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Women's Empowerment and Aggregate Shocks: Evidence from an RCT in Ebola-hit Sierra Leone*

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Abstract

The condition of women in developing countries is characterized by low economic empowerment and limited agency over their body. This paper evaluates a policy intervention aimed at relaxing these constraints for adolescent girls in Sierra Leone. The empowerment and livelihood for adolescents (ELA) intervention provides young women with a safe space where they can find support, access vocational training and information on reproductive health. The evaluation tracks 4,700 young women in 200 villages. Unexpectedly, the post-baseline period coincided with the 2014 Ebola outbreak in West Africa, the most severe ever recorded. Compounding the epidemic's health costs, the closure of all schools and mobility restrictions resulted in acute disruptions to socioeconomic life. The analysis leverages the cross-village variation in severity of disruptions and random assignment to the ELA program to document the impact of the aggregate Ebola shock on young women, and the ameliorating role played by the program. In control villages, higher exposure to Ebola-related disruption correlates with a 20pp drop in school enrolment for girls aged 12-15. Early marriage and fertility rose. These adverse effects on the 12-15 years old cohort are muted in ELA treated villages. The results show how such interventions can help younger adolescent girls cope with aggregate shocks. *JEL Classification: I25, J13, J24.*

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1 Introduction

Economic development and women's empowerment are closely linked. Over the past three decades, declining poverty rates across the world have been accompanied by a substantial reduction in gender inequality. The primary education gap has been closed in two-thirds of all countries, women account for 40% of the world's labor force and their life expectancy at birth is higher than men's in both developed and developing countries [World Bank 2011].

Progress has affected women's empowerment in a number of ways.[1] First, rising aggregate income levels have often reduced the need for households to discriminate between boys and girls when allocating resources [Rose 1999, Duflo 2012]. Technological innovation has allowed more girls to join the labor force and, by increasing returns on human capital, fostered the expansion of women's rights [Doepke *et al.* 2012], as well as better health and education outcomes [Jensen 2012]. Improved access to education, in turn, strengthened women's agency in developing countries and allowed many girls to delay marriage and pregnancies [Breierova and Duflo 2004, Ozier 2011, Baird *et al.* 2014, Behrman 2015]. Finally, improved family planning creates a virtuous cycle that fosters maternal and child health [Trussell and Pebley, 1984], human capital investment [Field and Ambrus 2008] and lower incidence of spousal abuse [Jensen and Thornton 2003].[2]

Despite this evidence, women in developing countries still face a range of disadvantages. Significant gender gaps are still in place and most women in these countries are trapped in an equilibrium where low human capital and poor labour market outcomes, together with limited agency over their bodies, lead to a vicious cycle of disempowerment and dependence on men [Bandiera *et al.* 2017]. More importantly, hard-earned gains in terms of women's empowerment can be quickly erased, or even reversed, by external shocks [World Bank 2011]. This paper focuses on one such instance, documenting the dramatic impact of the 2014 Ebola outbreak on a representative sample of 4700 young women aged between 12 and 24 in Sierra Leone, surveyed immediately before, and after the crisis.

The Ebola epidemic that struck West Africa in 2014 was the most severe ever recorded in terms of contagion and fatality rates. Compounding the health impact of the disease, some of the policies enacted by the Sierra Leoneon government to contain the outbreak resulted in acute disruptions to the socioeconomic lives of rural communities. All primary and secondary schools remained closed throughout the 2014-15 academic year, nearly all villages experienced lock-downs, and travel bans restricted economic activity and the provision of health services. While every village was affected by the crisis, we exploit differential intensity of socioeconomic disruptions across villages to measure the impact that the Ebola aggregate shock had on the lives of adolescent girls.

[1] The link between development and empowerment is bidirectional, see Duflo [2012] for a discussion of how reducing the gender gap can foster development.

[2] While economic development can explain much of the trend in gender inequality, it is of course not the only factor. For example, Field *et al.* [2010], and Jayachandran [2015] provide detailed examples of social and cultural norms hampering women's empowerment.

Adolescent girls might well be considered a group particularly vulnerable to Sierra Leone's Ebola crisis. It is thus natural to ask whether policy can play a role in mitigating the effects of large aggregate negative shocks. We answer this question with evidence from a field experiment designed to evaluate the Empowerment and Livelihood for Adolescents program (ELA). This intervention, aimed at kickstarting girls' socioeconomic empowerment, was rolled out in 150 randomly selected villages right before the onset of the Ebola crisis, with a further 50 randomly selected communities chosen as controls.[3] Operating from youth-development centres (ELA clubs) within each village, the program helps adolescent girls make informed and independent choices through the provision of mentorship and training. Most importantly, these clubs offer adolescent girls the opportunity to find support, develop new skills or engage in leisure activities within the confines of a safe space. This feature of the program has been critically important during the crisis since all adolescent girls were left for most of the day without the protection usually afforded by schools.

The fact that the ELA program evaluation was underway at the time of the Ebola outbreak in Sierra Leone was entirely coincidental. The ELA program was not intended as a response to the Ebola outbreak, and both its design and implementation took place before villages in our evaluation sample recorded the first cases of Ebola. Yet, the preliminary findings we report here suggest the program effectively curbed some of the negative impacts of the Ebola crisis, especially for younger girls.

The analysis employs both the variation in intensity of Ebola-induced disruptions and the random allocation of ELA clubs across villages to measure whether the program had a mitigating effect. In control villages, higher exposure to Ebola-related disruptions correlates with a 20pp drop in enrolment for girls aged 12-15, and a 6pp drop for girls aged 16-25. Thus higher exposure to economic disruptions accelerated the transition out of school and into employment. Marriage appears to be a common coping strategy in more severely affected communities, even for girls in the 12-15 age range. The concomitant increase in fertility, however, cannot be attributed to change in marital status alone, as close to half of the pregnancies occurred out of wedlock. We complement these findings with further evidence of a deterioration of girls' agency due to an increase in sexual abuse and transactional sex.

These trends, however, are mostly muted in treated villages. In other words, the ELA program mitigated the adverse impact of Ebola-induced disruptions on most of the dimensions taken into consideration. While in control villages higher exposure to disruptions led to a vicious cycle of disempowerment, ELA clubs helped a significantly higher number of girls return to school once the crisis abated. The effect is particularly strong for girls age 12-15 years old, whose enrolment dropped by 20pp in control villages and remained unaltered in treated communities. Part of this effect is explained by the simultaneous impact that the program had on girls' control over their body. The higher incidence of early marriages and teen pregnancies observed in control villages

[3]Bandiera *et al.* [2017] provide detailed evidence of the ELA program's impact, during less tumultuous times, in Uganda.

as a consequence of the shock is fully mitigated by ELA clubs for girls age 12-15 years old and considerably attenuated for older girls. Additionally, the intervention reduced exposure to sexual abuse and engagement in transactional sex for the younger cohort.

We contribute to the literature on the impact of economic shocks on households' welfare [Fallon and Lucas 2002, Skoufias 2003] by measuring the effects of severe socioeconomic disruptions on adolescent girls in Sierra Leone. Our findings are closely related to the analysis of the 1995 Mexican peso crisis by McKenzie [2003], which offers a detailed account of the coping strategies employed by households affected by an aggregate shock. We report similar results in terms of labour supply, which increased over the extensive margin, but important differences are found in terms of changes to family structure. During the Ebola epidemic, villages more severely affected by socioeconomic disruptions experienced an increase in fertility, while delaying pregnancies appeared to be a common coping strategy in McKenzie's sample. We explore the possible causes behind this result by documenting the deterioration of young girls' agency during the crisis, offering a broader perspective on the deep-cutting impact of shocks on this vulnerable group.

We also contribute to the growing literature using field experiments to investigate the link between resource constraints and women's empowerment. In particular, we complement the work of Bandiera *et al.* [2017] evaluating the impact of a very similar ELA program in Uganda. In that context, the ELA program was found to significantly reduce the incidence of early pregnancy, marriage and sexual abuse, as well as increase labour force participation in a country plagued by severe youth unemployment. Hence, while that earlier evaluation showed ELA's ability to kickstart a virtuous cycle of empowerment in the stable environment of Uganda, in this paper we document how the ELA program can help protect young girls from the dramatic setbacks brought by severe aggregate shocks.

The remainder of this paper is organized as follows: Section 2 briefly chronicles the Ebola outbreak in Sierra Leone, describes the intervention and the context in which it took place. Section 3 describes our research design and data. Section 4 presents estimates of the impact of the Ebola shock, and the role played by the ELA program in mitigating against these impacts. Section 5 concludes.

2 Context

2.1 The Ebola Outbreak

The Ebola Virus Disease (EVD or Ebola) is an acute hemorrhagic fever that is often fatal for humans when untreated. The disease takes its name from the river in Central Africa running near the villages where the first cases were recorded in 1976. The disease first reached West Africa in 2013, giving rise to the *"longest, largest, deadliest, and the most complex [Ebola outbreak] in history"* [UNDG 2015]. Unlike previous episodes, which had been short and mostly confined to

rural areas, the 2014-16 outbreak affected three countries (Guinea, Sierra Leone and Liberia), spreading quickly through urban centres and infecting 28,652 individuals.[4]

Sierra Leone was the country most affected, hosting half of the total number of cases and 4,810 deceased. The top part of the timeline in Figure 1 shows the progress of events related to the Ebola outbreak in Sierra Leone. A tribal healer is believed to have brought the disease from Guinea in May 2014. Traditional burial practices, households' high mobility and a slow policy response resulted in Ebola spreading to all of Sierra Leone's 14 districts by October 2014. The rapid contagion forced the government to close borders and enforce strict quarantines, followed by the deployment of trained health workers that sought possible cases door-to-door and mapped patterns of contagion. It was only in July 2015 that the epidemic started to slow down. The WHO declared Sierra Leone as Ebola-free in March 2016.

