

The Socio-Economic Impacts of Ebola in Liberia

Results from a High Frequency Cell Phone Survey

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Overview

As of early November, 2014, Liberia has had nearly 7,000 cases of Ebola Virus Disease (EVD) and more than 2,500 deaths. Many of the cases have occurred in the poorest and most densely populated areas of the capital city, Monrovia, but all counties have now been affected by EVD.

In an effort to measure the economic impact of EVD on Liberian households, the World Bank, with the Liberian Institute of Statistics and Geo-Information Services and the Gallup Organization, has conducted two rounds of mobile-phone surveys, in October and November 2014. Based on these results, it is clear that the EVD has substantially impacted the Liberian economy across all sectors of employment, in both affected and non-affected counties. In all, nearly half of the working population of Liberia is no longer working since the crisis began.

Those engaged in self-employment activities have been the hardest hit, in large part due to the closure of markets in which they operate. Before the crisis, over 30 percent of working household heads were self-employed—as of this latest survey, this is down to just above 10 percent.

The wage employment sector has also seen substantial job losses, with only about half of those originally surveyed still working since the crisis unfolded. The main reason cited by respondents is that their business or government office is closed; illness-related absence was only named by a small percentage of respondents.

After an initial downturn, the agricultural sector is showing the most resilience in the face of EVD. Rural areas have seen a substantial return to farming; the latest survey round coincided with the beginning of harvest season in many areas of the country.

These economic impacts have exacerbated existing issues, especially those related to food prices and food security. Imported rice prices have seen a huge jump—of nearly 40 percent over the average for October—but over 70 percent of respondents said that regardless of price, they do not have enough money to afford food. Many households have reduced the number of meals eaten, and restricted adult consumption in order to feed their small children, but still more than 90 percent of those surveyed worried that their household would not have enough to eat. With the arrival of the harvest, these figures have and will likely continue to trend downward, but they remain alarmingly high.

Whether directly affected by the virus or not, communities in every corner of Liberia are suffering from its consequences. Government mandated closures and other policies to contain and reverse the spread of EVD are in place across the country, and therefore the negative economic effects of EVD touch everyone. It will be essential to focus relief efforts not only in areas where the virus is active, which is crucial, but also in those remote counties where the population was already quite poor, food availability was scarce and is now worsening, markets are closed, and mobility is extremely limited.

“The Ebola virus has tempered our economy. It has hurt our economic investments. Our businesses have been closed down and our country has been abandoned.” – 39 year old male respondent, Bomi county

Map

IBRD 33435R2



JULY 2007

Objective

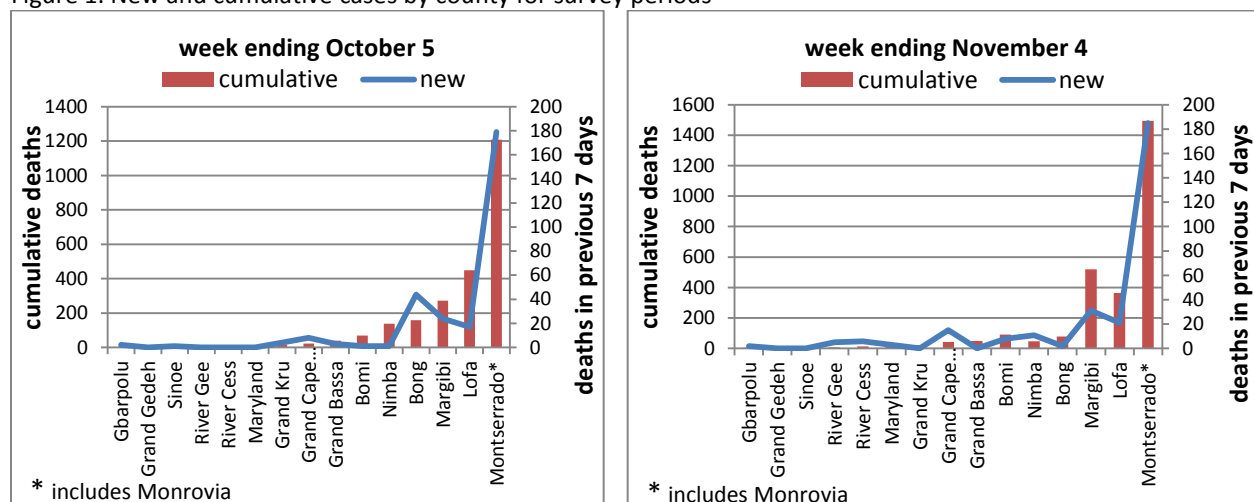
The Economic Impact of Ebola survey is a high frequency cell phone survey designed to monitor the socio-economic impacts of the ongoing Ebola crisis in Liberia. The survey has been conducted in two rounds in the fall of 2014 and is based on the nationally representative Household Income and Expenditure Survey (HIES) implemented from February to August 2014 by the Liberia Institute of Statistics and Geo-Information Services (LISGIS). This effort was designed to provide rapid indicators from households across the country at a time when conducting a traditional face-to-face survey is extremely challenging. To that end, the survey was conducted by phone, calling a sub-sample of households who participated in the HIES and for whom cell phone numbers were recorded. The Methodological Annex provides details on the data collection and the survey weights. Low response rates hinder the representativeness of the survey.

This report begins with a brief background of the situation in Liberia in terms of Ebola-related deaths at the time of data collection. This is followed by five sections focusing on the survey findings with respect to knowledge of Ebola, employment, prices, food security, and migration.

Background

Montserrado county and the city of Monrovia specifically are some of the most highly affected areas, but new infections are no longer concentrated only in the north and west of the country. Since its initial appearance in December 2013 in rural Guinea, the Ebola Virus Disease (EVD) has spread to four other West African countries. As of November 4, 2014, Liberia has had nearly 7,000 cases and more than 2,500 deaths. There have been a significant number of cases in the capital of Monrovia, many occurring in the poorest and most densely populated parts of the city. In the short period of time during which the two rounds of the survey were conducted (October 1- October 7 and October 21-November 7), the geographic pattern of the disease has shifted. At the time of the first round, the most affected county was Montserrado, which contains the capital Monrovia. The next highest counties in terms of total deaths were Lofa and Margibi, but there were a higher number of new infections in Bong county.

Figure 1. New and cumulative cases by county for survey periods



Source: Humanitarian data exchange (accessed November 12, 2014)

For the week ending on November 4, the highest numbers of cumulative and new deaths were again in Montserrado, but Margibi had surpassed Lofa county for the second highest total. Margibi also had a higher number of new deaths during this period, and there were growing numbers in Nimba and Grand Cape Mount counties. Deaths had also declined in the previously affected counties of Bomi and Bong.

