

# The Relationships between Adverse Life Events, Depression, Economic activities, and Human Capital Investment in Nigeria

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## Abstract

This paper examines the links between adverse events, depression, and decision-making in Nigeria. It investigates how events such as conflicts, shocks, and deaths of family members can affect short-term mental health, as well as longer-term decisions on economic activities and human capital investments. First, the findings show that exposure to conflict has the largest and strongest relationship with depression, associated with a 21-26 percentage point increase in the probability of depressive symptomatology. Second, depression is associated with lower labor force participation, child educational investment, and annual per capita income, holding constant covariates such as exposure to adverse events. People with depressive symptoms are 8 percentage points less likely to work. In addition, parents exhibiting depressive symptoms spend 18 percent less on their children's education. These findings show the links between adverse events and important outcomes such as labor and education through mental health. As such, policymakers must consider both the direct and indirect effects that adverse events – particularly conflicts - and depression can have on welfare.

## 1. Introduction

This paper examines the effects of conflicts, economic shocks, and deaths of family members on depression, and investigates whether depression and adverse events are negatively correlated with productive activities and future investments.

This topic was chosen to support growing literature on mental health. According to the WHO, depression is a common disorder, affecting 264 million people worldwide (2020). Lack of recognition and access to treatment for depression and associated disorders result in an estimated economic loss of a trillion US dollars every year (Chisholm et al. 2016). Beck et al. (2011) report that even small changes in depression are linked to productivity loss.

The stress process model outlines sources (such as life events) and mediators (such as social support) of stress, with an emphasis on predicting outcomes (such as mental health outcomes) (Pearlin et al. 1981). To support this model, we provide quantitative data to support the model on how stressful life events may be associated with an increased probability of depressive disorders.

Exposure to trauma has long-term negative impacts on health (Yehuda et al. 2002). Empirical studies have found economic shocks (Das et al. 2009), paternal loss (Nickerson et al. 2013) and loss of a child (Rosenberg et al. 2012) are associated with an increased likelihood of becoming depressed. Recent studies report political conflict and associated violence have increased the risk

of depression in conflict prone areas such as West Bank and Gaza, Colombia, Sri Lanka, West Papua and Georgia (Canetti, et al. 2010, Richards et al. 2011, Murthy and Lakshminarayana 2006, Senarath et al. 2014, Tay et al. 2015, Saxon et al. 2017).

While these studies call attention to the impacts of political conflict and violence on mental health, little is still known about their implications on behavior and decision-making among people who are affected by conflict, as well as on their estimated economic welfare via depression. In addition, the onset of mental health problems during hardships depends on numerous factors, such as wealth, social support, life circumstances, personality type, coping abilities, or previous psychiatric history (Bonanno et al. 2002; Gries et al. 2010).

In order to help provide a greater clarity between external shocks, depression, and their impacts, we evaluate the association between experiences of conflicts or/and other shocks, and self-reported depressive symptoms in Nigeria, while holding constant factors such as household expenditures. We also estimate the monetary value of the effect of these adverse events on mental health. Finally, we explore how the depression and adverse events are correlated with productive activities and future investments through lower employment and educational investment.

## 2. Methods

The data is from the third wave of the Nigerian General Household Survey Panel (GHS-Panel), conducted in 2015/2016, with over 4,500 nationally-representative households. Data were collected on consumption, behavioral preferences, depressive symptoms, history of conflicts (in the past 5 years), deaths of family members (in the past 2 years), and economic shocks (in the past 2 years), among others. We analyze data for the 4,579 households for which we have a complete dataset of consumption expenditures, depression scores, economic activities, educational investment and other variables.

The Center for Epidemiological Studies-Depression (CES-D 10) scale was used to measure depression. A cutoff score of 10 (out of 30) is used to indicate depressive symptomatology (Andresen et al. 1994, Björngvinsson et al. 2013). Our primary unit of analysis is individuals who responded to this CES-D module; only one individual per household was selected.