The impact on public health and loss of lives represent only one aspect of the socioeconomic consequences brought by Ebola. Restrictions on mobility and disruptions to the functioning of economic institutions resulted in the country's GDP growth rate plummeting from 8.9% to 2.0% [Thomas *et al.* 2015]. Travel bans, compounded by fear and distrust of public places, resulted in the breakdown of domestic trade. All periodic markets were forced to close and food security became an issue of concern as early as December 2014 [Thomas *et al.* 2014]. A considerable number of jobs were lost during the outbreak, especially in rural areas and within the self-employed sector outside the capital [Evans *et al.* 2015, Himelein *et al.* 2015].

Young women were particularly vulnerable to the Ebola crisis. The mandated closure of all schools in order to contain the epidemic effectively resulted in the loss of one academic year for all youth. Without the protection afforded by time spent in school, girls especially became more exposed to sexual abuse [Amnesty International 2015]. The Ebola outbreak also resulted in higher health-related risks for women in Sierra Leone. Their role as care-givers made them more exposed to contagion and access to standard medical services, such as ante-natal and maternal care, was severely hampered during the outbreak.[5]

2.2 The ELA Program

The Empowerment and Livelihood for Adolescents (ELA) program was designed and implemented by the NGO BRAC to address some of the constraints to socioeconomic empowerment faced by adolescent girls.[6] Through village-level youth development centres (ELA clubs) the program provides participants with a combination of: (i) life skills, (ii) vocational training, and (iii) microfinance. Each club is staffed by older girls from the community, who receive training and act as

[4] Estimates from the Centers for Disease Control and Prevention, updated on April 13th 2016.

[5] A combination of capacity constraints and fear of hospitals led to considerably fewer women accessing antenal care or giving birth in health facilities during the epidemic crisis [UNICEF *et al.* 2014]

[6] BRAC has recently expanded its activities to Sierra Leone. It is one of the world's largest NGOs, operating a broad range of programs across 11 countries.

mentors and facilitate the club meetings. Within these clubs, adolescent girls were offered opportunities to productively use their time and, most importantly, a safe space to come together and find support. The program was designed and tailored to the context pre-Ebola. The ELA program was not designed as a response to the challenges posed by the economic crisis that accompanied the Ebola epidemic. However, due to the coincidental timing of the intervention's rollout, we are able to observe the impact that ELA clubs had in the wake of the Ebola outbreak.

The first element of the program, life skills training, focuses on strengthening girls' ability to make informed choices by developing leadership skills and knowledge on reproductive health.[7] According to the program implementation schedule, detailed in Figure 1, this is the only component of the ELA program that was rolled out in all villages from August 2014, before the outbreak reached its peak. Safety concerns and logistical constraints led to the economic empowerment components of the program, i.e. vocational training and microfinance, being postponed until the first quarter of 2015, when schools and markets reopened.

Participation in club activities is voluntary and no conditionality is imposed on beneficiaries, so they do not need to be participating in other BRAC activities to be able to enrol into ELA clubs. Throughout the design and implementation of the ELA program, efforts were devoted to preventing club activities from displacing enrolment in formal schooling for participating girls. In particular, life skills training were organized outside of school hours and only girls older than 17 were eligible for vocational trainings and microfinance.

The program was rolled out in a nationally representative sample of villages across four districts: Port Loko, Kambia, Moyamba and Pujehun. Eligible communities were selected according to criteria that guaranteed the cost effectiveness of the program and reduced the risk of spillovers.[8] Of the 200 eligible communities in the sample, 150 were randomly assigned to one of three ELA treatment arms, with each group receiving an incrementally larger set of interventions. The first treatment group (T1), received both an ELA club and life skills training. Eligible and interested young women within the second treatment group (T2) were also offered livelihood training, mostly in the form of vocational and financial literacy trainings. Finally, the third treatment arm offered eligible club members the opportunity to participate in BRAC's microcredit program (T3), together with livelihood and life skills training. No ELA clubs were established in control villages during the evaluation period.

The life skills training component was regarded as an integral part of the ELA program and, therefore, rolled out in all treated villages upon establishment of ELA clubs. This was also the only component effectively rolled out before the Ebola outbreak reached its peak. For this reason,

[7] The topics covered by the life skills training are: sexual and reproductive health, early pregnancy, menstruation and menstrual disorders, leadership among adolescents, gender, sexually transmitted infections, HIV/AIDS, family planning, gender-based violence, and adolescent responsibility within the family and community

[8] Eligible communities were selected according to the following criteria: (i) communities had to include a sufficiently large number of households and adolescent girls (ii) villages had to lie within a predetermined radius from BRAC's branch office and (iii) villages had to be no less than 30 minutes walking distance from each other.

in the analysis that follows we do not distinguish between treatment arms and pool all treated villages together, and henceforth refer to them as ELA villages.

3 Data and Estimation

3.1 Surveys

The analysis that follows employs five data sources: Figure 1 details the exact timeline of data collection. Prior to the assignment of villages to ELA treatment groups, a census was administered to 94,338 respondents (17,233 households) in the 200 sample villages. Enumerators collected information on households' composition and compiled *Progress Out of Poverty Index* (PPI) scorecards for each household: PPI scores range between 0 and 100 and measure a household's poverty status.[9]

In February 2014, a few months before the Ebola outbreak, a baseline survey was administered to 5,775 randomly selected young women aged 12 to 24, of which 3,750 were teenagers. Detailed information was collected related to outcomes most likely to be impacted by ELA such as their labor force participation, fertility, and sexual behavior.[10] Respondents were also asked questions on topics closely related to socioeconomic empowerment such as knowledge of risky sexual practices, perception of gender roles, financial literacy and economic aspirations. The sample was interviewed again in February 2016, around two years after the baseline, and around one year after the Ebola crisis had receded to a level that allowed schools to reopen.

Two more surveys were administered during the Ebola epidemic. The first was administered to community leaders and was designed to map access to infrastructure and, most importantly, monitor Ebola's impact and response effort at the village level. The second is a monitoring survey for ELA mentors to track the functioning of ELA clubs and delivery of training programs during these turbulent times. Both surveys were administered during the crisis period via phone in June and October 2015 (as enumerators were prohibited to go to the field during the crisis).

3.2 Descriptives

Table 1 presents descriptive statistics for the adolescent girls in our sample, measured at baseline. Their average age is 18 years and approximately one third of the sample is younger than 16. Panel B shows that 80% of adolescent girls had received some form of formal education. However, current enrolment at baseline was only 44%, with more than half the girls having dropped out of

[9] This simple yet effective instrument was designed and adapted to Sierra Leone by the Grameen Foundation and provides our main poverty index. The PPI score ranges between 0 and 100 and is linked to the likelihood of an household's poverty status. For example, a PPI score equal to 36, which corresponds to our sample average, indicates a 69% chance of being below the $1.25 per day poverty line, and a 85% chance of falling below Sierra Leone's national poverty line.

[10] Due to the sensitivity of some survey modules, all enumerators were female and received specific training.

school and a similar proportion was *de facto* illiterate. The lack of human capital accumulation persists across generations: 53% of girls had both parents without any form of education.

Adolescent girls in Sierra Leone exhibit a high degree of labor force participation. Panel C shows that half the sample is engaged in some form of income generating activity (IGA), a staggering number when compared to the 2.6% labour force participation rate among adolescent girls found in a comparable study in Uganda [Bandiera *et al.* 2017]. Self-employment is the most common activity, mostly taking the form of small trade and food processing businesses. About 37% of the sample is engaged in such activities, and 23% of adolescent girls work in similar sectors for a wage.

Panel D provides a summary of variables connected with young women's sexual behaviors. Notwithstanding their young age, 72% of girls are sexually active. The average age of first intercourse is 15, with 14% being active by age 12. Between ages 13 and 17 we note a sharp increase in sexual debut, and by age 19 almost all girls (98.8%) report being sexually active. This highlights the critical time at which girls start to become exposed to the inherent risks associated with (unprotected) sex, and the age at which they are in need of sexual health education as offered by the ELA program.

Vulnerability and exposure to risky practices is indeed prevalent. Of those sexually active, 11% have experienced sex against their will and 4% have engaged in transactional sex.[11] Among other things, being exposed to these predatory behaviors has the effect of disempowering women, heightens the risk of teenage pregnancy and poses serious health threats. Consensual sex can also be risky when basic reproductive health knowledge is lacking. In our sample, contraceptive methods are employed by only 43% of girls and 90% of sexually active girls have never used condoms.