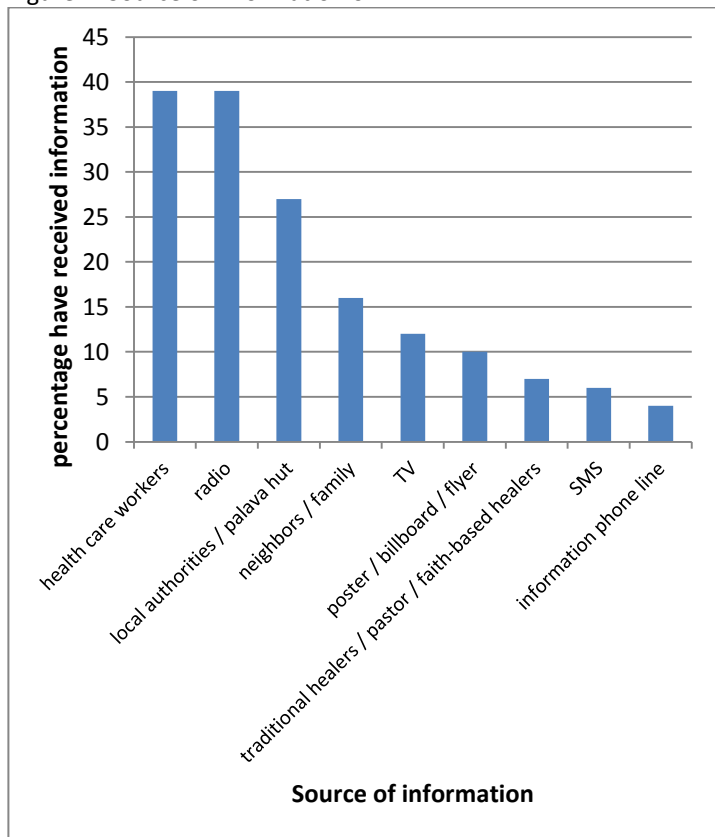
“He is not alive.” - 29 year old man in Monrovia in response to why household head is no longer at previous job.

Knowledge of Ebola

Information campaigns about EVD launched by government, NGOs, and donor organizations were widely successful in reaching the population.

The overwhelming majority of round 1 respondents, more than 93 percent, had heard of EVD. In addition, when this question was asked to new round 2 respondents, all but one had heard of the virus. Of those having heard of the virus, nearly all said they knew how to protect themselves and had received information from one or more sources, including healthcare workers (39) percent, the radio (39) percent, local authorities/palava hut (27) percent, neighbors/family (16) percent, TV (12) percent, poster/billboard/flyer (10) percent, traditional healers/pastor/faith-based healers (7) percent, SMS (6) percent, and through a phone number (4) percent. In addition, 35 percent of respondents indicated having received information from other sources.

Figure 2. Source of information on EVD



Source : Results from high frequency phone survey (October – November 2014)

“Because of the Ebola virus - I did not want the contact with people.” - 28 year old man in Monrovia in response to question on why he is not working.

Employment

Prior to EVD, the majority of the rural labor force was in smallholder agricultural activities while wage work non-agricultural self-employment activities were equally prevalent in urban areas. Figure 3 shows the distribution of the working age (16-64) adult population across five employment categories:

wage labor, self-employment outside agriculture, agriculture (smallholder farming), unpaid household work, and out of the labor market. The latter category includes groups such as the unemployed and students. Figure 4 shows the same distribution but for household heads only, the group most directly comparable to high frequency phone survey respondents. Urban areas have the largest share of workers evenly split between wage labor and non-agricultural self-employment, while the majority in rural areas works in agriculture. While the data refers to household heads, these results can be generalized to the working population generally since EVD would impact all those in working in the sector.

Figure 3. Distribution of working age adults prior to EVD

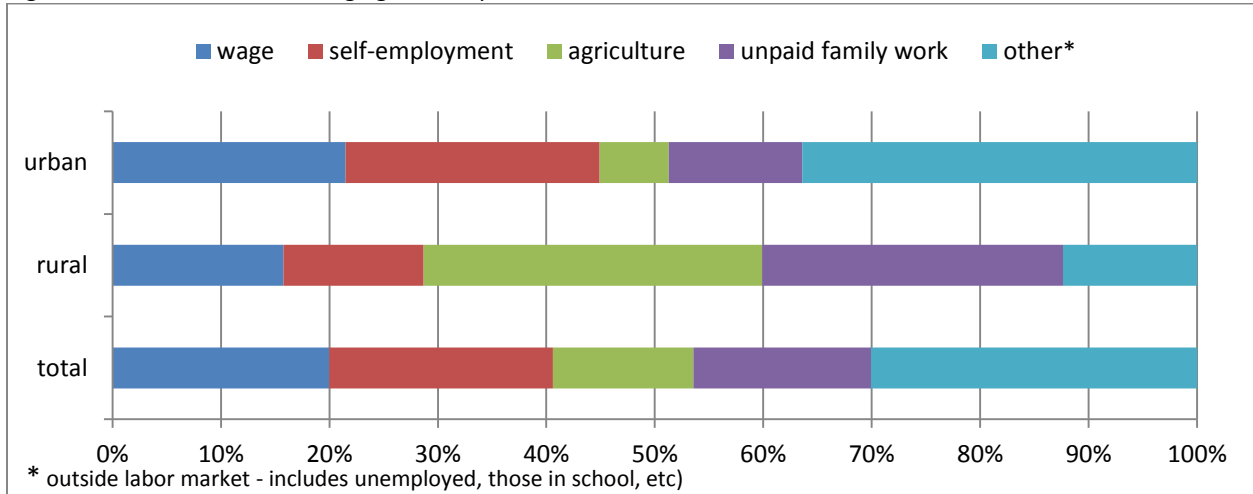
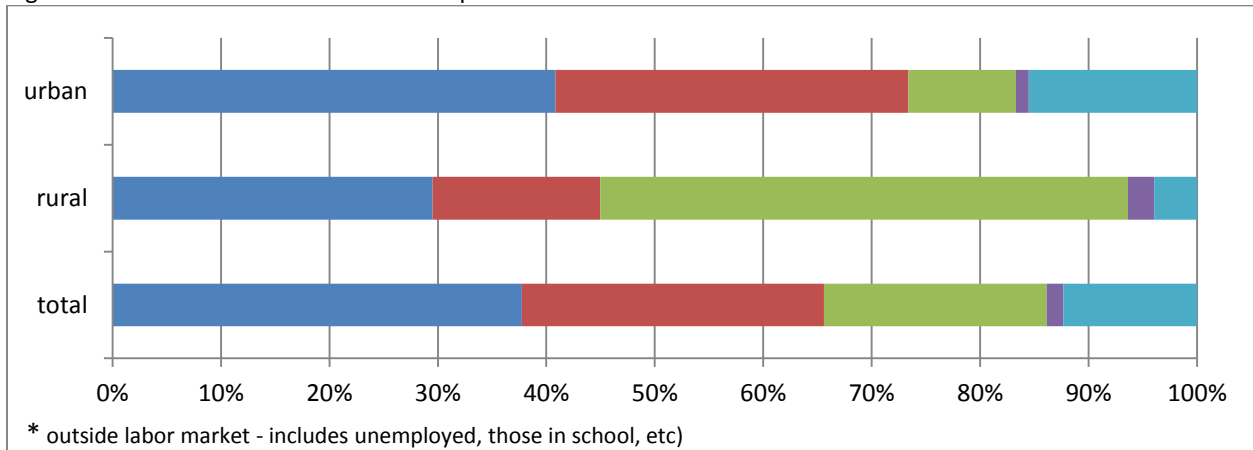


