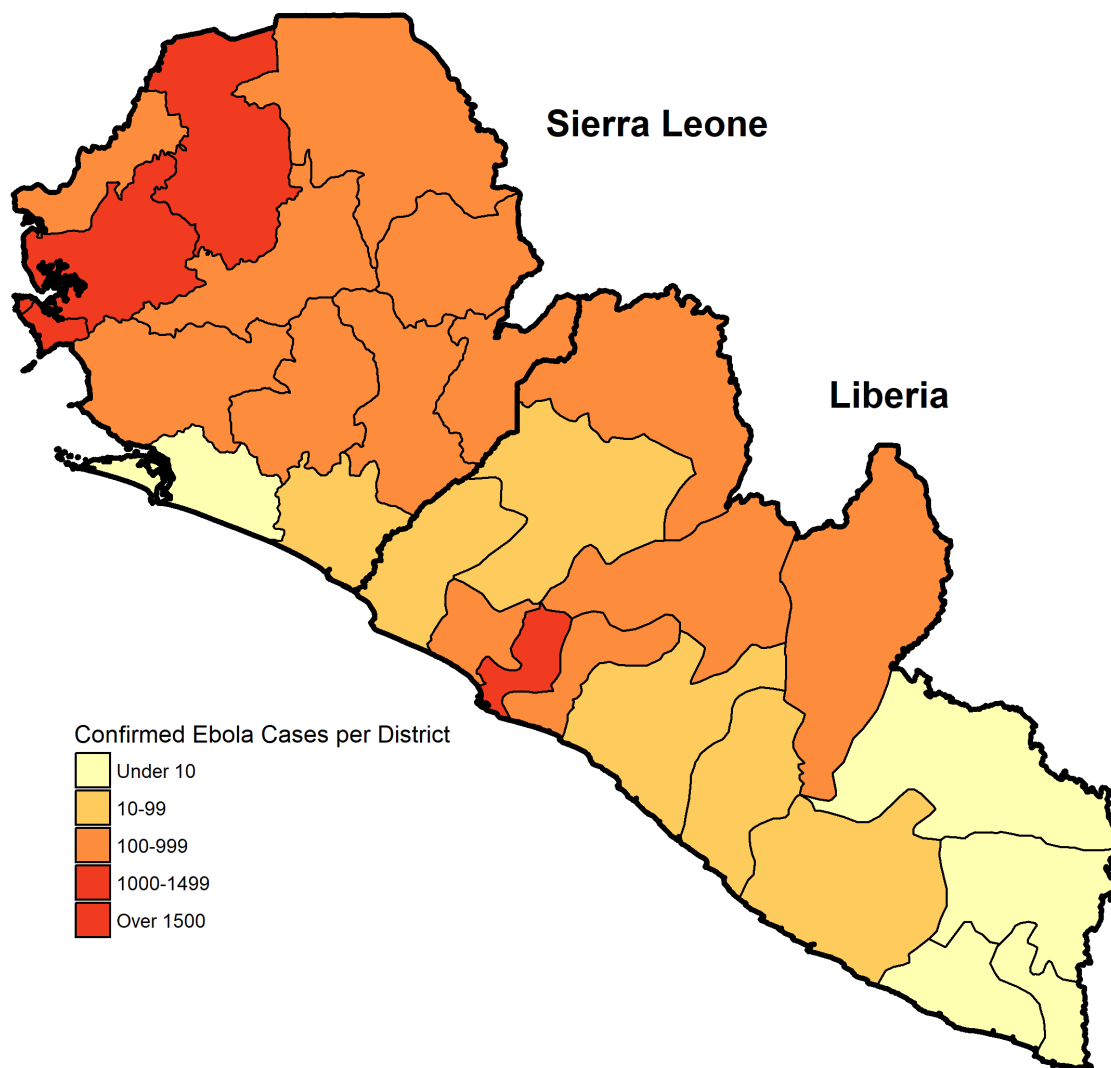
In 3 Liberian regions and 8 Sierra Leonean regions, the most commonly used method was implants- in one county (Koinadugu), implants accounted for over 80% of CYPs. In all but two regions, the second most popular method was either injectables or implants.   In all regions, when comparing these four methods, implants and injectables accounted for between 67% and 96% of all CYPs distributed.