Childbearing out of wedlock in not uncommon. Panel E shows that, while 71% of girls have never been married, 43% have already experienced at least one pregnancy. Those who marry, do so relatively early (average age at marriage is 16) and to considerably older men (average age at marriage is 32).[12]

Marriage and early pregnancies can pose serious constraints to the socioeconomic empowerment of young women. Access to schools is explicitly forbidden for girls visibly pregnant, further increasing the cost of pursuing an education for young mothers. In addition, girls' role in society, especially within the household, is considerably skewed against gender equality. We summarized answers to a series of questions on gender roles in a index ranging from 0 to 100, with higher val-

[11] Unwanted sex was translated in the local language as "mami-dadi business by fos", or "sex by force". Transactional sex is defined as the occasional or recurrent exchange of intercourse for either money, gifts or help. In the analysis that follows we will focus on whether girls have experienced either of the above over the past year. However, it is worth noting that a considerably higher share of girls has been exposed to either sexual abuse or transactional sex at least once in their life (23% and 7% respectively).

[12] It is worth noting that these patterns do not match girls' marriage aspirations which, on average, would see them married at 21 years old with a partner who is 26. Similar considerations hold for the birth of the first child, which happens on average around age 17 but is seen as ideal around age 21

ues indicating a more gender neutral perception of roles within the household.[13] On average, girls scored 17 on this scale, in line with social norms that see women disproportionately responsible for household chores and family caretaking. This is important when thinking about the impact that Ebola had on the lives of adolescent girls, bringing not only loss of livelihood, but also additional responsibilities in terms of caring for vulnerable members of the family. These dynamics interact with girls' career choices and might increase the cost of returning to school and seeking out labor market opportunities.

3.3 Measuring Ebola Exposure

Over the summer of 2015, WHO reports began to show signs of decreasing rates of EVD contagion. Table 2 shows various measures of Ebola exposure: Panel A presents selected summary statistics from a phone survey administered to community leaders in October 2015, examining village level measures of Ebola exposure. Panel B shows information collected at endline between February and March 2016, once Sierra Leone had been declared Ebola-free, from adolescent girls themselves.

On village measures, the first row of Panel A shows that although travel bans were enforced throughout the country, only 5% of sampled villages experienced a complete quarantine. Partial quarantines, affecting only a limited number of households, were more frequent and 18% of villages experienced at least one. Confirmed Ebola cases were reported in 13% of surveyed villages. Panel B looks at respondent-level exposure recorded at endline. Direct contagion of an household member was reported by 3% of surveyed adolescent girls. Contagion of a member of the extended family network was more common, affecting 12% of respondents.

Rather than focusing on direct contagion, our analysis documents the impact the broader economic disruption had on the life choices made by adolescent girls during the crisis period. Disruptions to the functioning of key socioeconomic institutions were both common and severe. The breakdown of domestic trade, restricted mobility and, most importantly, the closure of all primary and secondary schools altered the costs and trade-offs faced by adolescent girls when making decisions about education, employment and fertility. These choices are closely related, and have lifelong implications for the empowerment of adolescent girls and full realization of their potential.

Part of Ebola-induced economic disruptions stemmed from the policy response enacted by Sierra Leone's government. An assessment of these policies is beyond the scope of this study, but focusing on the broader socioeconomic environment allows us to explore whether complimentary interventions can effectively mitigate the negative impact of community-wide shocks on adolescent

[13]The gender equality index is a variable that cumulates the number of times a respondent answers "Both/Same"to the following questions: "Who should earn money for the family?", "Who should have a higher level of education in the family?", "Who should be responsible for washing, cleaning and cooking?", "If there is no water pump or tap, who should fetch water?", "Who should be responsible for feeding and bathing children?", "Who should help the children in their studies at home?", "Who should be responsible for looking after ill persons?".

girls. Hence, the analysis that follows relies on two sources of variation: (i) intensity of disruptions brought by naturally occurring Ebola and (ii) randomly assigned ELA clubs.

The severity of the Ebola epidemic meant that all villages where affected, allowing the impact of disruptions to be assessed only over the intensive margin.[14] In order to distinguish moderately exposed villages from those more severely hit by disruptions we construct a binary variable representing whether the nearest Peripheral Health Unit (PHU) was forced to close at any point during the outbreak. These facilities represent the primary point of contact between the population and the health system and 14% of sampled villages experienced disruption to this service. The most common causes for the breakdown of health services were lack of supplies and personnel [UNICEF *et al.* 2014].

3.4 Attrition

Sierra Leonean households show high degrees of internal mobility, with 70% of respondent girls having moved at least once since birth. Similarly, migration was also common during the study period. Only 3,868 (67%) girls were located at their original place of residence two years after baseline. Of the ones that moved, enumerators were able to track and interview 922 (16%), resulting in total attrition of 985 (17%) girls. The analysis of Section 4 focuses on all adolescent girls for which two data points are available, regardless of their migration status, leaving us with a sample of 4,790 respondents.

Appendix Table 1 explores the patterns of attrition in our sample. Assignment to the ELA treatment and severe exposure to Ebola do not predict attrition over the study period. Certain baseline characteristics, however, do correlate with attrition. Adolescent girls that are enrolled in school or married were more likely to be tracked by enumerators, while patrilocal traditions make single girls more likely to migrate. In ELA villages, instead, the dampening effect of enrolment and marriage on attrition is smaller.

3.5 Balance

Our identification strategy relies on the variation in ELA club assignment between villages with the same degree of exposure to Ebola-induced disruptions. Appendix Table 2, Columns 1 through 4, show that random assignment of villages into treatment and control groups, which happened before the Ebola outbreak, resulted in two subsamples that are balanced across baseline outcomes and key characteristics of respondents. The second set of Columns 5 to 8, compares subsamples according to the intensity of Ebola-induced disruptions. The two samples are balanced with respect to most variables, although we note that villages that were more severely hit are smaller, have higher rates of self-employment and girls are marginally older (5 months on average). While the

[14] For example, not only all schools across the country were forced to close, but none of the periodic markets in the study districts managed to remain open continuosly through the crisis.

null hypothesis of equal means for these two variables is rejected, normalized differences computed following Imbens and Wooldridge [2009] are small and lower than the .25 rule-of-thumb threshold.

The most relevant question, however, is whether ELA clubs have in any way interacted with the incidence of Ebola. Knowing that women were more exposed to contagion due to their social role as caregivers, ELA clubs might have facilitated contagion in treatment communities by providing a venue for young women to gather. At the same time, facilities of this kind might have fostered the diffusion of information and safe practices, or the coordination of response actions in the wake of the Ebola outbreak, thus dampening the spread of the disease in ELA villages. While both arguments are plausible, the available evidence supports neither. Table 3 shows estimates from a regression of our Ebola measure on an indicator variable for treatment assignment and a series of controls. In no specification is the presence of ELA clubs found to be correlated with incidence of socioeconomic disruptions.

To further check the strength of our identification strategy, Table 4 shows a set of balance checks for each subsample of villages defined by our key Ebola indicator. Two results are worth highlighting. First, even if Ebola might have spread following a non-random pattern, there is an equal share of randomly selected ELA villages in the moderately and severely exposed subsamples. Secondly, treatment and control samples show signs of balanced observables regardless of the degree of exposure.

3.6 Estimation

This preliminary analysis focuses on outcomes that proxy for adolescent girls' economic empowerment and agency over their bodies: enrolment, engagement in income generating activities, marriage, pregnancy during the outbreak, unwanted sexual interactions and engagement in transactional sex. Due to the low autocorrelation between post-Ebola outcomes and their baseline values, we employ an OLS Analysis of covariance (ANCOVA) specification, which delivers more efficient estimates with respect to the classic difference-in-difference approach [McKenzie, 2012].[15]

Throughout the analysis, separate results are shown for girls in the 12-15 age group at baseline and older respondents. Average effects, in fact, hide a considerable degree of heterogeneity in terms of vulnerability to socioeconomic disruptions and effectiveness of the ELA program in mitigating such an adverse shock. The age threshold is chosen according to Sierra Leone's education policy, which mandates schooling for all children up to junior secondary school, i.e. up to age 15 for a child that enrols into primary school according to the statutory age of 6 years old and progresses through the school system without any grade repetition. Figure 2 shows the age structure of the education system in Sierra Leone, and highlights that age 15 is an important cut-off between junior and senior secondary school. It is then reasonable to assume that girls within the two

[15] Six out of eight outcomes have an autocorrelation lower than .20.

age groups face different sets of incentives and costs of attending school.[16] Regardless, the core implications emerging from this analysis are robust to one-year perturbations of the threshold in either direction.

The first set of results document the average impact of exposure to disruptions. The coefficient of interest is β in the following specification:

$$Y_{ij1} = \alpha + \beta Ebola_j + \delta Y_{ij0} + \gamma X_{ij0} + \epsilon_{ij1}, \tag{1}$$

where Y_{ij1} (Y_{ij0}) represents the outcome of interest for individual i in community j measured at follow-up (baseline), $Ebola_j$ is the measure of exposure described above, X_{ij0} is a vector of control variables measured at baseline and ϵ_{ij1} is an idiosyncratic shock, where we cluster standard errors by community.[17]

We then compare average effects by ELA status, using the random assignment of ELA clubs to shed light on whether the program had an impact in the wake of Ebola's outbreak. The empirical specification used is,

$$Y_{ij1} = \alpha + \beta_1 Ebola_j + \beta_2 ELA_j + \beta_3 \left(Ebola_j \times ELA_j\right) + \delta Y_{ij0} + \gamma X_{ij0} + \epsilon_{ij1}, \tag{2}$$

where ELA_j is an dummy indicating random assignment of community j to treatment or control group.[18] Beyond documenting the impact that Ebola had on girls' outcomes in the two sets of villages, we are interested in whether ELA clubs offered a coping mechanism that helped young women throughout the crisis. To answer this question, we test the null hypothesis of Ebola having equally affected ELA treatment and control groups, or equivalently $\beta_3 = 0$ in (2).