The GHS-Panel also collects information on household-level adverse events, which we describe as shocks, deaths, and conflicts. We disaggregate shocks into two categories: idiosyncratic and covariate shocks. Idiosyncratic shocks include the death or disability of an adult working member of the household, death of someone who sends remittances to the household, or illness of an income-earning member of the household. Covariate shocks include poor rains and floods that caused harvest failure, pest invasion that caused harvest failure or storage loss, loss of property due to fire or flood, and more. Deaths, the second household-level adverse event, include the death of anyone in the household (from illness, accident, injury, murder, suicide, or other reasons). Finally, conflicts are defined if any family member of or if an individual was killed (in a non-natural death), suffered physical aggression, was injured or disabled, or suffered sexual violence.

To measure the relationship of adverse events, we first estimate the following regression model:

$$y_{ias} = \alpha + \beta_1 \text{Any adverse event}_{ias} + \beta_5 X_{ias} + \mu_s + \varepsilon_s \quad (1)$$

where  $y_{ia}$  is a dummy variable which equals 1 if individual  $i$  reports depressive symptoms (i.e., if the CES-D score is over 10) and lives in enumeration area (EA)  $a$ ;  $Any\ adverse\ event_{ias}$  takes a value of one if a household member from person  $i$ 's family experienced idiosyncratic shocks, covariate shocks, deaths of family member, or conflicts. We control for various individual characteristics in vector  $X_{ia}$ , including age, education level, marital status, religion, and household consumption expenditures. We also include state  $s$  fixed effects  $\mu_s$  to control for any unobserved factors that are associated with the dependent variables at the state level.

Next, we measure the relationship of each adverse events: conflicts, economic shocks, and deaths of family member with depression, with the following regression model:

$$y_{ias} = \alpha + \beta_1 Covariate_{ias} + \beta_2 Idio_{ias} + \beta_3 Death_{ias} + \beta_4 Conflict_{ias} + \beta_5 X_{ias} + \mu_s + \varepsilon_s \quad (2)$$

where  $Covariate_{ia}$  ( $Idio_{ia}$ ) takes a value of one if person  $i$  reported experiencing a covariate (idiosyncratic) shock, and 0 if otherwise. Similarly,  $Death_{ia}$  takes a value of one if a household member from person  $i$ 's family had passed away in the past two years, while  $Conflict_{ia}$  takes a value of one if a person  $i$  (or someone in their family) experienced a conflict.

For these regression models, we use Ordinary Least Squares regression (OLS) regression for the straightforward interpretation of coefficients. We also utilize a probit and logit model for robustness checks, and find that results are consistent.

To explore the potential consequences of depressive symptoms on their economic and societal costs, including correlations with labor supply and on investments in children, we use the following regression specification:

$$i_{ias} = \alpha + \beta_1 Depression_{ias} + \beta_2 X_{ias} + \varepsilon_s \quad (3)$$

where  $i_{ias}$  is various measurements of individual  $i$ , such as activities in the labor market and  $i$ 's children's schooling and labor activities.  $X_{ias}$  includes a vector of individual's characteristics. We cluster standard errors at the state level  $s$ .

Endogeneity through simultaneity and reverse causality is a concern under a linear regression approach. We frame our findings as a correlation between depression and the considered economic outcomes rather than a causal link.

### 3. Results

Table 1 presents the summary statistics of each variable. Seventy-four percent of respondents are household heads (with 21 percent of all households being female-headed). Thirty-seven percent of respondents are female (with 21 percent of households being female-headed), with the average age of the respondents being slightly over 50 and the average household size being between five and six. About 74 percent of respondents are married, of which 57 percent are monogamously married, and 17 percent are polygamously married. Some 43 percent are Muslim, while the rest are Christian (with two percent having unknown or no religion). On average, 41 percent of the sample lives in an urban area, and seven percent of households have recently moved. They have 6.75 years

of education, which is slightly above primary school completion. On average, respondents worked 32.5 hours in the week prior to the interview. The annual consumption per capita was about 60,000 naira.<sup>2</sup> The average age of the head was 53.