Ebola in Liberia and Sierra Leone

The WHO recorded over 3000 confirmed cases of Ebola in Liberia (as well as an additional 7000 probable or suspected cases) and almost 9000 cases in Sierra Leone (as well as an additional 5000 probable or suspected cases), resulting in an total of 8761 deaths between the two countries[4]. Regions within each country saw variations in the numbers of cases: four regions in Sierra Leone had over 1000 confirmed cases each, the highest being 2511 in Western Area Urban, compared to one region in Liberia, Montserrado, with 1978 cases. Both Western Area Urban and Montserrado are the most populous administrative areas in their respective countries and include that country's capitals, Freetown and Monrovia.   13 regions between the two countries had between 100 and 1000 confirmed cases (5 in Liberia, 8 in Sierra Leone). The final 11 regions (9 in Liberia, 2 in Sierra Leone) had less than 100 confirmed Ebola cases each (Figure 2).

The five regions with the highest total number of cases also saw the highest peak in any month of the outbreak, with the worst region in Liberia recording 827 confirmed cases in one month, and the highest in Sierra Leone at 704.

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[4] http://apps.who.int/ebola/current-situation/ebola-situation-report-30-march-2016

Confirmed Ebola Cases per District

- Under 10
- 10-99
- 100-999
- 1000-1499
- Over 1500

Sierra Leone's regions also saw a longer length of epidemics, over a year elapsed between the first and last confirmed Ebola cases in four regions, while the longest duration seen in Liberia was 11 months. On average, the Ebola outbreak lasted 10 months in Sierra Leonean regions, and 6 months in Liberian regions.

When discussing family planning outcomes below, we separate regions into those that had over 1000 confirmed cases of Ebola, and those under 1000.

Family Planning During the Ebola Crisis

During the Ebola crisis in Liberia, the lowest level of family planning service provision was August 2014, when only the equivalent of 4054 CYPs were distributed, a 65% reduction compared to the six-month average before the first Ebola case. Between June and July 2014 (when the number of cases increased

from 78 to 193), CYPs declined by 33% month on month, then from July to August experienced another 44% decline, while the number of Ebola cases skyrocketed to 874[5]. On average, during the whole of the Ebola crisis in Liberia, there was a monthly distribution of 8890 CYPs, a decline of 23% from the six month period prior (Figure 3).

Average Monthly Distribution of Contraception: Before, During, and After Ebola

In Sierra Leone, the lowest level of family planning service provision was seen in December 2014 (November 2014 saw the record number of Ebola cases), when 11602 CYPs were distributed, a 23% decline from the 6 month period prior to the first case of Ebola. Over the 16 months of the Ebola epidemic in Sierra Leone, on average CYPs were only 5% lower than before the Ebola epidemic (Figure 3). This average decline is relatively small because family planning service provision returned to pre-Ebola levels by May 2015, 3 months before the last Ebola case was recorded.
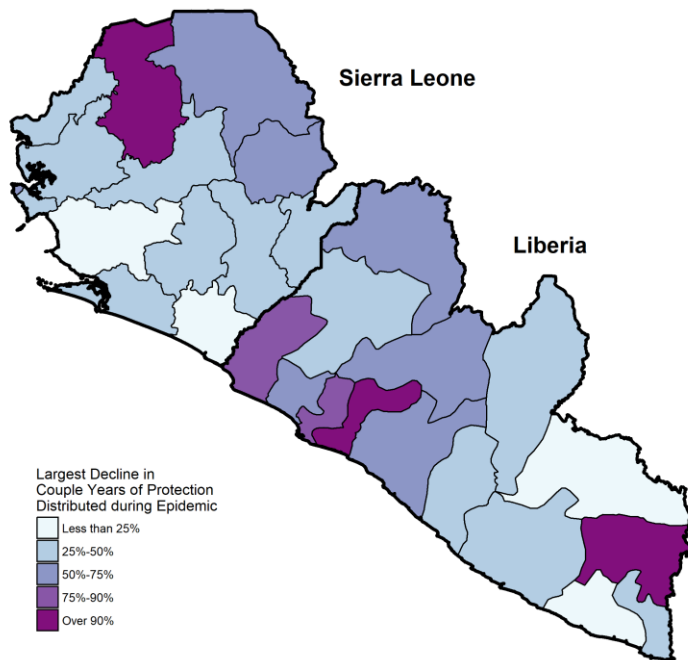
Looking at individual methods, the largest decline in Liberia was seen in implants, which during their lowest month of distribution during the Ebola crisis fell to only 20% of pre-Ebola levels. On average, implant distribution was down 43% for the duration of the epidemic compared to pre-Ebola distribution. Similarly, male condoms distribution fell to 22% of pre-Ebola levels, and on average were just 51% of