Random assignment of the ELA intervention, under the assumption that the treatment did not interact with the intensity of disruptions (so $Ebola_j$ is not itself causally related to ELA_j as the results in Table 3 suggest), ensures unbiased β_3 estimates and validates our main results on the role played by ELA club for girl outcomes.[19]

[16] In line with this being the relevant age split, we note that school dropout rates over the sample period are highest between age 15 and 16. Another factor contributing to this distinction is the observation of a marked increase in the probability of first intercourse and marriage around age 15.

[17] Control variables include: age, PPI score, household size, illiteracy, village size (number of dwellings), village average PPI score, average distance to major infrastructure (nearest clinic, secondary school and market), a dummy equal to one if the village is a political stronghold (i.e. has a resident paramount and/or section chief), the number of NGOs active within the village before the Ebola outbreak, share of Christian households, and an indicator variables for whether the village received food and/or school supplies as part of the Ebola relief effort. All specifications include dummies for randomization strata following Bruhn and McKenzie [2009].

[18] Since participation is voluntary and might have been affected by the severity of Ebola-induced disruptions, we do not explicitly account for it. The approach taken is therefore akin to measuring intention to treat effects.

[19] The intensity of Ebola-induced disruptions, however, represents a non-experimental shock. To the extent that the severity of the shock correlates with omitted variables that also affect outcomes of interest, estimates for β in (1) and β_1 in (2) could be biased. For example, low reproductive health knowledge might simultaneously increase the probability of contagion (and thus the likelihood of the village being quarantined) and the probability of pregnancies, biasing estimates upwards. To mitigate these concerns, we control for a rich set of village-level variables. These considerations, however, do not affect our key results on the mitigating impact of the ELA program.

Finally, while the analysis focuses on the effects of broader socioeconomic disruptions, our measure of exposure might also pick up the health impact that EVD had on households and communities. To ensure that the observed impacts are due to disruptions and not, for example, due to exposure to the disease itself, all empirical specifications include two dummies indicating whether any case of contagion was recorded among respondents' extended family or community.

4 Results

4.1 Ebola and Economic Disruptions

Table 5 reports the first set of estimates, documenting the average impact of Ebola-induced disruptions on young women. For each outcome (Columns 1 through 8) we report the difference in average outcomes between severely affected villages and the reference group (coefficient β from (1)) for girls aged 12-15 at baseline (Panel A) and for those aged 16-25 at baseline (Panel B).

4.1.1 Education and Employment

Column 1 through 4 document the link between exposure to the shock and transition out of school and into employment. Estimates in Panel A indicate a 6.6pp drop in enrolment of girls aged 12-15 relative to less exposed communities. Although imprecisely measured, this represents a 8% drop relative to average enrolment in the comparison group.[20] More marked is the impact on labor force participation, which is 12.9pp higher in severely affected villages (30% of the reference group's average employment). The increase in employment is almost equally split between wage labour and self-employment, 7.7pp and 7.0pp respectively.

Panel B compares average outcomes according to exposure for 16-25 year-old girls, finding no significant impact of Ebola exposure. Taken together, this evidence suggests that the simultaneous increase in the cost of human capital investment and loss of livelihoods meant that among younger girls, on average fewer girls returned to school after the outbreak, opting instead to engage in income generating activities.

From this perspective, younger girls represent a particularly vulnerable group. They are more affected by the shock itself and abandoning education at a younger age can have more severe consequences on the their socioeconomic empowerment. On the one hand, the stock of human capital accumulated at a younger age reduces the cost of future learning [Cunha *et al.* 2010], further expanding the set of choices available to adolescent girls and fostering their independence. On the other hand, schools offer a safer space where girls spend a significant share of their time, thus protecting them from sexual abuse and encounters with older men.

[20] Results do not appear to be driven by supply side constraints. We control for the timing of school re-opening, which did not coincide with the beginning of term for 21% (18%) of primary (secondary) schools.

4.1.2 Marriage, Fertility and Risky Behaviors

We first examine the change in marital status for girls aged 12-15. Column 5 in Panel A compares severely and moderately exposed girls, reporting an increase of 2.7pp in marriage rates in those severely exposed to Ebola. The effect is both significant and large relative to the reference group (49%). The two groups are not significantly different in terms of fertility. Among older girls, Panel B shows that marriage also appears to be a coping mechanism common, with heightened exposure to disruptions resulting in a 4.8pp increase in the number of married girls. Concomitantly, we observe a statistically significant increase in fertility among older girls of 3.7pp (12%).

While it is not surprising to observe marriage being used as a strategy to cope with economic shocks [Skoufias 2003], this has broader implications for the lives and socioeconomic empowerment of young women. Early marriage is found to have a negative impact on girls' investment in human capital [Field and Ambrus 2008]. The impact is even more severe when marriage results in a pregnancy, which explicitly prevents Sierra Leonean girls from going back to school. Moreover, the crisis might have affected the quality of matches being formed and the younger age at which girls married is likely to have an effect on their bargaining power [Heath 2014].[21]

Columns 7 and 8 summarize the impact on unwanted and transactional sex. More severe exposure to disruptions resulted in an higher risk of sexual abuse for both age groups, although neither effect is statistically significant.[22]

Taken together, these results provide an important contribution to the literature on the socioeconomic impacts of economy-wide shocks. They highlight that schools might offer a safer space for young girls, and one consequence of the crisis was to speed up the transition from schooling to work for younger girls. This abrupt halt in their human capital accumulation might have long lasting consequences. Moreover, the observed increase in marriage rates is not sufficient to explain the increase in fertility that correlates with exposure to the shock. In fact, 45% of pregnancies recorded during the outbreak happened outside of wedlock. Higher fertility in the wake of a large economic shock is also in sharp contrast with the work of McKenzie [2003], where delaying pregnancies is found to be a common coping mechanisms for Mexican households during the Peso crisis (where the sample examined is older than those we study). We are then led to conclude that the observed increase in fertility is linked, at least in part, to constraints on young women's ability to exert control over their bodies, thus avoiding abusive or unsafe practices.[23]

[21] Travel bans might have reduced the pool of potential partners. Moreover economic shocks can correlate with the returns from marrying [Mobarak *et al.* 2013] making less advantageous matches viable when faced with an economic shock.

[22] The observed increase/stability in transactional sex is in contrast with the work of Dupas and Robinson [2012], which documents a fall in the volume of commercial sex demanded during the 2007 crisis in Kenya. While there might be important nuances in the way transactional sex is defined, it is worth stressing that the impact of a livelihood shock on this variable is *a priori* ambiguous, as both demand and supply side are affected. For example, while Dupas and Robinson [2012] survey sex workers, our sample is representative of all young women aged 12-25 at baseline. Hence, while the two authors look at the intensive margin, we analyze only the extensive margin.

[23] Duflo, Dupas and Kremer [2015] discuss whether a change in the cost of schooling can affect fertility by alterning

4.2 ELA and Ebola

Faced with this evidence, it is natural to ask whether development policies can play any role in mitigating the effects of such a large aggregate shock. Table 6 addresses this question by separately reporting the impact of disruptions on girls randomly assigned to control group (Row 1) and to the ELA program (Row 2). The difference between the two (Row 3) indicates whether the two groups were differently affected by the crisis as a result of the ELA program.

4.2.1 Education and Employment

Column 1 shows that ELA clubs were strikingly effective in curbing school dropout rates once the crisis abated. In control villages, higher exposure to disruptions is correlated with a 20pp drop in enrolment for girls aged 12-15, while the effect is not significantly different from zero in treated villages. The difference in trends between the two groups is both large and precisely estimated. Interestingly, while we saw no significant impact on the aggregate enrolment of older girls, Panel B shows that the shock did negatively affect schooling decisions also for girls in the 16-25 age group. Enrolment dropped by 5.6pp in control villages while the effect is fully mitigated in treatment villages.[24] ELA clubs, therefore, proved to be a formidable policy tool in containing the much larger transition out of schooling observed for the rest of Sierra Leonean young women. In the next subsection we provide evidence that this is a combination of a direct impact on the cost of returning to school and, most importantly, the program's indirect impact through its effects on employment, marriage and fertility.[25]

The ELA program has also reduced the number of adolescent girls between 12 and 15 years old that joined the labour force (Panel A, Column 2). In the absence of ELA clubs, disruptions correlate with a 24.6pp increase in youth employment over the reference group. The effect is only 9pp in treated communities and the difference between the two groups (15.5pp) is significant. The loss of livelihood brought by the crisis meant that a large number of very young girls had to engage in income generating activities to support falling incomes. In ELA villages, however, fewer girls were forced to resort to this coping strategy and more invested in human capital after the crisis. This is in large part due to fewer girls permanently transitioning from education to employment, but we also observe more girls combining the two activities in treated communities.

girls' choices in terms of relationships. Their model predicts that an increase in the cost of schooling reduces the opportunity cost of childbearing and, thus, committed relationships. Such a prediction would be in line with the observed increased in fertility and concomitant fall in enrollment in Sierra Leone during the outbreak. However, while the authors present experimental evidence that a change in the cost of schooling does not affet out of wedlock pregnancies, Ebola-induced disruptions did, suggesting that additional mechanisms play a role in our context.