Table 1 also summarizes experience of adverse events between 2014 and 2016 among sampled households. Seventeen percent of households in our sample experienced one or more covariate shocks, 19 percent experienced one or more idiosyncratic shocks, 11 percent experienced one or more deaths of household members, and 4 percent experienced one or more conflict event. Overall, 36 percent of all respondents reported any of these adverse events occurring in the last two years.

The average CES-D depression score was 7.05, and 22 percent of our respondents – and 23 percent of household heads - are defined as having depressive symptoms (i.e. with responses indicating a CES-D score higher than 10).

Table 1: Summary Statistics

| Variable   | Obs  | Mean  | Std. Dev. |
|--|------|-------|-----------|
| Urban  | 4579 | 0.41  | 0.49      |
| Household head   | 4579 | 0.74  | 0.44      |
| Female   | 4579 | 0.37  | 0.48      |
| Age  | 4579 | 50.37 | 15.67     |
| Years of education   | 4579 | 6.79  | 5.66      |
| Married  | 4579 | 0.74  | 0.44      |
| Married (monogamous)   | 4579 | 0.57  | 0.5       |
| Married (polygamous)   | 4579 | 0.17  | 0.38      |
| Muslim   | 4579 | 0.43  | 0.5       |
| Other or unknown religion  | 4579 | 0.02  | 0.13      |
| Log per capita consumption in 2012/2013 (annualized average between post-planting and post-harvest data) (Naira) | 4316 | 11.39 | 0.705     |
| Hours worked past week   | 4579 | 32.53 | 24.74     |
| Household size   | 4579 | 5.52  | 3.19      |
| Head of HH is female   | 4579 | 0.21  | 0.41      |
| Head of HH age   | 4579 | 53.09 | 14.62     |
| Recently moved or missing EA   | 4579 | 0.07  | 0.26      |
| HH experienced covariate shock 2014-2016   | 4579 | 0.17  | 0.38      |
| HH experienced idiosyncratic shock 2014-2016   | 4579 | 0.19  | 0.39      |
| HH experienced death of family member 2014-16  | 4579 | 0.11  | 0.31      |
| HH experienced conflict between 2014-2016  | 4579 | 0.04  | 0.19      |
| HH experienced shock, conflict, or death 2014-2016   | 4579 | 0.36  | 0.48      |
| Depressive symptomatology (CES-D Score > 10)   | 4579 | 0.22  | 0.42      |
| CES-D score (max 30)   | 4579 | 7.05  | 5.19      |