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[5] During this time, the International Planned Parenthood Federation was distributing some commodities, but they were reported as a lump sum in January 2015.

pre-Ebola levels throughout the epidemic. Pill distribution declined to 43% of pre-Ebola levels in its lowest month, but over the period of the epidemic averaged 81% of pre-epidemic levels. Injectables plummeted to half the pre-Ebola levels in their lowest month, but averaged slightly higher than pre-Ebola levels throughout the epidemic.

While all methods saw declines in distribution during the Ebola crisis in Sierra Leone, the declines were not as dramatic as those experienced in Liberia. As in Liberia, implants fell sharpest in Sierra Leone, to a minimum of 70% of their pre-Ebola levels. However, due to an increase in the number of implants towards the end of the crisis, the average number of implants inserted throughout the crisis was the same as the average distribution in the 6 months before the epidemic. Male condoms, pills, and injectables all declined to between 75-80% of their pre-epidemic levels, averaging 84-90% of pre-epidemic distribution over the course of the epidemic.

Subnational variation in declines during the Ebola Crisis

Looking at individual regions (Figure 4), Bombali region in Sierra Leone saw one month drop to only 7 CYPs (the average prior to Ebola was more than 800 CYPS distributed a month), more on the individual methods distribution in Bombali is discussed below. Five Liberian regions saw drops of over 70%, at the lowest end Margibi and River Gee dropped to 6% and 7%, respectively, of their pre-epidemic levels.

For regions with over 1000 Ebola cases, the peak declines from pre-epidemic levels ranged from 99% in Bombali to 40% in Western Area Rural. Many Liberian regions, even those with small numbers of total Ebola cases, experienced major declines in family planning distribution. Looking at the average distribution across the epidemic, 7 regions in Sierra Leone average at 90% or higher of their pre-Ebola levels, while this was only the case in the two regions in Liberia with the lowest number of Ebola cases.

Only one region in Liberia, Montserrado, had over 1000 cases of Ebola, its peak month saw 827 new cases. During the epidemic, implants, condoms, and injectables all saw declines in distribution to 8-13% of their pre-Ebola levels, with pills falling to 16%. The next most effected region- Margibi- which had 399 total cases, saw implant distribution drop to 1% of pre-Ebola levels, and pills, injectables and condoms ranged from 5 to 8%. For both regions, over the course of the epidemic, the average distribution of methods ranged from just over 35% for implants in Margibi and 51% in Montserrado to over 100% for injectables in Montserrado and pills in Margibi.   Three regions had months with 0 recorded implant insertions. Grand Gedeh, Liberia, only had one confirmed Ebola cases, and in that month saw more implant insertions than the average 6 months prior.

In Sierra Leone, the region of Bombali had the lowest single month in terms of family planning distribution for every method. In December 2014, not a single implant or pill packet was distributed, and only 15 injectables were given out. In regions that had more than 1000 cases (which includes Bombali), we saw implants drop to between 0% and 58% of their pre-Ebola levels, and maintained a level of 74% to 93% of their pre-Ebola level throughout the crisis. The distributions of minimum implant provision among regions with less than 1000 cases was higher- from 19 to 98%, with 6 out of 10 averaging over 100% throughout the crisis.