[24] To ensure that assignment to the program does not pick up the effect of other forms of support that might have been intermediated through these facilities, we explicitly control for whether each girl has received school supplies or food as part of the relief effort.

[25] For example, ELA clubs could have facilitated girls' access to the radio education programs set up by the Ministry of Education.

4.2.2 Marriage, Fertility and Risky Behaviors

The ELA program was specifically designed to foster young girls' independence and control over the body. Table 6, Columns 5 through 8, present evidence of ELA clubs' effectiveness in achieving this objective in the wake of Ebola-induced disruptions. Starting from girls in the 12-15 age group, Row 2 of Panel A shows that the intensity of the shock had no impact on girls' propensity to marry or become pregnant in ELA villages. The effect on these outcomes is instead positive for girls in control villages. Panel B, Column 5 and 6, present a similar pattern for older girls, with disruptions resulting in a 8.8pp increase in marriage and 8.1pp in childbearing for those girls that did not have access to an ELA club. The differences between treatment and control groups are thus of the expected sign, but sample size constrains the precision of the estimates.

We observe significant differences in trends when focusing on the impact on unwanted and transactional sex. Column 7 shows that there is no significant change in the incidence of sexual abuse imputable to higher shock exposure, regardless of age (Row 2, Panel A and B), in ELA villages. This finding is in line with ELA clubs functioning as a safe space for young women of all ages within the village. When looking at the full sample of women, there is no significant change in the incidence of unwanted sex in control villages either, but this average effect masks considerable heterogeneity. Sample size and low baseline incidence call for a cautious interpretation of these results, but it appears that disruptions made sexual abuse significantly more likely for young girls (5.7pp) and less likely for older ones (5.2pp). Young respondents' increased vulnerability can be traced back to schools' closure, but the findings for older girls require further analysis, and is the subject of ongoing analysis.[26]

ELA clubs appear to have also affected the decision of providing transactional sex. In the wake of a large economic shock, the exchange of sexual favours for gifts or money represents a coping strategy available to many girls. The risk of falling prey to this behavior, which initiates a negative cycle of dependence and health hazards,[27] is compounded by the closure of schools that increased young girls' exposure to older men's attentions. This is what we observe for the 12-15 year-old sample in control villages, where transactional sex increased by 5.7pp as a result of more severe economic hardship. The effect is not significantly different from zero for older girls in control villages, highlighting once again the higher vulnerability of the younger cohort.

In ELA villages, instead, the incidence of transactional sex decreases for the younger cohort and moves in the opposite direction for older girls. As a result, while it appears that ELA clubs

[26] Time use data could for example show whether older women became more encumbered with labour or caretaking within the home, making them less vulnerable to violence. It could be possible that the increased vulnerability of younger girls made it relatively more costly to abuse older women. It is also worth noting that we look only at the extensive margin of abuse, and cannot investigate frequency of abuse for the victims. Finally, we do not distinguish whether the recorded episodes of abuse were perpetrated by the spouse or other men from the village, a distinction that is particularly important for pubescent brides.

[27] The use of condoms is rare in our sample. Moreover, Dupas and Robinson [2012] document deteriorating safety conditions for women who provided sex as a consequence of a large economic shock.

have a positive impact on this outcome (Row 3, Panel B), this is due to more complex dynamics that affect girls of different ages in ELA villages. We cannot exclude that, by being more effective in protecting the marginally more vulnerable younger girls, ELA clubs had an unexpected impact on older ones. A conclusive interpretation of this evidence, however, requires further analysis.

5 Conclusions

Promoting women's empowerment requires a multi-faceted approach that simultaneously tackles obstacles to economic empowerment and strengthens young women's control over their body. The evidence presented in this paper offers an example of how closely interlinked schooling, career and fertility decisions are for young women in developing countries. We documented how these choices are affected by a large shock that increased the cost of school attendance and brought economic hardship on Sierra Leonean households. The sizeable drop in school enrolment for girls more severely affected is of primary concern, not least because a premature labor force transition is bound to correlate with low productivity and perpetrate poverty or dependence on men.

Economic empowerment, however, represents only one aspect of adolescent girls' lives and the constraints they face. Our estimates offer a broader perspective on this issue by documenting how a large shock eroded young women's agency over their body. The disruptions that accompanied Ebola's outbreak, in fact, correlated with a substantial increase in fertility, a phenomenon that is hard to justify as a coping strategy. On the one hand, almost half of these pregnancies took place out of wedlock, a condition that leaves young mothers particularly vulnerable, and even girls in the 12-15 age group were affected. On the other hand, we document a concomitant increase in the incidence of sexual abuse and in the number of girls that engaged in transactional sex. This loss of agency, in turn, exacerbates the constraints observed in terms of economic empowerment and further reduce the set of choices available to young women. For example, pregnant students were explicitly forbidden from returning to schools once they reopened, compounding the toll that early childbearing has on girls' human capital investment.

A growing body of evidence has shown that policy can play a crucial role in fostering women's empowerment. We contribute to this debate in two significant ways. First, the findings of this paper draw attention to the fragility that characterizes the condition of women in developing countries. While interest has traditionally focused on policies that promote opportunities for girls in these countries, we show that gains can be swiftly erased by unexpected shocks. Therefore, achieving equal opportunities for girls requires not only measures that lift existing constraints, but also interventions that protect adolescent girls against adverse shocks.

Our second contribution speaks to this argument by providing evidence of a policy that can achieve the dual goal of *promoting and protecting* girls' ability to choose. Empowerment and Livelihood for Adolescents is a program that provides both life and technical skills. Originally

developed in Bangladesh, the program has now been adapted to a number of African countries.[28] Bandiera *et al.* [2017] assessed ELA's impact in Uganda, showing that the program simultaneously boosted young women's economic empowerment and agency. Program recipients reported significantly higher rates of self-employment, as well as lower incidence of teen pregnancies, early marriages and sex against their will. The authors document also the program's cost effectiveness, a feature that is crucial for its scalability. Our paper complements this evidence by assessing ELA's potential as a social protection tool against a large shock.

The ELA program mitigated the adverse impact of Ebola-induced disruptions on most of the dimensions taken into consideration. The evidence demonstrates ELA's potential as a tool to foster and protect adolescent girls' ability to invest in human capital and exert agency over their body. Yet, a deeper understanding of the mechanisms through which ELA clubs deliver these gains requires further research. The ELA program, in fact, is a bundle of three distinct interventions: (i) the provision of a safe space and mentoring, (ii) life skills and (iii) vocational training. Each of these elements might drive the observed effects through different channels. The life skill training, for example, provided reproductive health knowledge in a context where unsafe practices are widespread and might have had an impact on some of the social norms held by treated girls. The economic empowerment component of the program might have increased the opportunity cost of childbearing, or girls' bargaining power within existing relationships, by raising their productivity. We also cannot exclude that the provision of a safe space where girls can find protection and build their social network might be an effective measure in and of itself. Finally, it is possible that some of these elements interact with each other and only a bundled intervention can be effective. For example, even if the provision of a safe space might be the key element, ensuring participation might require clubs to offer training programs that girls deem as valuable for their personal or professional development.

Finally, further research should explore the quality of relationships established by girls in our sample during the crisis. The Ebola outbreak, in fact, had two potentially distinct effects on villages' marriage market. On the one hand, girls faced an heightened pressure to marry in the wake of a negative income shock, which might alter the quality of marriages in terms of welfare gains for the bride and her family [Mobarak *et al.* 2013], as well as for the bride's bargaining power within the household [Field 2003]. On the other, travel bans significantly altered the pool of available partners. This is a relevant shock for the Sierra Leonean context since patrilocal tradition often see girls marry older men from other villages and migrate. It is unclear how the change in partners' availability might have affected the quality of relationships, but we cannot exclude that the observed increase in sexual abuse might include cases where the spouse is the perpetrator. Moreover, the different nature of family networks established during the crisis, predominantly within the community rather than across villages, might have had deeper

[28] The program (or similar variant) is currently active in Bangladesh, Sierra Leone, Uganda, Liberia and South Sudan.

implications for households' ability to insure against village-level shocks, or for brides' bargaining power.