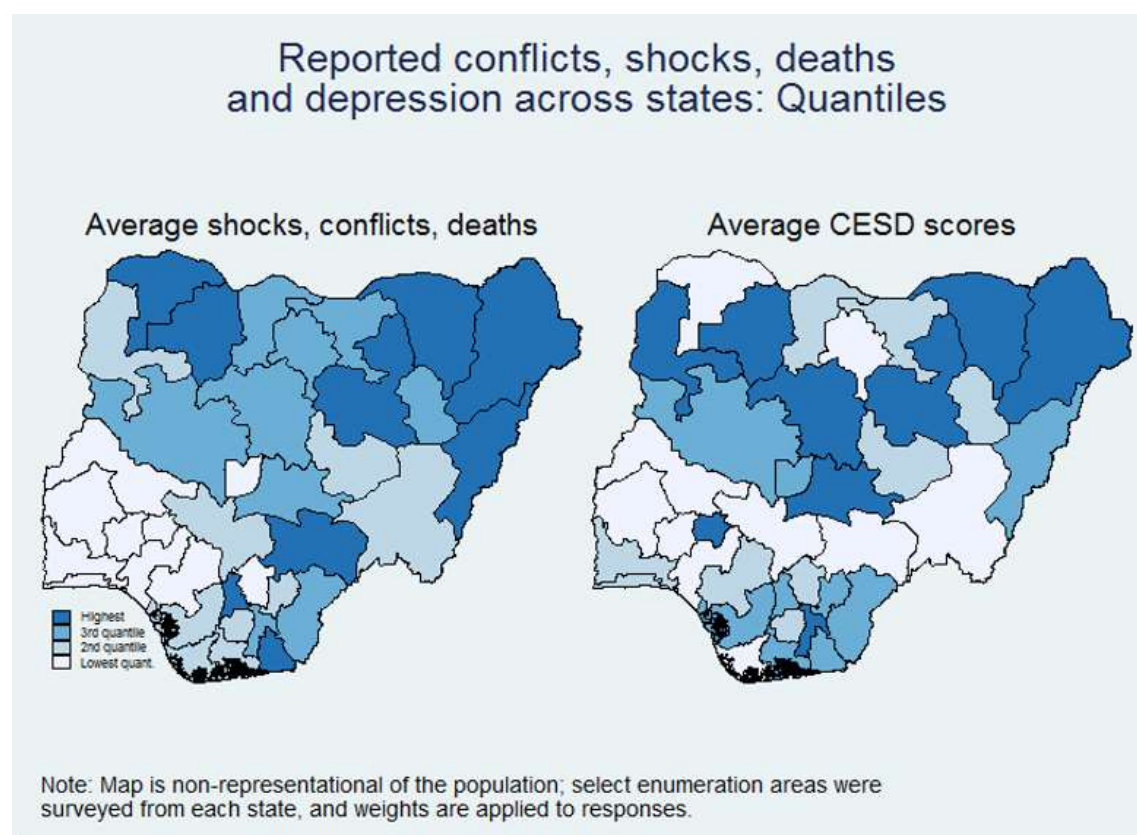
### Effect of various adverse events on depression

First, we look at the correlation between any type of negative event - idiosyncratic shocks, covariate shocks, deaths of family member, and conflicts - with the measure of depression. Figure

<sup>22</sup> This is prior to conversion to a logarithmic form in the analysis.

1 shows this relationship visually: the map on the left-hand-side shows a quartile map of the percent of respondents in each state whose family has been affected by any adverse event. The map on the right shows a quartile map of the average CES-D scores in each state; recall that higher scores are associated with higher probabilities of depressive symptoms. Side by side, these maps demonstrate that states where more people experienced any negative events are likely also states which have significantly higher CES-D scores.

Figure 1: *Percent whose households have been affected by shocks, conflicts, and/or deaths of family member, on left, or have higher CES-D scores, on right. Darker shades of blue indicate a higher percent of survey participants from within the state who have suffered from these negative incidents, or who have higher CES-D scores, respectively.*



We find the same trend in our regression results. Table 2, Panel A shows that experiencing any type of adverse event is strongly associated with a higher probability of showing depressive symptoms. Experiencing an incident is also associated with 7.2 to 11.0 percentage points increased likelihood that one is over the CES-D score cutoff.

We then examine which types of adverse events are more correlated with levels of depression. Figure 2 shows the mean CES-D score by the type of negative incident experienced. We find that, of all the adverse events, the experience of conflict has the strongest and largest relationship with the respondent's measure of depression. The average CES-D score among respondents who experienced conflict significantly exceeds 10, which is the cutoff point for reporting depressive symptoms. The second highest average CES-D score is among people who experienced

idiosyncratic shocks, followed by those with death of family members, then covariate shocks. The depression score among respondents who did not report any incident is the lowest of all the sub-groups.

Figure 2: Mean CES-D score of depressive symptoms by each type of adverse event.