Injectables saw minimums reach 1% to 67% of the pre-Ebola levels in the hardest hit regions, and only 60% to 92% in less effected regions. While the average over the period ranged from 65% to 84% for higher Ebola regions to 66% to 110% in the others. Pills and condoms saw similar patterns, with both the means and minimums much worse in harder hit regions.

Family Planning Post Ebola

To examine post Ebola recovery in the family planning sector, we look up to 24 months following the last new confirmed Ebola case in each country.

In Liberia, 24 months following the last new case of Ebola, there was an 87% increase in implant distribution compared to the 6 months prior to the outbreak of Ebola (Figure 3). For injectables and pills there were also substantial growth in distribution, 38% and 22% respectively, compared to pre-Ebola levels. Male condom distribution recovered to similar levels seen prior to the outbreak. At the national level, an average of 11539 CYPs per month were being distributed prior to the Ebola outbreak. During the crisis, CYPs fell to an average of 8899 per month. After the Ebola crisis had ended, average monthly CYPs grew steadily from 11764 in the first 6 months to 16012 during months 19 – 24 post crisis, 39% above pre-crisis levels.. Figure 3 shows that the main driver of change was growth in implants and injectables.

In Sierra Leone, nationally, distribution of male condoms, oral contraceptive pills, and injectables was lower 24 months post-Ebola compared to the average over the 6 months pre-Ebola. In contrast, implant insertions were up 37% at 24 months post-Ebola . Overall, an average of 15050 CYPs per month were distributed during the 6 months prior to the outbreak of Ebola. CYPs then fell slightly during the crisis, to an average of 14261 per month. Following the crisis, CYPs returned to pre-Ebola levels during the first

6 months (average of 15693), and grew to 19060 19 to 24 months after, an increase of 27%[6]   Figure 3 shows that the only method which led to the increase in CYPs was implants.

Looking at regional distribution of CYPs by month, all but one (28 out of 29) region returned to their pre-Ebola levels within 24 months of the last case of Ebola (the sole exclusion being Sinoe, Liberia). 14 of the 28 remaining regions returned to pre-Ebola levels of CYPs the first month following the end of Ebola, and 24 out of 28 recovered within 6 months. However, many regions experienced dips below their pre-Ebola levels post recovery- 20 out of 28 regions fell back below their pre-Ebola levels after recovering, within the 24-month window. Looking at the 5 regions with over 1000 Ebola cases (4 in Sierra Leone, 1 in Liberia), all were above pre-Ebola levels at 6 months following their last recorded cases, but at 12 months and 24 months, both regions containing the country capitals (Western Area Urban and Montserrado) were below to their pre-Ebola levels (Figure 5)- they fluctuated above and below throughout the 24 months. When looking at the regions with smaller numbers of Ebola cases- 33% were distributing more CYPs 6 months post-Ebola than pre-Ebola, and the proportion rose to 66% by 12 months and 75% by 24 months.