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Figure 1: Timeline

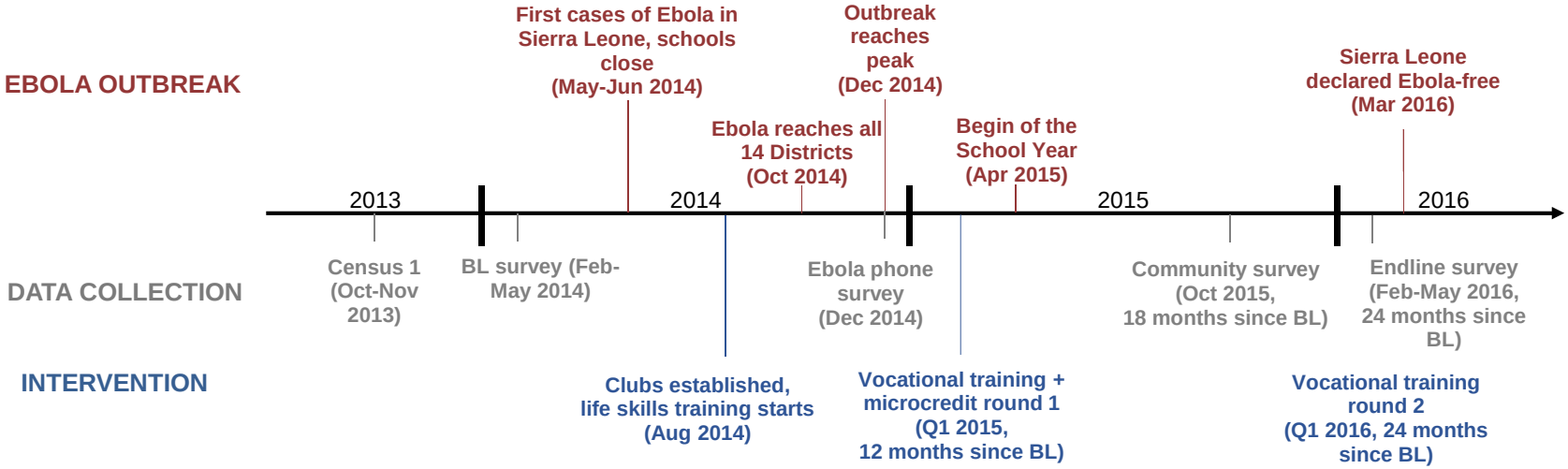
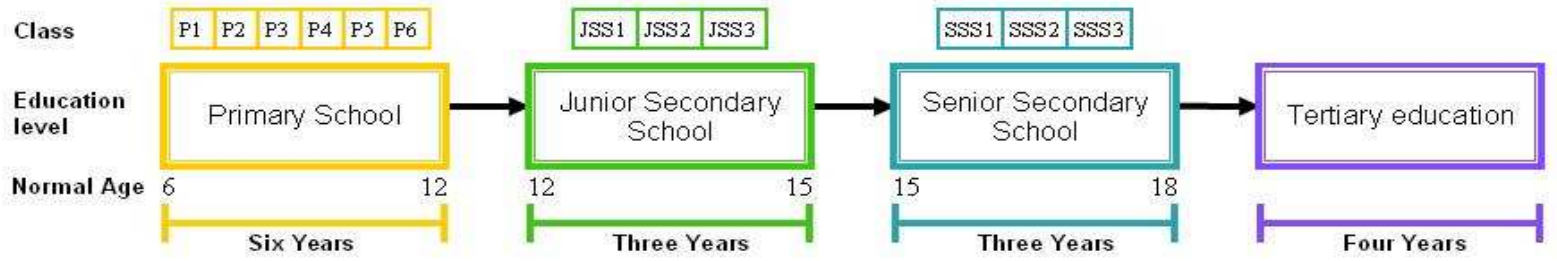


Figure 2: Educational Stages in Sierra Leone



Source: Education in Sierra Leone. (2017, September 15). In *Wikipedia, The Free Encyclopedia*. Retrieved 16:43, October 29, 2017,

Table 1: Baseline Characteristics of Adolescent Girls

Means, standard deviations in brackets

A. Sample	Number of adolescent girls	4,790
	Average age	17.6 [3.78]
	Aged 12 - 15 [yes=1]	.367 [.482]
B. Education	Ever Attended School [yes=1]	.804 [.397]
	Enrolled [yes=1]	.444 [.497]
	Illiterate [yes=1]	.533 [.499]
	Both parents uneducated [yes=1]	.534 [.499]
C. Income Generating Activities	Any Employment [yes=1]	.502 [.500]
	Wage Employment [yes=1]	.234 [.423]
	Self-Employed [yes=1]	.366 [.482]
D. Sexual Behaviors	Sexually active [yes=1]	.717 [.451]
	(if sexually active) Age at first sex	14.6 [2.17]
	(if sexually active) Ever used condom [yes=1]	.102 [.303]
	(if sexually active) Had sex unwillingly in the past one year [yes=1]	.105 [.307]
	(if sexually active) Engaged in transactional sex in the past one year [yes=1]	.035 [.184]
E. Marriage, Fertility and Empowerment	Married [yes=1]	.289 [.453]
	Has child(ren) [yes=1]	.431 [.495]
	(if married) Age at marriage	16.2 [2.83]
	Gender empowerment index [0-100]	16.8 [20.5]

Notes: The sample includes those adolescent girls that were observed at baseline and midline. Illiteracy is defined as the self-reported inability to read simple text such as the label of a product. The gender equality index is a variable that cumulates the number of times a respondent answers "Both/Same "to the following questions: "Who should earn money for the family?", "Who should have a higher level of education in the family?", "Who should be responsible for washing, cleaning and cooking?", "If there is no water pump or tap, who should fetch water?", "Who should be responsible for feeding and bathing children?", "Who should help the children in their studies at home?", "Who should be responsible for looking after ill persons?". The index is then rescaled to range from 0 to 100, with higher values indicating a more gender neutral perception of roles within the household.

Table 2: Ebola Descriptives

Means, standard deviations in brackets

		Mean	Correlations							
A. Village level (n=200)	(1) Ever totally quarantined [yes=1]	.045 [.208]	1							
	(2) Ever partially quarantined [yes=1]	.175 [.381]	.431	1						
	(3) Confirmed Ebola Case	.125 [.332]	.592	.790	1					
	(4) PHU ever closed	.140 [.348]	.139	.125	.114	1				
B. Household Level (n=4,790)	(5) Visited by Contact Tracers	.274 [.446]	.197	.091	.141	.191	1			
	(6) Ever Quarantined	.039 [.194]	.415	.194	.312	.149	.298	1		
	(7) Ebola case within the HH	.029 [.168]	.269	.172	.214	.112	.239	.694	1	
	(8) Ebola case within extended family	.120 [.325]	.153	.119	.151	.113	.138	.189	.182	1

Note: The data in Panel A was collected through a survey of community leaders in June 2015, while Panel B presents information collected at midline. Pairwise correlations in panel B computed on the full panel (n=4,790). A *partial quarantine* is defined as the quarantining of at least one household within the village, while a total quarantine indicates cases where public authority deemed necessary to quarantine the entire village. Peripheral Health Units (PHU) are facilities designed to deliver primary health care and include: Community Health Centre, Community Health Posts, and Maternal and Child Health Posts. Contact Tracers are specialized health workers deployed by the Ministry of Health to monitor and track patterns of contagion.

Table 3: Correlates of Ebola Exposure

OLS estimates, standard errors in parentheses

	PHU Ever Closed [yes=1]		
	(1)	**(2)**	**(3)**
ELA Club	.001	.011	.007
	(.049)	(.054)	(.054)
Village Size		.004	.005
		(.006)	(.006)
Average Distance from Key Facilities		.016	.108
		(.421)	(.440)
Paramount Chief resides in the village		.023	.025
		(.047)	(.047)
PPI Score (village average)		-.430	-.357
		(.463)	(.460)
Share of Christian HHs		.285**	.171
		(.143)	(.164)
Number of pre-existing NGOs		-.013	-.0104
		(.013)	(.013)
Infrastructure Index		-.047	-.047
		(.137)	(.137)
Never used Condoms (share of sample)			.125
			(.194)
Average HIV Knowledge			-.103
			(.085)
Illiterate Young Women (share of sample)			-.141
			(.186)
Average School Enrollment (share of sample)			-.265
			(.233)
Average Employment (share of sample)			.290**
			(.144)
Married (share of sample)			.069
			(.223)
Has children (share of sample)			-.386
			(.284)
Experienced unwilling sex (share of sample)			-.332
			(.224)
Experienced transactional sex (share of sample)			-.039
			(.557)
Adjusted R-squared	.238	.231	.225
Number of Observations	200	200	200

Notes: ***, ** and * denote significance at the 1%, 5%, and 10% levels. The unit of observation is the village. Estimates use OLS with strata dummies and robust standard errors. Covariates were chosen via Least Angle Regression [Efron et al., 2004] as predictors of at least one of the available measures of village-level Ebola incidence and socio-economic disruptions. Nearest clinic, secondary school and market are used to compute the average distance from key facilities. The Progress out of Poverty index (PPI) is calculated through scorecards and its value, ranging from 0 to 100, represents the likelihood of an household being below the poverty line. The infrastructure index is the cumulative number of facilities available within the village, from the following list: water well, barray, market structure, primary school, secondary school, health center, commercial bank. The index is then standardized to range from 0 to 1. HIV knowledge is summarized in an index ranging from 0 to 6 and cumulating the number of correct answers, at baseline, to the following questions: True or False: "A person who has HIV is different from a person who is ill with AIDS", "During vaginal sex, it is easier for a woman to receive the HIV virus than for a man", "Pulling out the penis before a man climaxes keeps a woman from getting HIV during sex", "A women cannot get HIV if she has sex during her period", "Taking a test for HIV one week after having sex will tell a person if she or he has HIV", "A Pregnant woman with HIV can give the virus to her unborn baby". The index is then averaged at the village level. Illiteracy is defined as the self-reported inability to read simple text such as the label of a product.