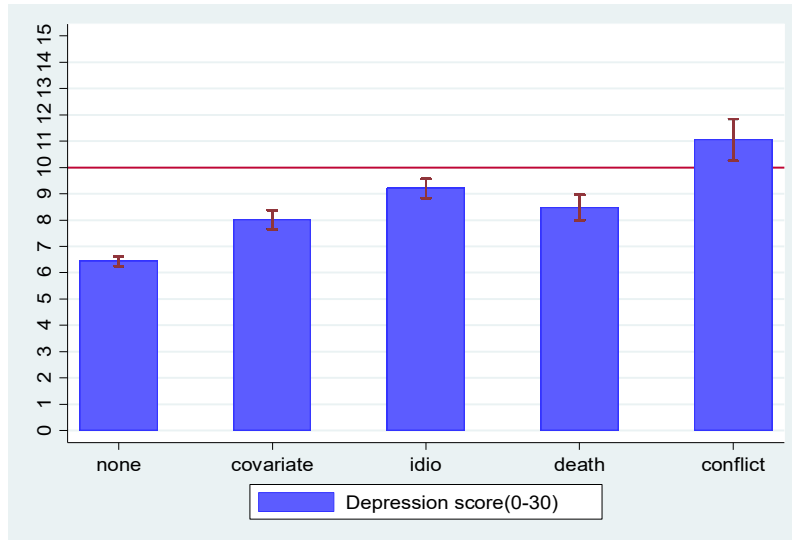


Table 2 Panel B indicates that the experience of conflict in the last two years is associated with an increased likelihood of being over the cutoff by 21 to 26 percentage points. Idiosyncratic shocks have the second largest and significant relationship with depression, as they are associated with an increased likelihood of depressive symptomatology by 8.1 to 13 percentage points. Covariate shocks and deaths of family member are not significantly associated with the likelihood of reporting depressive symptoms.

Table 2: Correlations of adverse events with depression

|   | Panel A<br>Over CES-D cutoff (>10)<br>for depressive symptoms |                     |                     | Panel B<br>Over CES-D cutoff (>10)<br>for depressive symptoms |                     |                     |
|---|---|---------------------|---------------------|---|---------------------|---------------------|
|   | (1)   | (2)                 | (3)                 | (1)   | (2)                 | (3)                 |
| Any adverse event                             | 0.110***<br>(0.019)   | 0.107***<br>(0.018) | 0.072***<br>(0.016) |   |                     |                     |
| Covariate shock 2014-2016                     |   |                     |                     | 0.031<br>(0.022)  | 0.019<br>(0.024)    | 0.006<br>(0.022)    |
| Idiosyncratic shock 2014-2016                 |   |                     |                     | 0.130***<br>(0.021)   | 0.128***<br>(0.022) | 0.081***<br>(0.019) |
| Experienced HH death 2014-16                  |   |                     |                     | 0.023<br>(0.027)  | 0.014<br>(0.029)    | 0.033<br>(0.026)    |
| Conflicts between 2014-2016                   |   |                     |                     | 0.238***<br>(0.052)   | 0.261***<br>(0.052) | 0.208***<br>(0.047) |
| Log per capita consumption in 2013<br>(Naira) |   | -0.019<br>(0.013)   | -0.032*<br>(0.013)  |   | -0.017<br>(0.013)   | -0.031*<br>(0.013)  |
| N   | 4579  | 4304                | 4304                | 4579  | 4304                | 4224                |
| Fixed effects                                 |   |                     | X                   |   |                     | X                   |

Notes: Results are from an OLS regression specification with clustered standard errors (EA). Column (1) does not have any covariates, while Columns (2) and (3) includes covariates; covariates include urban, household head, female, age, age squared, years of education, marital status, Muslim, "other or unknown religion" and "recently moved or missing EA." Column (3) includes state fixed effects. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.