Figure 4. Distribution of household heads prior to EVD



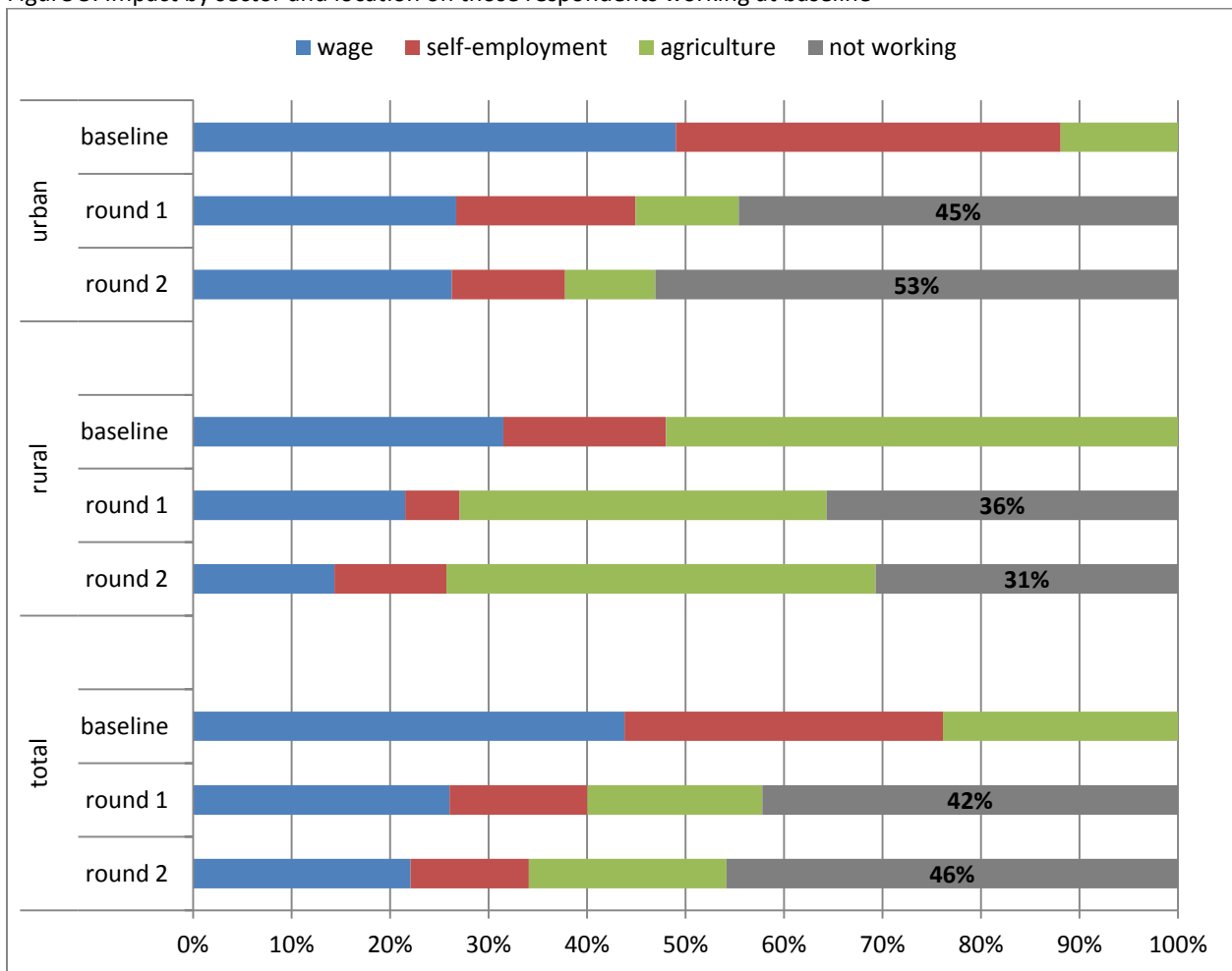
Source: Preliminary findings from the HIES (2014)

“The construction closed, no more job available.” - 28 year old man in urban Bong county in response to question on why he is not working.

“There is not enough people to work. People are staying back and not going to work.” - 41 year old woman in urban Margibi county in response to question on why she is earning less.

EVD has substantially impacted employment activities, especially in urban areas and for those previously engaged in non-agricultural self-employment. Figure 5 shows the impact of EVD by sector and location for those working at the time of the HIES baseline (conducted earlier in 2014). The gray area shows the fraction of those who had been working but were out of work by mid-October (Round 1) and early November (Round 2). In urban areas the wage and self-employment sectors were the most heavily impacted, while the small share involved in agriculture was largely unaffected. This is consistent with large numbers of public servants that were deemed to be non-essential staff being released from work, though most are still being paid for this period. The self-employed experienced the largest decline in work with the closure of markets in which they operate. In rural areas, the impact is roughly evenly divided between three main groups: wage, self-employed, and farming. By Round 2, there was almost no change in urban areas, though there was a further decline among the self-employed. Rural areas saw a substantial return to farming; this round coincided with the beginning of the harvest period for many areas of the country.

Figure 5. Impact by sector and location on those respondents working at baseline

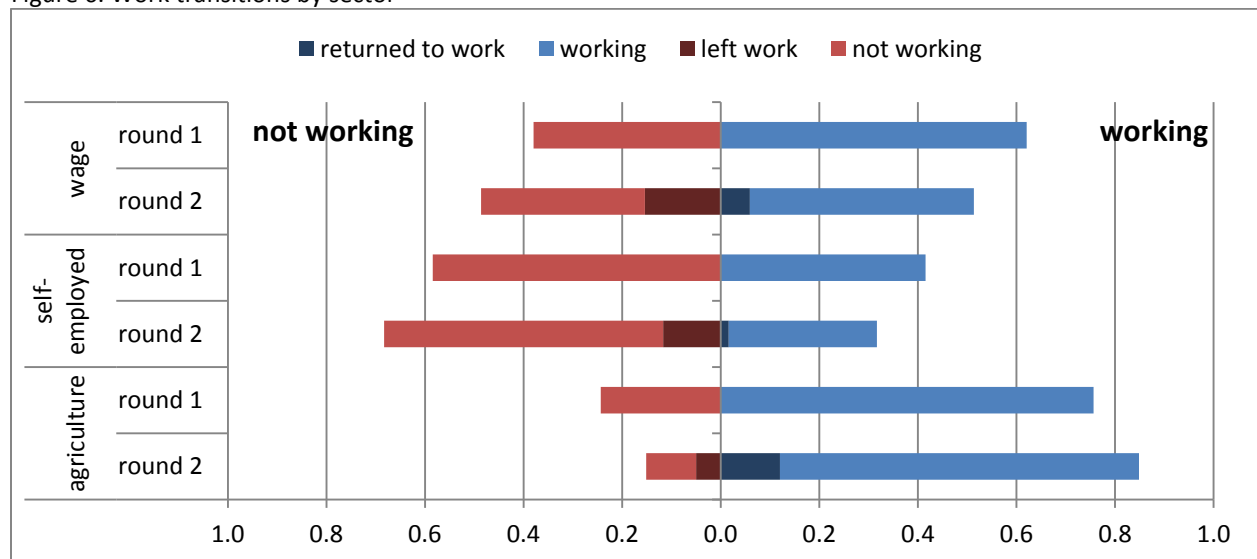


Source : Results from high frequency phone survey (October – November 2014)