Post Ebola: Contraceptive Distribution Recovery in Liberia and Sierra Leone
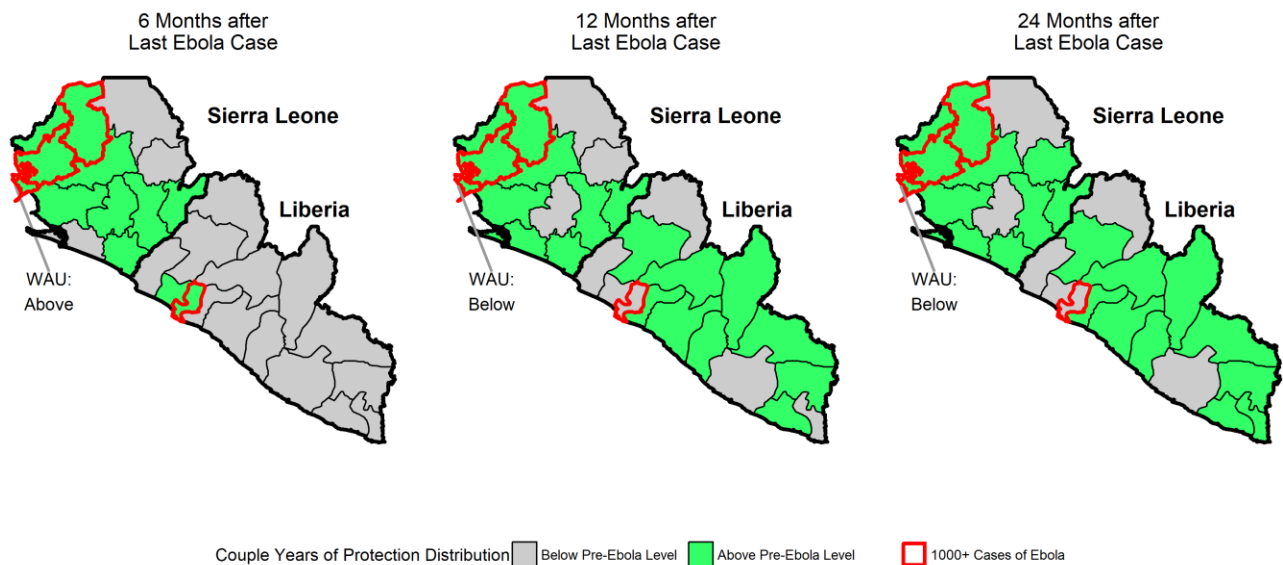
Turning to method specific recoveries, of the 29 regions (15 in Liberia, 14 in Sierra Leone), all saw at least one month of implant distribution higher than the 6 month pre-Ebola average. 27 regions saw a recovering in injectables, 25 in pills, and 26 male condoms. Almost all regions that had at least one method for which distribution did not recover to pre-Ebola levels are in Sierra Leone (the exception is Sinoe, Liberia which never saw a recovery in condoms. Surprisingly 4 out of 5 were among those that saw fewer than 1000 Ebola cases. Western Area Urban, in Sierra Leone, which had the highest number of Ebola cases of any region in both countries did not see a return to pre-Ebola levels in pills, however

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[6] Note that this growth would not translate into a 27% increase in mCPR, as population grew by over 2% per year according to United Nations Estimates

CYPs had exceeded the 6 month pre-Ebola average by six months after the last new Ebola case in the region.

Many regions saw a spike in contraceptive distribution in the first month following the last new Ebola cases, exceeding the average 6 months before Ebola.   For injectables, 11 regions reached this threshold, and 14 regions did so for implants, for pills there were 11, and condoms had 10. For injectables and implants, 3 out of 5 of the regions with over 1000 Ebola cases had returned to pre-Ebola levels in the first month.

However, these rapid returns to pre-Ebola levels of contraceptive distribution should not be interpreted as sustained recoveries. The majority of regions that saw recovery in one or more methods also saw declines to below pre-Ebola levels during the 2 year follow up period: 21/28 for implants, 23/26 for injectables, 24/25 for pills, and 23/26 for condoms.

To further look at the trend in recovery, we look at 6, 12, and 24 months post Ebola, by method. In regions with over 1000 cases of Ebola, all had more than recovered regarding implant distribution at 6 months, but at 12, only 3 of the 5 regions were above the pre-Ebola level, at 24 months 4 out of 5 were recovered. For regions with fewer Ebola cases, only 42% were above pre-Ebola levels at 6 months, but by 12 and 24 months the percent grew to 67% and 75% respectively.

For injectables, 4 out of 5 regions had distributions higher than before Ebola at 6 months after the last case, though this fell to only 2 regions 12 months out, and none two years out. For lower impact regions, the trend went from 33% at 6 months, down to 46% at 12 months, then to 67% at 24 months.

Pills and condoms follow a similar pattern- with harder hit regions having higher recovery rates at 6 months than less hit regions, but seeing the proportion cross over- with distribution decline over time in higher Ebola areas, and increasing distribution in lesser hit areas (compared to pre-Ebola levels).

Recovery in the 2016 Malaria Indicator Surveys

In 2016, both Liberia and Sierra Leone conducted Malaria Indicator Surveys through the DHS. Only Liberia asks about contraception.