Table 4: Balance of Outcomes at Baseline, by Ebola Exposure

Means, standard errors in parenthesis
P-value of t-test of equality of means in braces
Measure of Ebola Exposure = Nearest PHU ever closed

		By Ebola Exposure							
		Moderate				Severe			
		Control	ELA Club	Difference	Normalized Difference	Control	ELA Club	Difference	Normalized Difference
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A. Village Level (n=200)	**Num of sampled AG**	16.9 (2.17)	15.7 (.671)	-1.27 {.576}	-.078	13.4 (2.23)	16.6 (.813)	3.18 {.189}	.283
	Num of Households	519.5 (232.4)	258.6 (32.1)	-260.9 {.268}	-.166	107.5 (24.0)	148.3 (25.5)	40.8 {.255}	-.371
	PPI Score (Mean)	.350 (.008)	.343 (.004)	-.007 {.462}	-.085	.368 (.014)	.365 (.010)	-.003 {.875}	-.157
	PPI Score (CV)	.305 (.009)	.310 (.006)	.005 {.670}	.046	.298 (.019)	.296 (.014)	-.002 {.948}	.134
	Infrastructure Index	.349 (.033)	.366 (.018)	.017 {.650}	.058	.309 (.080)	.285 (.040)	-.024 {.793}	-.075
	Average Distance from Key Infrastructures	.041 (.003)	.051 (.004)	.010** {.049}	.210	.044 (.007)	.044 (.004)	-.000 {.990}	-.011
	Political Stronghold [yes=1]	.418 (.075)	.341 (.042)	.077 {.372}	-.112	.285 (.158)	.334 (.089)	.049 {.791}	.069
	Number of Villages	43	129			7	21		
B. Individual Level (n=4,790)	**Enrolled**	.475 (.033)	.446 (0.017)	-.029 {.436}	-.040	.344 (.045)	.411 (.030)	.067 {.223}	.069
	Any IGA	.496 (.034)	.478 (.017)	-.018 {.639}	-.031	.647 (.042)	.601 (.036)	-.045 {.435}	-.109
	Wage Employment	.226 (.022)	.207 (.011)	-.019 {.444}	-.035	.331 (.035)	.371 (.028)	.040 {.395}	.036
	Self-Employed	.365 (.030)	.355 (.015)	-.011 {.749}	-.021	.458 (.028)	.396 (.036)	-.061 {.211}	-.117
	Married	.268 (.023)	.282 (.014)	.014 {.614}	.016	.402 (.043)	.325 (.019)	-.077 {.110}	-.092
	Has Children	.428 (.024)	.432 (.013)	.004 {.887}	.005	.496 (.036)	.409 (.028)	-.087* {.067}	-.100
	Unwilling Sex	.115 (.026)	.107 (.012)	-.008 {.792}	-.012	.057 (.016)	.092 (.020)	.035 {.186}	.083
	Transactional Sex	.041 (.008)	.032 (.004)	-.009 {.332}	-.029	.035 (.015)	.039 (.011)	.004 {.822}	.009
	Age	17.5 (.164)	17.5 (.100)	.037 {.849}	.007	18.4 (.255)	17.7 (.198)	-.683** {.044}	-.101
	HH Size	8.27 (.222)	8.11 (.124)	-.165 {.521}	-.034	9.33 (.585)	9.55 (.399)	.221 {.765}	-.019
	PPI Score	36.1 (.897)	36.0 (.438)	-.100 {.920}	-.006	37.6 (.948)	37.8 (.639)	.186 {.873}	.005
	Number of Adolescent Girls	1,014	3,060			184	532		

Notes: *** denotes significance at 1%, ** at 5%, and * at 10%. All data, excluding measures of Ebola exposure, is from the baseline survey. Means and standard errors for each outcome/characteristic are derived from an OLS regression of the characteristic of interest, for each subsample, on a dummy variables indicating assignment to treatment. All regressions include strata (district) dummies. Panel A reports robust standard errors, while in Panel B standard errors are clustered at the community level. Normalized differences are computed following Imbens and Wooldridge [2009]. The *Infrastructure Index* ranges between 0 and 1 and summarizes villages' endowment of 7 key infrastuctures (water well, town barray, market structure, primary school, secondary school, health center, and commercial bank). Average distance from key infrasatructures is computed using the nearest Market Structure, Secondary School and Health Centre. A village is labelled as a political stronghold if it has a resident paramount and/or section chief. The Progress out of Poverty index (PPI) is calculated through scorecards and its value, ranging from 0 to 100, represents the likelihood of an household being below the poverty line.

Table 5: Impact of Ebola

OLS estimates, standard errors in parentheses, p-values in braces

Severe Ebola Exposure = Nearest Peripheral Health Unit closed

PANEL A. **Age ≤15 when first Ebola Case**	**Enrolled in school [0-1]**	**Employed (any) [0-1]**	**Wage employment [0-1]**	**Self-employed [0-1]**	**Married [0-1]**	**Fertility [0-1]**	**Had sex without consent in past 1 yr [0-1]**	**Engaged in transactional sex in past 1 yr [0-1]**
(Age≤17 at Midline)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Severe Ebola Exposure	-.066	.129***	.077***	.070**	.027*	.017	.015	-.013
	(.031)	(.014)	(.012)	(.022)	(.010)	(.020)	(.008)	(.010)
	{.121}	{.003}	{.008}	{.050}	{.079}	{.478}	{.175}	{.276}
Mean of outcome if Exposure=0	.744	.434	.212	.275	.055	.106	.048	.037
Adjusted R-squared	.306	.096	.030	.099	.121	.068	.024	.0005
Observations	1,755	1,755	1,755	1,755	1,755	1,755	1,316	1,316

PANEL B. **Age 16+when first Ebola Case**	**Enrolled in school [0-1]**	**Employed (any) [0-1]**	**Wage employment [0-1]**	**Self-employed [0-1]**	**Married [0-1]**	**Fertility [0-1]**	**Had sex without consent in past 1 yr [0-1]**	**Engaged in transactional sex in past 1 yr [0-1]**
(Age 18+ at Midline)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Severe Ebola Exposure	-.024	.019	-.011	.033	.048**	.037**	.007	.022
	(.026)	(.040)	(.015)	(.052)	(.012)	(.012)	(.005)	(.014)
	{.426}	{.664}	{.523}	{.569}	{.030}	{.050}	{.221}	{.226}
Mean of outcome if Exposure=0	.162	.630	.194	.508	.496	.309	.064	.051
Adjusted R-squared	.380	.101	.008	.117	.329	.008	.030	.012
Observations	3,027	3,027	3,027	3,027	3,027	3,027	2,796	2,796

Notes: ***, ** and * denote significance at the 1%, 5%, and 10% levels. Control variables include: age, PPI score, household size, illiteracy, village size (nr of dwellings), village average PPI score, average distance to major infrastructure (nearest clinic, secondary school and market), a dummy equal to one if the village is a political stronghold (i.e. has a resident paramount and/or section chief), the number of NGOs active within the village before the Ebola outbreak, share of Christian households, and an indicator variables for whether the village received food and/or school supplies as part of the Ebola relief effort. Fertility is defined as a dummy equal to one if the girl became pregnant after the baseline survey (i.e. gave birth after August 2014). All specifications include dummies for the randomization strata (district) and errors are clustered at the unit of randomization (village). The schooling equations controls also for whether primary and secondary schools reopened no later than the beginning of the academic year. The Progress out of Poverty index (PPI) is calculated through scorecards and its value, ranging from 0 to 100, represents the likelihood of an household being below the poverty line.

Table 6: Ebola and ELA Clubs

OLS estimates, standard errors in parentheses, p-values in braces

Ebola Exposure = Nearest Peripheral Health Unit closed

PANEL A. **Age ≤15 when first Ebola Case**	**Enrolled in school (0-1)**	**Engaged in any IGA [0-1]**	**Wage employment [0-1]**	**Self-employed [0-1]**	**Married [0-1]**	**Fertility [0-1]**	**Had sex without consent in past 1 yr [0-1]**	**Engaged in transactional sex in past 1 yr [0-1]**
(Age≤17 at Midline)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1. ΔY/ΔEbola, given ELA=0 (Control)	-.199***	.246***	.130**	.155*	.088	.067	.059	.057*
	(.069)	(.078)	(.065)	(.086)	(.057)	(.043)	(.035)	(.032)
	{.004}	{.002}	{.046}	{.072}	{.128}	{.121}	{.104}	{.072}
2. ΔY/ΔEbola, given ELA=1 (Treatment)	-.022	.090	.060	.042	.007	-.000	.002	-.034**
	(.036)	(.058)	(.060)	(.047)	(.025)	(.026)	(.021)	(.014)
	{.541}	{.122}	{.320}	{.370}	{.781}	{.995}	{.916}	{.018}
3. Difference (T-C)	.177**	-.155*	-.071	-.113	-.081	-.067	-.054	-.093***
	(.073)	(.094)	(.086)	(.097)	(.059)	(.048)	(.037)	(.035)
	{.017}	{.100}	{.412}	{.245}	{.175}	{.164}	{.143}	{.009}
Mean of outcome if Ebola=0 & ELA = 0	.759	.395	.202	.246	.045	.107	.047	.028
Mean of outcome if Ebola=0 & ELA = 1	.739	.446	.216	.285	.058	.106	.048	.041
Adjusted R-squared	.309	.097	.030	.100	.123	.068	.024	.004
Observations	1,755	1,755	1,755	1,755	1,755	1,755	1,316	1,316