Employment impacts were not disproportionately worse in counties most affected by EVD. As there are not a sufficient number of observations to detect differences within the sectors at county level, four groups of counties are constructed. The first is Montserrado county, which contains the capital city of Monrovia. The second consists of Lofa and Margibi counties, the two most affected counties after Monrovia. The third includes Bomi, Bong, Grand Bassa, and Nimba counties, which were all affected by EVD though not to the same extent as the previous three. The final category includes the remaining counties which have been thus far only marginally affected. In Round 1, there were no statistically significant differences between these categories in the probability of not working compared to the baseline in any of the three sectors.¹ In addition, the level of affectedness of the county explains very little of the variation in the probability of not working, with an R² of 0.01 for wage employment, 0.02 for self-employment, and 0.10 for agriculture. In round 2, there are still not statistically significant differences between the geographic areas for the three sectors. The values of R² have increased slightly to 0.02, 0.06, and 0.07 for wage, self-employment, and agriculture, respectively.

Some in agriculture have returned to work since early October, but the wage and non-agricultural self-employment sectors have seen further losses. By using the 424 households that responded in both rounds, it is possible to examine the transitions into and out of work. Of those working at the baseline, respondents are divided into four groups: those that were consistently working in both rounds of the high frequency phone survey, those that were consistently not working in both rounds, those that had returned to work or found new jobs between rounds 1 and 2, and those that stopped working between round 1 and round 2. Overall job loss was greatest for the wage sector and the self-employed sector between rounds, while agriculture saw a substantial percentage returning to work. Figure 6 shows these transitions in further detail.

Figure 6. Work transitions by sector



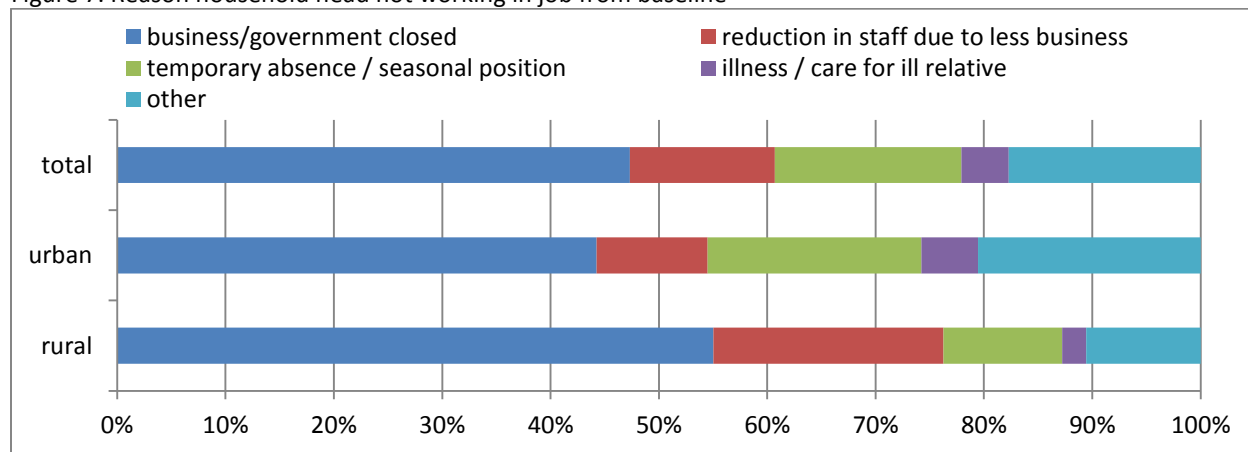
Source : Results from high frequency phone survey (October – November 2014)

¹ There was a statistically significantly lower probability of working in agriculture in Montserrado county in round 1 but this finding is based on only three observations.

Wage Labor

Many in wage labor are not working because their business or government office is closed, and very few have been able to return or find alternative employment. In the HIES, 38 percent of household heads indicated their primary employment was in wage labor. Of these wage employees, 40 percent indicated they were no longer working in their previous job in round 1 and 51 percent in round 2. The percentage was relatively steady between rounds in urban areas, just about 45 percent, but seems to have increased in rural areas (though the limited sample size makes it difficult to measure the magnitude). The main reason cited in round 1 was the closure of the business or government office where the respondent was working (46 percent), followed by temporary absence (14 percent), and a reduction in staff due to reduced business (13 percent). As shown by figure 7, which presents the results from round 1, this is true in both urban and rural areas. Relatively few respondents indicated health reasons for their absence: one percent for illness and three percent to care for an ill relative. Also while interviewers and analysts allocated responses into specific categories that best described the reason, the majority of respondents mentioned Ebola specifically in their answers. Of those no longer working in their the same job as in the baseline, five percent indicated that they were able to find other employment in round 1, but nearly universally this group indicated that they were earning less. Of the panel respondents, approximately six percent were able to find another job between rounds 1 and 2, though a further 15 percent stopped working in their original position during this period. Of those who returned to work, nearly 90 percent went to a different job from that in which they were previously working. It should also be noted, however, that many public servants are still being paid even though they are not going to work, so the negative welfare impacts are somewhat overstated. It is estimated that approximately 15 percent of wage employees are in the public sector.

Figure 7. Reason household head not working in job from baseline



Source : Results from high frequency phone survey (October – November 2014)

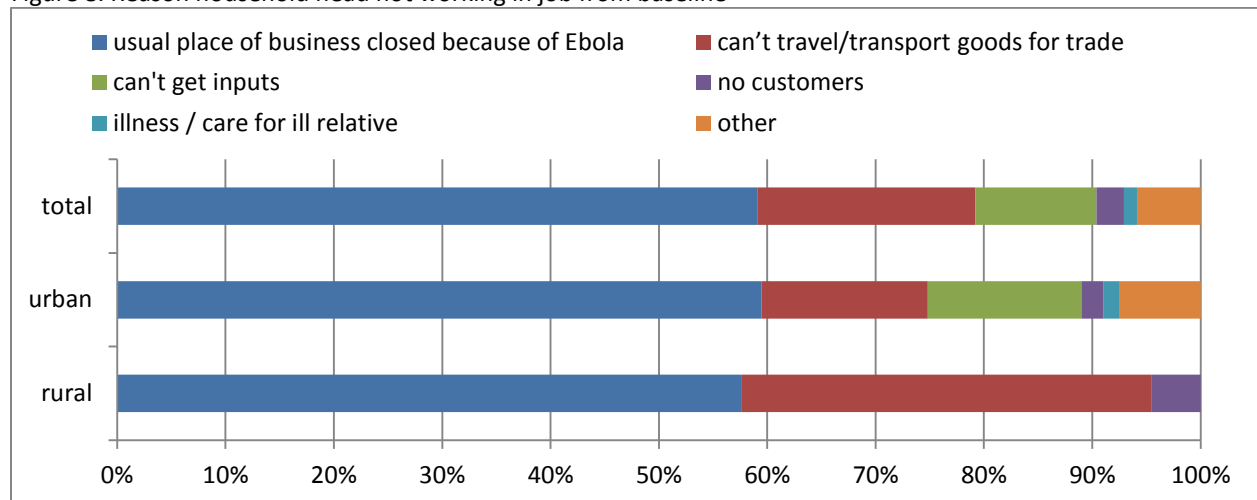
“It’s a driving business, nothing good going on.” - 48 year old man in Monrovia in response to question on why he is not working.