In the 2013 Liberia DHS, 20.5% of women were using a modern method of contraception, in the 2016 MIS this increased to 30.7% (Figure 3). The largest single change in methods was injectables- from 12.5 to 18.9% (service statistics also show a large increase- from a 2013 monthly average of 3911 CYPs to 6938 CYPs in 2016). Implant use increased from 2.3 to 3.5% of women, also a 51% increase (service statistics only saw an increase in insertions from a 2013 monthly average of 4034 CYPs to 4518 CYPs in 2016, though the DHS is picking up implant users who had their implants inserted at an early time).

Discussion

This is one of the first studies examining the immediate and long-term impact of the Ebola crisis on the provision of contraceptive services. This study illustrates that family planning services, like other health care services, suffered during the crisis, with dramatic declines seen in some of the hardest hit regions. While some of these declines may have been driven by health system failures (loss of health care providers to Ebola, overwhelmed health care facilities, disruptions in supplies, etc), other studies have identified Ebola stigma and fear and suspicion of healthcare providers as additional barriers to service utilization during and following the Ebola crisis (Barden O'Fallon et al, 2015). The dramatic declines in

service provision seen in regions that experienced relatively few cases of Ebola may illustrate the power of this fear and stigma in reducing utilization of health care services, including family planning, during the crisis. Given the risks of unintended pregnancy and the high rates of maternal and child mortality in Liberia and Sierra Leone prior to the Ebola crisis, the disruption of these services and potential gaps in contraceptive coverage risked rollbacks in recent advances in contraceptive use and maternal and child health.

Given that the data used in this analysis is based on service data available in the national routine data, it is important to note that declines in service provision may not be equivalent to declines in contraceptive use. This routine data does not capture all sources of contraception in the country, and given fears and stigma around health care facilities in the context of the crisis, it is possible women sought contraceptives methods like pills and condoms from other sources, like shops and private pharmacies or private providers, or may have used non-medical or traditional methods in the interim. A better understanding of if, and where, women sought FP services during the crisis may help shed light on the full impact of the outbreak and the extent to which the trends seen here represent the full FP market.

Encouraging in the results of this analysis was the rapid return of contraceptive services to pre-Ebola levels in most regions. During and immediately following the outbreak, there were concerns about the long-term impact of the crisis on provision of family planning services after the Ebola outbreak had ended. This study indicates that the family planning health sector can recover (and continue to improve) following a significant disruption and is a lesson in resilience. It's important to note that this recovery was not equal or sustained in all areas. In some regions hardest hit by Ebola, there was an immediate recovery of family planning services following the end of the outbreak. This rapid recovery of contraceptive distribution was possibly driven by emergency response and an influx of funding and effort, or the result of rush of women back to healthcare facilities for FP services once they were perceived as safe. However, this recovery was generally not sustained in comparison to those regions that had smaller outbreaks, indicating deeper, longer lasting damage to service delivery systems in those harder hit regions. Continued monitoring of family planning provision and accessibility along with sustained support for these services beyond the immediate emergency response is essential to ensuring women continue to be protected against unintended pregnancy and that gains made before the crisis are not lost.

Conclusion

Our analysis finds that Liberia's family planning sector disproportionately suffered during the Ebola crisis, however, in the two years since it has made great strides towards restoring and growing contraceptive services. We note that while Sierra Leone had a greater number of Ebola cases, its family planning distribution did not decline as dramatically as Liberia's. However, based on service statistics data, Sierra Leone has not seen as large of growth in contraceptive commodity distribution as Liberia.

Limitation

During the Ebola crisis, fewer clinics were reporting monthly numbers into the DHIS2 system. Liberia routinely had reporting rates above 80% before the Ebola crisis, closer to 100% if Montserrado, which has many private clinics is excluded. During the Ebola crisis, reporting rates fell to around 80% in most counties, and around 60% in Montserrado and Margibi. While these can downwardly bias our

distribution estimates, we also believe that the facilities not reporting were also most likely to be the ones with the most effected Ebola cases, and lowest family planning distribution.

We are currently working with the Ministry of Health in Sierra Leone to obtain their monthly, district level reporting rates.

Finally, we are in talks with aid organizations to understand their flow of contraceptive methods into Liberia and Sierra Leone during and immediately following the epidemic, as well as their entry into the DHIS2 system.

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