Next, we evaluate how large the correlation of each type of event is with depression in monetary terms by comparing their effects alongside the coefficient of consumption expenditures (Appendix 1). Using our regression specification, we can simulate how much extra consumption a respondent would need (the percentage point change in the depressive measure from consumption over the percentage change from each adverse event) in order to compensate for the effects of each incident on depression. We find that the effects of idiosyncratic shocks and conflicts on depressive symptoms are equivalent to the loss of 3,852 and 7,914 naira, respectively. In other words, the experience of idiosyncratic shocks (conflicts) would need to be compensated with 3,852 (7,914; worth around USD \$52.27) naira to overcome the impact of mental health. This is substantial, as the average per capita annual consumption is 60,000 Naira; the experience of idiosyncratic shocks alone is worth 6.4 percent of this amount.

### Depression and its connection to welfare outcomes

This section explores the potential consequences of depressive symptoms via their economic and societal costs by checking their correlations with labor supply and investments in children.

The regression results in Table 3 show that being over the CES-D cutoff of 10 points is associated with a reduced likelihood that one is engaged in any work by 8 percentage points (column 1), in wage work by 2.5 percentage points (column 2), in agricultural work by 4.9 percentage points (column 3), and in non-farm enterprise by 3.5 percentage points (column 4).

Table 3: Economic activities and educational investment

|  | Engaged in any activities (0/1): |                    |                      |                               | Educational investment       |  |
|--|----------------------------------|--------------------|----------------------|-------------------------------|------------------------------|--|
|  | Any work<br>(1)                  | Wage<br>(2)        | Agriculture<br>(3)   | Non-Farm<br>Enterprise<br>(4) | Child<br>in<br>school<br>(5) | Log Educational<br>Expenditures<br>(those with > 0<br>expenditures)<br>(6) |
| Over CES-D cutoff<br>(>10) for<br>depressive<br>symptoms (0/1) | -0.080***<br>(0.020)             | -0.025*<br>(0.013) | -0.049***<br>(0.018) | -0.035*<br>(0.021)            | -0.017<br>(0.017)            | -0.200**<br>(0.092)  |
| Covariate shock<br>2014-2016                                   | 0.044***<br>(0.016)              | -0.022<br>(0.015)  | 0.029<br>(0.023)     | 0.095***<br>(0.024)           | 0.009<br>(0.016)             | -0.106<br>(0.092)  |
| Idiosyncratic shock<br>2014-2016                               | -0.024<br>(0.020)                | 0.010<br>(0.021)   | -0.024<br>(0.021)    | -0.050**<br>(0.023)           | 0.005<br>(0.021)             | -0.025<br>(0.079)  |
| Experienced HH<br>death 2014-16                                | -0.025<br>(0.021)                | 0.026<br>(0.018)   | -0.035<br>(0.023)    | 0.007<br>(0.027)              | -0.025<br>(0.027)            | 0.017<br>(0.108)   |



|  |                   |                     |                      |                  |                  |                     |
|--|-------------------|---------------------|----------------------|------------------|------------------|---------------------|
| Conflicts between<br>2014-2016           | 0.042<br>(0.027)  | 0.005<br>(0.030)    | -0.034<br>(0.041)    | 0.033<br>(0.046) | 0.013<br>(0.044) | 0.198<br>(0.337)    |
| Log per capita<br>consumption in<br>2013 | -0.003<br>(0.012) | 0.085***<br>(0.012) | -0.094***<br>(0.014) | 0.020<br>(0.013) | 0.012<br>(0.009) | 0.562***<br>(0.082) |
| N  | 4316              | 4316                | 4316                 | 4316             | 4051             | 2925                |
| r2                                       | 0.233             | 0.110               | 0.337                | 0.183            | 0.150            | 0.523               |

Notes: Results are from an OLS regression specification with clustered standard errors (EA). \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Data on respondents' children aged 5 to 18 years were included in column 5 and 6. Covariates include urban, household head, female, age, age squared, years of education, marital status, Muslim, "other or unknown religion" and "recently moved or missing EA".