“All the teachers are sitting home, no way to put bread on the table.” - 37 year old man in Monrovia in response to question on why he is not working.

Self-Employment

The largest and most sustained impacts were on those engaged in the non-agricultural self-employment sector. Self-employment was the second most common sector for household heads, employing 28 percent in the HIES, including 33 percent of urban heads. In the overall labor market for adults aged 16-64, self-employment is more prevalent than even wage labor. Additionally, of the working age population engaged in self-employment, nearly two-thirds were women and it is the most common source of livelihood for female headed households. Of those interviewed in the high frequency phone survey, 57 percent in round 1 and 64 percent in round 2 were no longer operating their businesses. Of this group, the most common reason cited in the first round was usual place of business closed due to Ebola (60 percent), followed by cannot travel / transport goods for trade (18 percent), and cannot get inputs (12 percent). Similar to wage employment, very few respondents cited reasons related to health. In both urban and rural areas, the usual location for business being closed was the most prevalent reason. Transportation issues were also important in rural areas and the inability to procure inputs was cited only in urban areas. See figure 8 for further details on round 1. Of the 73 respondents in the non-farm self-employment sector, only one was able to find a new job as of round 1. Of those respondents in the panel, less than two percent returned to work between the first and second rounds, while an additional 12 percent stopped working. More than 90 percent of those who were not working in the first round remained out of work by round 2.

Figure 8. Reason household head not working in job from baseline



Source : Results from high frequency phone survey (October – November 2014)

“Ebola is in Liberia. Everyone is not buying clothes and shoes, they are just buying food.” - 41 year old woman in Montserrado county in response to question on why her small business is earning less.

“I sell oranges. The business is way down.” - 36 year old woman in Bong county in response to question on why her small business is earning less.

Agriculture

There has been a substantial return to agriculture since early October but it is too early yet to estimate the impact on the ongoing harvest. Agriculture was the most common sector of employment in rural areas, comprising 31 percent of the 15-64 aged rural population, and was the main source of livelihood for 49 percent of rural household heads. Agriculture is also the most difficult sector to accurately measure with this instrument. The response rate is particularly low in rural areas due to limited cell phone network and availability of electricity to charge handsets. Also the nature of agricultural work naturally has extended lapses in activities, such as in the post-planting and post-harvest periods.

The 2014 harvest period in Liberia began in August and finished in September for the southern counties of Maryland, Grand Kru, Rivergee, Sinoe and Grand Gedeh. This is one month later than the normal agricultural season due to a slightly late start for the rainy season in these areas. In the remainder of the county, the harvest season began around October and will be completed by December.

In the first round of the survey, corresponding to pre-harvest period for most of the country, 30 percent of respondents indicated that they were no longer working in agriculture compared to the baseline HIES. The majority cited worries about Ebola as the main reason they were not working. At the same time, of this group, two-thirds indicated that someone within the household was still engaged in farming. This suggests that generally farms were not being abandoned by households. While it is not possible to distinguish between staple farming and vegetable gardening, more than 70 percent of farm households that were growing rice in the HIES will harvest. About half believe the harvest will be smaller than last year's, 35 percent believe it will be larger, with the remainder believing it will be about the same. By the second round of the survey, corresponding with the start of the harvest in many areas, the percentage of rural households in which the head indicated not working had halved. Of those who were still not working, more than 80 percent indicated that someone in the household was farming.

With the caveat that the agriculture section has the most methodological issues, the high frequency phone survey shows that while agriculture has been affected by EVD, the impact is short of some of the more dire predictions of wide spread farm abandonment. It is difficult, however, to gauge the overall impact on food security from pre-harvest estimates. Also many farmers depend on the *kuu* system of shared labor during the harvest period. Mobility limitations and fear of infection may limit available labor this year. Follow-up question on labor during the harvest period and on yields in the post-harvest period are planned for later rounds.

“The sickness has affected us. My strength has gone down, personally.” - 47 year old man in rural Grand Cape Mount county on why the harvest will be smaller this year.

“People are afraid to leave their houses to work on the farms.” - 35 year old man in rural Grand Cape Mount county on why the harvest will be smaller this year.

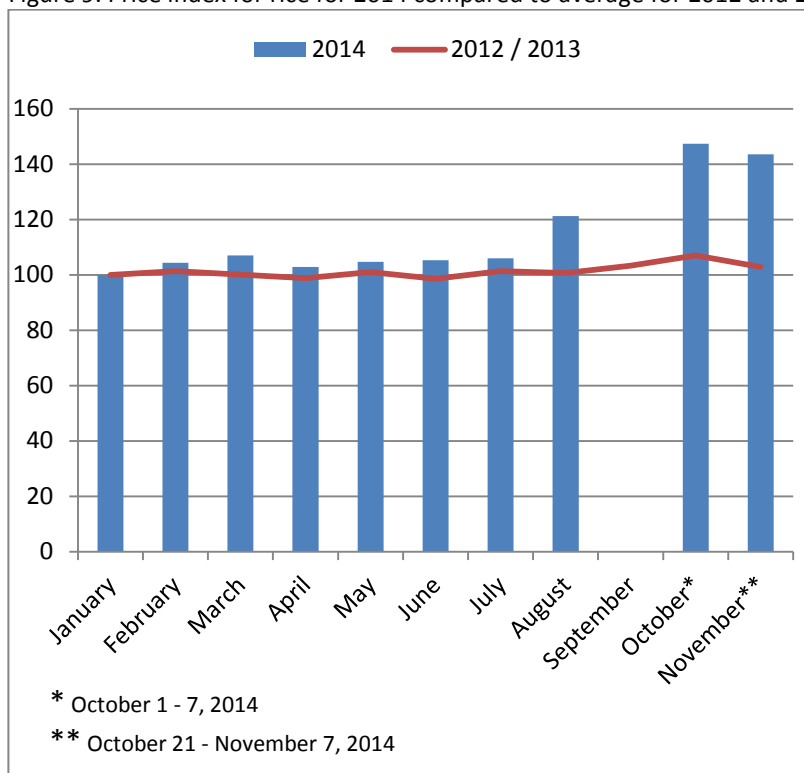
“We are afraid of going to the farm. The rice is used to feed the animals.” - 35 year old man in rural Grand Cape Mount county on why agricultural profits will be lower this year.

Prices

Rice prices have spiked well above usual seasonal increases.