PANEL B. **Age 16+when first Ebola Case**	**Enrolled in school (0-1)**	**Engaged in any IGA [0-1]**	**Wage employment [0-1]**	**Self-employed [0-1]**	**Married [0-1]**	**Fertility [0-1]**	**Had sex without consent in past 1 yr [0-1]**	**Engaged in transactional sex in past 1 yr [0-1]**
(Age 18+ at Midline)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1. ΔY/ΔEbola, given ELA=0 (Control)	-.063*	-.006	-.013	-.008	.088**	.081*	-.052***	-.021
	(.030)	(.045)	(.050)	(.040)	(.038)	(.045)	(.019)	(.017)
	{.034}	{.900}	{.802}	{.839}	{.021}	{.073}	{.006}	{.222}
2. ΔY/ΔEbola, given ELA=1 (Treatment)	-.011	.028	-.010	.047	.035	.023	.027	.037**
	(.019)	(.040)	(.028)	(.042)	(.026)	(.030)	(.025)	(.016)
	{.548}	{.482}	{.715}	{.263}	{.180}	{.446}	{.280}	{.024}
3. Difference (T-C)	.052	.034	.002	.055	-.054	-.058	.079***	.058**
	(.032)	(.053)	(.056)	(.053)	(.045)	(.054)	(.027)	(.023)
	{.128}	{.525}	{.965}	{.300}	{.230}	{.283}	{.004}	{.012}
Mean of outcome if Ebola=0 & ELA = 0	.204	.600	.184	.476	.467	.291	.063	.039
Mean of outcome if Ebola=0 & ELA = 1	.149	.639	.198	.518	.506	.314	.065	.055
Adjusted R-squared	.380	.101	.007	.118	.325	.008	.032	.015
Observations	3,027	3,027	3,027	3,027	3,027	3,027	2,796	2,796

Notes: ***, ** and * denote significance at the 1%, 5%, and 10% levels. Control variables include: age, PPI score, household size, illiteracy, village size (nr of dwellings), village average PPI score, average distance to major infrastructure (nearest clinic, secondary school and market), a dummy equal to one if the village is a political stronghold (i.e. has a resident paramount and/or section chief), the number of NGOs active within the village before the Ebola outbreak, share of Christian households, and an indicator variables for whether the village received food and/or school supplies as part of the Ebola relief effort. Fertility is defined as a dummy equal to one if the girl became pregnant after the baseline survey (i.e. gave birth birth after August 2014). All specifications include dummies for the randomization strata (district) and errors are clustered at the unit of randomization (village). The schooling equations controls also for whether primary and secondary schools reopened no later than the beginning of the academic year. The Progress out of Poverty index (PPI) is calculated through scorecards and its value, ranging from 0 to 100, represents the likelihood of an household being below the poverty line.

Table A1: Attrition

OLS estimates, standard errors in parentheses
P-value of joint significance test in braces

	Tracked between BL and ML				
	(1)	**(2)**	**(3)**	**(4)**	**(5)**
ELA Club (T1+T2+T3)	.007		.009	.009	-.016
	(.016)		(.018)	(.017)	(.095)
Ebola Exposure		.018	.030	.028	.009
		(.024)	(.029)	(.029)	(.103)
ELA x Ebola			-.016	-.014	-.015
			(.034)	(.034)	(.033)
Age				-.003	-.005
				(.002)	(.005)
Enrolled in school [yes=1]				.030**	.088***
				(.015)	(.027)
Income Generating Activity [yes=1]				.032***	.037
				(.010)	(.022)
Married [yes=1]				.047***	.101***
				(.015)	(.030)
Has child(ren) [yes=1]				.025	.037
				(.020)	(.049)
PPI Score				-.0005	-.001
				(.0004)	(.0009)
ELA x Age					.003
					(.006)
ELA x Enrolled in school					-.074**
					(.031)
ELA x IGA					-.007
					(.025)
ELA x Married					-.070**
					(.033)
ELA x Has child(ren)					-.016
					(.052)
ELA x PPI					.001
					(.001)
Ebola x Age					-.003
					(.005)
Ebola x Enrolled in school					-.009
					(.038)
Ebola x IGA					-.0003
					(.027)
Ebola x Married					-.007
					(.032)
Ebola x Has child(ren)					.010
					(.040)
Ebola x PPI					.002*
					(.001)
F-test Joint Significance	-	-	-	4.45	4.79
				{.000}	{.000}
Mean of outcome variable	.829	.829	.829	.829	.829
Adjusted R-squared	.004	.005	.004	.008	.008
Observations	5,743	5,743	5,743	5,743	5,743

Notes: *** denotes significance at 1%, ** at 5%, and * at 10%. All regression are computed on the full baseline sample and include dummies for each strata (district) and errors are clustered at the unit of randomization (village). The F-test is on the joint significance of the following variables: Age, Enrollment, Employment, Marital Status, Fertility, and PPI score (Degrees of freedom = {6, 199}).

Table A2: Balance of Outcomes at Baseline

Means, clustered standard errors from OLS regressions in parentheses
P-value of t-test of equality of means with relevant control group in braces
Measure of Ebola Exposure = Nearest PHU ever closed

		By ELA Assignment				By Ebola Exposure			
		Control	Treatment	Difference	Normalized Difference	Moderate	Severe	Difference	Normalized Difference
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A. Village Level (n=200)	**Num of sampled AG**	16.5 (1.90)	15.8 (.590)	{.714}	-.051	16.2 (.672)	14.3 (1.21)	{.077}	-.016
	Num of Households	463.4 (200.4)	242.7 (27.8)	{.277}	-.148	304.9 (55.7)	254.9 (53.2)	{.069}	-.222
	PPI Score (Mean)	.353 (.007)	.346 (.004)	{.394}	-.094	.349 (.004)	.338 (.009)	{.274}	.278
	PPI Score (CV)	.303 (.008)	.308 (.006)	{.586}	.059	.304 (.005)	.325 (.015)	{.179}	-.119
	Infrastructure Index	.345 (.030)	.355 (.016)	{.772}	.041	.356 (.016)	.328 (.037)	{.486}	-.255
	Average Distance from Key Infrastructures	.041 (.003)	.050 (.003)	{.062}	.189	.048 (.003)	.048 (.004)	{.866}	-.110
	Political Stronghold [yes=1]	.402 (.068)	.339 (.039)	{.423}	-.087	.353 (.037)	.365 (.088)	{.906}	-.058
	Number of Villages	43	129			7	21		
B. Individual Level (n=4,790)	**Enrolled**	.457 (.030)	.440 (.016)	{.621}	-.023	.452 (.015)	.402 (.031)	{.139}	-.085
	Any IGA	.521 (.030)	.496 (.016)	{.471}	-.043	.489 (.015)	.577 (.035)	{.023}	.187
	Wage Employment	.243 (.020)	.231 (.010)	{.582}	-.024	.227 (.010)	.271 (.027)	{.133}	.236
	Self-Employed	.380 (.026)	.361 (.014)	{.514}	-.036	.353 (.013)	.437 (.031)	{.015}	.080
	Married	.287 (.022)	.289 (.013)	{.918}	-.002	.286 (.012)	.305 (.026)	{.499}	.102
	Has Children	.437 (.022)	.429 (.012)	{.727}	-.011	.429 (.011)	.441 (.025)	{.651}	.001
	Unwilling Sex	.107 (.022)	.105 (.011)	{.924}	.001	.110 (.011)	.078 (.020)	{.164}	-.063
	Transactional Sex	.041 (.007)	.033 (.004)	{.378}	-.023	.034 (.003)	.039 (.009)	{.632}	.012
	Age	17.6 (.153)	17.5 (.090)	{.720}	-.010	17.5 (.083)	17.9 (.190)	{.035}	.062
	HH Size	8.44 (.210)	8.32 (.121)	{.629}	-.032	8.36 (.116)	8.30 (.375)	{.896}	.183
	PPI Score	36.3 (.774)	36.3 (.385)	{.925}	-.005	36.3 (.376)	36.4 (.667)	{.860}	.100
	Number of Adolescent Girls	1,198	3,592			4,074	716		

Notes: *** denotes significance at 1%, ** at 5%, and * at 10%. All data, excluding measures of Ebola exposure, is from the baseline survey. Means and standard errors for each outcome/characteristic are derived from an OLS regression of the characteristic of interest on a dummy variables indicating either assignment to treatment or severe Ebola exposure. All regressions include strata (district) dummies. Panel A reports robust standard errors, while in Panel B standard errors are clustered at the community level. Normalized differences are computed following Imbens and Wooldridge [2009]. The Progress out of Poverty index (PPI) is calculated through scorecards and its value, ranging from 0 to 100, represents the likelihood of an household being below the poverty line. The *Infrastructure Index* ranges between 0 and 1 and summarizes villages' endowment of 7 key infrastuctures (water well, town barray, market structure, primary school, secondary school, health center, and commercial bank). Average distance from key infrasatructures is computed using the nearest Market Structure, Secondary School and Health Centre.

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