As expected, the experience of adverse events also has a relationship with labor force participation decisions. The experience of covariate shocks is associated with an increased likelihood that one is engaged in any work by 4.4 percentage points, and in non-farm enterprise work by 9.5 percentage points (columns 1 and 4). Conflict is not associated with changes in labor activities.

Table 3, columns 5 and 6, investigates how parents' mental health is correlated with investments in children's education. Parental depression is significantly negatively correlated with educational expenditure for children (who are in school) by about 18 percent ( $=\exp(-0.200)-1$ )\*100) (column 6), while it does not seem to be related to the probability of their children being in school (column 5).

Overall, we find that one's mental health is likely to have tangible and striking correlations with the welfare of one's children as well as one's own labor supply. This leads to a potential storyline in which adverse events such as shocks and conflicts may lead to lower mental health outcomes, which in turn may be negatively correlated with human capital and labor.

#### 4. Discussion

This study shows that adverse events – and in particular, conflicts – are strongly correlated with measures of depression. The analysis also shows that beyond the direct effect of adverse events, there is an additional association that comes indirectly through the link between mental health and welfare outcomes: depression is associated with lower labor force participation and lower child educational investments. These correlations hold when controlling for other important covariates such as consumption measures. This finding is consistent with literature (Canetti, et al. 2010, Richards et al. 2011, Senarath et al. 2014, Tay et al. 2015, Saxon et al. 2017).

This paper focuses on Nigeria, as the country has been severely impacted by both conflict and economic shocks. In recent years, Nigeria has suffered from security crises caused by conflicts between ethnic groups, farmers, and herdsman. Some of the more egregious incidents have been committed by Boko Haram, which is responsible for terrorist attacks, including the abduction of more than 200 schoolgirls in 2014, and an estimated 20,000 deaths, and at least two million displacements (BBC News, 2018). Additionally, economic and weather-related shocks – many of which are accounted by our data - are also common throughout Nigeria. This paper found that these hardships are correlated with deteriorating mental health and long-term economic consequences.

This study has several limitations. First, we could not control for other potential factors that might affect mental health, such as genetic disposition, substance abuse, and other background medical conditions. Second, it cannot definitively prove a causal link between conflict, depression, and downstream outcomes. Both theory (including existing literature) and the robustness of the empirical analysis suggest that, even if there is partial endogeneity between these factors, the highlighted mechanism is a first-order determinant of outcomes. A natural next step is to rigorously evaluate scalable psychosocial and mental health interventions specifically in the context of fragile and conflict-affected environments.

## 5. Conclusion

This study shows that conflicts, along with other adverse events, are correlated with measures of mental health; a household with an experience of conflict (idiosyncratic shock) in the past two years is also more likely to display depressive symptomatology by 21 to 26 (8.1 to 13) percentage points. Additionally, depression is associated with lower labor force participation (by 8 percentage points) and lower child educational investments (by 18 percent, for households with any spending).

While these results are correlative in nature, they indicate a storyline in which adverse events could impact welfare both directly as well as through mental health. In light of these results, policymakers need to take into account both the direct and indirect effects that conflicts and depression can have on welfare. Our results are suggestive of costlier individual and societal impacts of adverse events than previously estimated, and that allocation of resources toward mental health treatment in conflict-heavy settings could be beneficial.

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## Appendix

### Appendix 1: Monetary Value of Shock Effect

|                                 | (1)<br>Over CES-D cutoff (>10)<br>for depressive symptoms (0/1) |
|---------------------------------|---|
| Covariate Shock/Expenditure     | 710.749<br>(1219.516)   |
| Idiosyncratic Shock/Expenditure | 3851.652***<br>(959.693)  |
| Death Shock/Expenditure         | 719.812<br>(1399.894)   |
| Conflict Shock/Expenditure      | 7914.276***<br>(1617.896)                                       |
| N                               | 4224  |