Due to the lack of available historical data, it is difficult to analyze the impact of EVD on prices. Numerous surveys, the high frequency phone survey included, have shown price increases since the outbreak began in July. Some increase in price, however, is to be expected due the seasonal shortages of locally produced rice in the immediate post-harvest period. Figure 9 shows the estimated price for a 50 kg bag of rice in 2014 as well as the average for 2012 and 2013 by month.² The price

Figure 9. Price index for rice for 2014 compared to average for 2012 and 2013



Source: 2014 HIES, high frequency phone survey, WFP VAM

trends upwards historically, particularly during September and October, but the 2014 increase was markedly higher. In 2012/13 data, prices were about seven percent higher than their January base price. In October 2014, however, the observed increase reached above 40 on average percent above the baseline.

There are a number of different factors behind the rice price increase. While the high frequency survey has neither a large enough sample nor a sufficiently extensive questionnaire to fully disentangle the issues, the spatial price variation and information on availability can provide some information on driving factors. In both the first and second rounds, approximately 30 percent of respondents indicated that they could not purchase rice at their local market. These households were concentrated in Monrovia, Bong, Lofa, and Nimba counties. At the same time, though prices have risen compared to the pre-EVD baseline across the country, the price data showed statistically significantly *lower* prices in Monrovia compared to the rest of the country, and *higher* prices in the three easternmost counties (Rivergee, Grand Kru, and Maryland). The other three counties with availability issues did not have higher prices than the remainder of the country. It would seem contradictory to basic supply-and-

² In the HIES the question refers specifically to imported rice while in the high frequency phone survey, the question is more general. These issues of comparability will be corrected in the next round, though the impacts are likely to be small due to the relative unavailability of local rice during this part of the agricultural calendar.

demand that market shortages would not automatically head to higher prices. The pattern may be explained, however, if the lack of availability was caused by market closures and transportation issues.

If the markets are closed, traders either stop participating or move to areas where they are still able to sell. This densification, accompanied by the fact that as the main port of entry for imported rice, prices in Monrovia are historically lower, explain both the lower prices and limited availability. Prices are higher outside the capital due to transportation costs, and there are similar issues with market closures in Nimba, Bong, and Lofa counties due to EVD. In addition, travel limitations may prevent supply from reaching some areas as well as preventing people from traveling to other areas with availability to push up prices there. Also, the distribution of food aid through treatment centers would offset upward price pressures. Finally, the poor infrastructure and travel restrictions would increase transportation costs, which would be most acutely felt in the more remote areas, particularly if border closures limit alternatives. This pattern of a lack of availability without accompanying price increases has also been observed in neighboring Sierra Leone according to the International Center for Growth's November Report on Markets, Traders, and Food Security, and will be an area of focus in subsequent rounds of the high frequency survey in Liberia.

Despite large rice price increases, evidence suggests insufficient income may be a larger threat to food security than prices. Such large increases in food prices have most likely had significant negative effects on food security, but this has been compounded by reductions in disposable income. In both the first and second rounds of the high frequency phone survey, conditional on rice being available for sale, more than two-thirds of respondents indicated that at some point in the previous two weeks they were unable to buy enough rice for their household. As with prices, it is likely that there is a seasonal component to food shortages, but when asked as to the reason why they were unable to buy enough rice, only about one-quarter indicated that the prices were too high. A small percentage cited availability issues, but the vast majority, approximately 70 percent across the two rounds, said that they did not have enough money consistent with the large job losses. This finding points to important income effects compounding the impact of higher prices.

“The price has increased. We do not have money. There is a state of emergency here and the government is not allowing travel to Monrovia.” - 35 year old man in rural Grand Cape Mount county on why he was not able to buy enough rice for his household.

Food Security

There is evidence of widespread food insecurity though it is difficult to estimate the relative impact of EVD compared to seasonal issues. More than 90 percent of households indicated that they were worried that their household would not have enough to eat at some point in the previous two weeks. Sixty-two percent said yes to this measure of food security in both rounds, 10 percent did not report issues in the first round but did in the second round, and 20 percent had issues in the first round but not the second. While these figures remain high by most measures, they do show a downward trend. This means that it is likely that at least some of the issues are related to seasonal food insecurity, and will continue to decrease as the harvest progresses. The largest reductions between the two rounds

occurred in Nimba county, which is the largest grain producing area of the county and which traditionally begins the harvest in late October. Overall households have pursued a variety of coping mechanisms to deal with food insecurity, the most common being reducing the number of meals eaten and restricting adult consumption. The frequency of these strategies has not changed markedly between rounds. See table 1 below for further details.

Table 1. Coping strategies for food insecurity

	In the past 7 days, how many days have you or someone in your household had to...				
	...rely on less preferred and/or less expensive foods?	...limit portion size at meal-times?	...reduce number of meals eaten in a day?	... restrict consumption by adults in order for small children to eat?	... borrow food, or rely on help from a friend or relative?
Round 1	2.9	3.0	3.4	3.3	2.1
Round 2	2.6	3.1	2.6	2.8	2.3

Source: High frequency phone survey (October – November 2014)

Migration

Migration has been limited and local and is most likely for economic reasons rather than health fears.

In the first round of data collection, a small number of households, about 14 percent, indicated having moved dwellings since the Ebola outbreak, but only 30 percent of these households left the county in which they had been living. Of those that remained in the county as in the HIES, about one-third were located within Monrovia, but overall movement was no more common in affected counties than in the remainder of the country. In addition, seven percent of households indicated that a regular household member had left due to Ebola, with more than half indicating that the member went to Monrovia and a further one-quarter said they remained within the same county but in a different location. Approximately five percent indicated that a household member had left Liberia.

By the second round, the percentage of households that moved remained constant around 15 percent, but the percentage of households in which a usual member had left had nearly doubled to 13 percent. The majority of these movers remained within the original county, with only about one-quarter going to Monrovia. Among those interviewed in both rounds, 94 percent of households remained in the same county. Of those that moved, 39 percent shifted from Montserrado to another county. Most did not go to the largely unaffected areas in the east, but rather to Bomi or Grand Cape Mount counties, which had low but growing numbers of infections. Of the remainder of the movers, 35 percent moved to Montserrado, coming from a range of counties distributed across the country. The remaining 26 percent moved between counties outside Montserrado, but again there was not a definite pattern.

Overall migration during this period was limited, possibly in part due to the uncertainty of the situation and the restrictions on travel put in place by the government. A small percentage changed dwellings but this is more likely natural movement as it did not occur more frequently in affected counties compared to the unaffected. Between the two rounds, a growing number of households indicated that though the

household itself remained, a usual household member had left. Since it was single members or small groups leaving, it is more likely to be attributed to economic migration than related directly to fear of infection. There also appears to be limited evidence for the hypothesis that there has been a recent increase in migration to previously unaffected areas. Also the data shows that a small number of households reported a usual member leaving the country but these were rare events occurring mainly in the earlier part of the outbreak.³

Conclusion

The Ebola Virus Disease has severely impacted the Liberian economy across all sectors of employment. Large percentages of those in wage employment have either been asked to stay at home or have lost their positions entirely. Similarly those involved in non-agricultural self-employment activities, such as small scale traders, have seen their business fall as markets are closed, potential customers become more reserved in their spending, and travel restrictions disrupts supply. This group is more vulnerable to negative impacts on their well-being because they are not receiving public sector salaries and because they have been less able to find alternative jobs. The impact on farmers has been the smallest in terms of overall percentage of the workforce, and there are signs that many that had stopped farming have now returned to farming, consistent with the start of the harvest period. There is still the potential for food insecurity as many farmers believe the harvest will be smaller this year, in part due to lack of labor from the traditional shared-labor systems. Food insecurity is widespread in the country, though a fraction of this is seasonal. The annual shortage in the pre-harvest period is being compounded this year by both higher prices and loss of income due to the inability to work because of EVD. Though some limited migration has taken place in response to these conditions for the most part this has been local and likely more focused on economic activities than fear of infection. There is some evidence of people leaving the country in the early stages but this seems to have decreased as the situation normalized. Overall the situation remains quite serious but there are some signs that it may be improving, including a return to farming. Further information will be available as the situation develops and after the next round of the survey is fielded in December.

³ It should be noted that the nature of the high frequency phone survey is vulnerable to under-reporting events such as outmigration. If members leave the country, they can no longer receive phone calls on their Liberian numbers. The propensity score component of the weight calculations to some extent adjusts for this, though some underestimation may remain.

Methodological Annex

The high frequency economic impact of Ebola survey was initiated by the World Bank, in partnership with the Liberia Institute of Statistics and Geo-Informational Services (LISGIS) and implemented by the Gallup Organization, to estimate the socioeconomic impact of the Ebola Virus Disease (EVD). The first round was conducted from October 1 through October 7 and the second round from October 21 to November 7. This note describes the survey methodology underlying the data collection and analysis.

Sample Design – The sampling frame uses the Household Income and Expenditure Survey (HIES), a nationally representative household survey launched by the LISGIS in February 2014 and halted about halfway through collection, in August, due to the outbreak. Since the HIES was designed to produce representative estimates for each quarter, the half-year dataset is representative nationally though not at the originally planned level of precision. As part of that survey, interviewers collected re-contact information for the households, including cell phone numbers for household members. Of the 4088 households for which data was collected before fieldwork stopped, 2137 included numbers. The limited list of available numbers is due to relatively low levels of cell network penetration in Liberia. The available numbers represent nearly all urban households and about one-third of the rural sample. Those households reporting numbers is unevenly distributed across the sample, but fortunately there is at least partial coverage in all counties, ranging from 80 percent with numbers in Monrovia / Montserrado county to 11 percent in Nimba county. All available numbers from the HIES were included in the high frequency phone survey.

Questionnaire – As the survey was being administered over the phone, the targeted length was 15 minutes. The round 1 questionnaire focused on economic impacts, including labor market conditions, remittances, prices, and food security. The questionnaire also included a number of questions on knowledge of EVD, focusing on whether the respondent had heard of Ebola, what were their main sources of information, etc. Questions specifically related to health were excluded since the instrument was not designed to detect and analyze rare events, such as EVD illness, and as to not increase suspicion among respondents at a time of high levels of distrust in the government and foreigners. The questions were worded as closely as possible to those in the HIES to allow for differences-in-differences analysis. Where topics were outside those covered in the HIES, previously pretested questions, such as those included in the Listening-to-Africa questionnaires, were used. For round 2, the new respondents received the round 1 questionnaire while the panel respondents received a slightly modified version which dropped certain questions (such as the knowledge of Ebola section) and took into account the fact that respondents had previously provided some information.

Implementation – The survey was implemented by the Gallup Organization from their Nebraska-based call center. During the review of the concept note, there was extensive discussion around this decision. The benefits of using Gallup were that they had extensive experience in the planning, programming, collection, and documentation of surveys of this type. This is in contrast to the only other viable implementation partner, the LISGIS, which has limited capacity overall and no experience in conducting telephone-based surveys. In addition, travel restrictions due to EVD limited the scope for technical assistance from consultants.

The interview plan was for each number to be called up to five times. If the phone was answered, the interviewer identified if the respondent was an original member of the household, and if so, which member. Even if the respondent was not an original member, the interview was continued after collecting a few necessary identifying characteristics, such as name, age, gender, location, and main source of employment in the previous 12 months. The assumption was that in most of the cases in which the respondent was unrelated to the original household, there was likely an error in the number, either at the recording stage or the data entry stage. This type of error would result in the de facto selection of a random respondent, which would, on average, be the same as the originally interviewed respondent that the team was attempting to contact.

Response Rate – Overall the response rate was lower than had been targeted during the design phase. The first round resulted in 648 complete interviews, 30 percent of the available 2137 numbers and the 16 percent of the total 4088 households. Following the results from this round, the team decided to implement a test for the non-responding households in the first round of data collection. These non-responders received a text message describing an incentive payment of one US dollar in phone credit for completed interviews. All numbers were again attempted five times, but the exercise netted only 48 additional households. This incentive structure was also used in the second wave of data collection. Prior to the second wave, the text message was sent to all respondents that participated in the first wave of data collection. The text message prior to the second round explained the purpose of the call and told them about the incentive. The Gallup Organization then re-contacted the original 648, completing 426 interviews. The second round then has a total of 472 observations, 426 of which form a panel with the first round. According to the metadata collected by Gallup, of the original 2137 numbers, the largest component of the non-response was from those that did not answer the call at any point during the repeated attempts. Table A1 below shows further details on the breakdown of call outcomes. The categories include interviewed households; did not connect, which includes mainly those that never answered the phone even though it rang; disconnected numbers for which the interviewer received a recorded message saying the number was no longer in service; and refusal in which the phone was answered but the respondent declined to participate in the survey.

Table A1. Round 1 and round 2 outcomes from original 2317 numbers

		second round				
		interviewed	did not connect	disconnected	refusals	total
first round	interviewed	427	184	22	15	648
	did not connect	47	1205	0	0	1252
	disconnected	0	0	376	0	376
	refusals	0	0	0	41	41
total		474	1389	398	56	2317

There are a number of hypotheses as to why these calls have gone unanswered. One is related to the suspicion of potential respondents to unknown foreign numbers, particularly during a crisis situation. A second relates to respondents not paying to have phones charged at a time when incomes have been reduced. Similarly, travel restrictions have limited the ability of traders to bring diesel to rural areas to

power generators, further complicating the process of charging phones. To explore these possibilities, the text messages were sent using a system that confirms delivery. Of the 1011 text messages sent before the second round, only 621 were delivered. This means that only about 61 percent of cell phones were turned on at any point during the week-long survey period, and suggests that both hypotheses played a role in the high non-response rates.

Overall the characteristics of respondents were similar in distribution to those in the original sample. Of the 648 interviewed in the first round, 83 percent were household heads, seven percent were other members of the original household, and ten percent were not part of the original household. These figures were 92, 4, and 4 percent, respectively in the second round. Comparing the average age of respondents to that of the original sample of household heads, the most logical available comparison group, the average age of a respondent was both 40 in the first and second rounds, compared to 39 in the original sample. In the high frequency phone survey, 22 percent of respondents were female in the first round and 21 percent in the second round, compared with 26 percent of household heads in the original sample. Tables A2 and A3, found at the end of this section, show the distribution by sector of employment and geography for the original sample and the two cell phone rounds. There are no statistically significant differences between the two samples, though the limited sample size means that there is limited power for these tests. The only area where there was a marked difference between urban and rural areas was in the urban/rural status of the respondent. Seventy-two percent of respondents in both the first and second rounds were living in urban areas, compared to 56 percent in the original sample.

Weights – Despite the general similarities between the original sample and high frequency phone survey respondents, it was necessary to calculate and apply an attrition correction in addition to the probability weights. To attempt to most accurately represent the original population, two steps were applied in the calculations. The first was to calculate a propensity score adjustment, which uses the available characteristics of the household head from the HIES (age, gender, location, and sector of employment) to calculate an aggregate probability of response. The results of this analysis for the two cross section and the panel rounds are presented in table A4 at the end of this section. The inverse of this probability is then applied to the probability weights, therefore increasing the weight for underrepresented groups. In addition, a post-stratification adjustment was applied. This adjustment increases the total weights in each stratum, in this case county by urban/rural, to match a known distribution. In most cases this would be numbers from the previous census inflated for population growth, but as this information is not available reliably at the stratum level, the total from the previous census were used. This means that these data cannot be used to calculate totals, such as the total number of Liberians who are no longer working, and therefore analysis of that type is excluded from this report. This methodology is applied to the two rounds of data to produce three sets of weights: cross-sectional weights for round 1, cross-sectional weights for round 2, and panel weights for those households that appear in both rounds.

Verbatim responses – For all questions in the questionnaire in which answer choices were given, interviewers could select “other” if respondent did not select one of the answer choices. The interviewer would then record the respondent’s answer verbatim to later be coded (if possible) into an existing category. The quotes listed in blue at the end of certain chapters come from these responses.

Table A2. Sector of employment of household head

sector of hh	HIES	round 1	round 2
wage	37.7	39.1	42.8
self-employment	27.9	21.8	24.2
agriculture	20.6	21.4	12.9
unpaid family	1.5	1.2	2.4
other	12.3	16.6	17.7

Table A3. Regional distribution of households

county	% households (census)	round 1		round 2	
		% households survey (unweighted)	n	% households survey (unweighted)	n
Bomi	3.1	4.0	26	4.7	22
Bong	10.4	6.3	41	5.5	26
Grand Bassa	7.1	6.2	40	5.5	26
Grand Cape Mount	3.6	3.9	25	3.0	14
Grand Gedeh	2.7	7.6	49	7.6	36
Grand Kru	1.3	2.6	17	2.1	10
Lofa	7.4	3.4	22	3.8	18
Margibi	6.7	8.6	56	8.1	38
Maryland	2.9	4.2	27	3.4	16
Montserrado	34.7	37.7	244	40.7	192
Nimba	12.0	3.9	25	5.7	27
River Cess	2.1	2.3	15	3.0	14
Sinoe	2.4	3.6	23	1.9	9
River Gee	1.5	2.6	17	2.8	13
Gbarpolu	2.2	3.2	21	2.3	11
Urban	56.2	71.5	463	74.2	350
Rural	43.8	28.6	185	25.9	122
Total	100.0	100.0	648	100.0	472

Table A4: Regression coefficients for logit response model

	round 1		round 2		panel	
	<i>coef</i>	<i>se</i>	<i>coef</i>	<i>se</i>	<i>coef</i>	<i>se</i>
Respondent Characteristics						
female	-0.228*	0.126	-0.303**	0.140	-0.358**	0.146
age	0.045*	0.024	0.021	0.026	0.018	0.027
age squared	-0.000*	0.000	-0.000	0.000	-0.000	0.000
Sector of Employment (Reference : Wage)						
self-employment	-0.163	0.132	-0.327**	0.145	-0.258*	0.151
agriculture	-0.537***	0.149	-0.598***	0.169	-0.533***	0.178
unpaid family work	-0.199	0.430	-0.706	0.556	-0.508	0.558
other	0.231	0.188	0.026	0.200	0.140	0.204
Geographic Strata (Reference : Monrovia)						
Bomi Urban	-2.564***	0.743	-2.137***	0.744		
Bomi Rural	-1.010***	0.264	-0.854***	0.281	-0.779***	0.287
Bong Urban	-0.585**	0.269	-0.861***	0.311	-0.813**	0.318
Bong Rural	-0.922***	0.315	-0.972***	0.359	-1.080***	0.387
Grand Bassa Urban	-0.281	0.258	-0.471*	0.277	-0.463	0.284
Grand Bassa Rural	-1.790***	0.399	-2.130***	0.534	-2.005***	0.535
Grand Cape Mount Urban	-1.542**	0.646	-1.119*	0.647	-2.222**	1.038
Grand Cape Mount Rural	-1.392***	0.268	-1.754***	0.340	-1.723***	0.354
Grand Gedeh Urban	-0.419*	0.231	-0.400	0.246	-0.307	0.248
Grand Gedeh Rural	-1.435***	0.353	-1.573***	0.420	-1.809***	0.484
Grand Kru Urban	-1.883**	0.770	-1.452*	0.771	-1.324*	0.771
Grand Kru Rural	-1.565***	0.303	-1.860***	0.388	-1.875***	0.410
Lofa Urban	-0.910***	0.330	-0.790**	0.359	-0.651*	0.360
Lofa Rural	-1.458***	0.410	-1.216***	0.436	-1.089**	0.438
Margibi Urban	-0.340	0.257	-0.585**	0.280	-0.570**	0.288
Margibi Rural	-0.742***	0.274	-0.844***	0.301	-0.773**	0.307
Maryland Urban	-1.020***	0.255	-1.260***	0.301	-1.386***	0.328
Maryland Rural	-3.124***	0.731	-3.429***	1.018	-3.306***	1.018
Montserrado Urban	-0.092	0.460	-0.078	0.470	0.064	0.471
Montserrado Rural	0.442	0.542	0.281	0.535	0.431	0.535
Nimba Urban	-1.054***	0.276	-0.510*	0.273	-0.635**	0.290
Nimba Rural	-2.106***	0.543	-1.711***	0.546	-1.898***	0.618
River Cess Urban	-1.859**	0.771	-0.968	0.660	-1.320*	0.772
River Cess Rural	-1.622***	0.328	-1.420***	0.352	-1.519***	0.381
Sinoe Urban	-1.108***	0.421	-1.516***	0.546	-1.364**	0.546
Sinoe Rural	-1.703***	0.303	-2.511***	0.475	-2.377***	0.476
River Gee Urban	-1.074***	0.350	-0.883**	0.373	-1.022**	0.404
River Gee Rural	-2.609***	0.476	-2.702***	0.601	-2.577***	0.601
Gbarpolu Urban	0.239	0.436	-0.689	0.521	-0.546	0.522
Gbarpolu Rural	-1.844***	0.377	-1.894***	0.446	-2.197***	0.532
Constant	-0.839	0.542	-0.665	0.585	-0.775	0.604
N	2324		2324		2296	
Pseudo R-squared	0.1151		0.1124		0.1123	

note: *** p<0.01, ** p<0.05, * p<0.1