EARLY-LIFE SHOCKS
AND IMPLICATIONS FOR HUMAN CAPITAL
A review of the evidence from low- and middle-income countries

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ABSTRACT
Exposure to shocks such as conflict, adverse weather events, or sudden loss of income has resulted in significant human capital losses, particularly in low- and middle-income countries. Beyond increased exposure to shocks in low-income households and low- and middle-income countries, these households are also particularly vulnerable to the negative effects on human capital due to reduced abilities to mitigate the associated impact on consumption. The impact of shocks on human capital is especially damaging when individuals are exposed to adverse events in early childhood – the first five years of life. Early childhood is a critical period for cognitive and physical development, and disruptions experienced during this period of the life cycle could have long lasting effects on human capital. This document first summarizes the existing literature investigating the association between exposure to shocks in early childhood and later life human capital outcomes in low- and middle-income countries. The document then details evidence-based interventions which could be used to mitigate the impact of exposure to shocks in early childhood on human capital accumulation. Additional attention is directed towards Sahel countries given the region’s increasing level of exposure and vulnerability to climate and other shocks.
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I. INTRODUCTION

Almost 83 million people have been forcibly displaced due to conflict, violence, or disasters. Nearly 12 percent of households in low-and middle-income countries (LMICs) spend more than 10 percent of their household income on health—compared to seven percent in high-income countries. Between 2010 and 2019, 3,165 natural and/or technological disasters were reported globally—almost 351 natural and/or technological disasters a year. Unanticipated events which result in significant disruptions at the household and/or national level, such as the events detailed above, are termed shocks. Shocks are further separated into idiosyncratic or covariate shocks according to the level of impact. Idiosyncratic shocks occur at the individual or household level and include events such as the illness of a household head or loss of income. Covariate shocks occur at a regional level and broadly include climate or conflict-related events. Idiosyncratic and covariate shocks can significantly change household income, consumption, and/or asset portfolio. Exposure to shocks has resulted in significant economic costs largely through the loss of human capital. Low-income households and LMICs are particularly vulnerable to shocks, mainly due to their reduced ability to withstand exposure to shocks in ways that minimize the impact on human capital formation.

Human capital, alongside appropriate infrastructure and resources is an essential pillar of economic growth. As defined by Buchsbaum (2022), human capital consists of "the knowledge, skills, and health that people accumulate over their lives." Within LMICs, accumulation and protecting human capital is necessary to both encourage and sustain economic growth. Given the significant number of economically vulnerable individuals in LMICs and the impact of shocks on both wealth and consumption, there is a need to understand how shocks impact human capital formation and how this association may vary within different regions. Furthermore, there is a need to determine how to best mitigate or eliminate these effects and protect human capital.

This document provides an overview of available literature examining the association between early-life shocks and human capital in LMICs and successful interventions that could be used to mitigate the impact of shocks on human capital. The document first details the theoretical framework for this research. It then examines literature detailing the association between shocks and human capital—both globally and in the Sahel. It concludes with an examination of successful interventions in LMICs. Throughout this document, the Sahel refers to six countries—Burkina Faso, Mali, Chad, Niger, Senegal, and Mauritania.

The Sahel was identified as a region of interest due to its high level of exposure and vulnerability to shocks and the associated impacts on human capital. First, the Sahel continues to experience frequent climate and conflict-based shocks. UN projections estimate that the increase in temperature within the Sahel is nearly 1.5 times higher than the projected average global temperature increase. The region has consequently observed numerous droughts over the years. Second, due to high levels of economic inequality within the region, a large proportion of the population is vulnerable to the negative impacts of shocks. In most Sahel countries, over two in every five people live under the national poverty

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line—between 41 percent in Niger and 44 percent in Mali. Persistent poor human capital outcomes further compound this. Children born in the Sahel are between one-third and two-fifths as productive in adulthood as they would be if human capital had been optimally developed.

1.1. Theoretical Conceptual Framework for Investing in Childhood Human Capital

Extensive research has detailed the importance of the first five years of life, particularly in laying the basis for lifelong outcomes. UNICEF has further developed a conceptual framework organizing the early childhood determinants of short- and long-term human capital outcomes. Determinants are organized into three broad categories—macro causes, underlying causes, and immediate causes. Macro causes directly impact underlying causes, and underlying causes directly impact immediate causes. The immediate causes ultimately impact both short- and long-term human capital outcomes. The black arrows in Figure 1 illustrate the perpetual cycle of adverse long-term outcomes negatively affecting the macro and underlying causes.

Figure 1: UNICEF Conceptual Framework for Investing in Childhood Human Capital

According to the above UNICEF conceptual framework classifications, shocks are macro-level determinants of short- and long-term human capital formation. The impact of shocks on parental investments can have significant implications on human capital formation in both the short- and long-term. Investments during this period play an outsized role in childhood development due to rapid brain and cognitive development and its malleability during the early years. Following the framework laid

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out in Cunha and Heckman (2008) and Cunha, Heckman, and Schennach (2010), a child’s human capital production function can be described as follows:

$$\theta_{t+1} = f_{t+1}(\theta_t, \eta_{t+1}, \theta_t, \eta_{t+1})$$

where $$\theta_t$$ and $$\theta_{t+1}$$ are the vectors of the child’s human capital at time $$t$$ and $$t+1$$, respectively; $$\eta_{t+1}$$ are parental investments that occur in between the realizations of $$\theta_t$$ and $$\theta_{t+1}$$; $$P_t$$ corresponds to parental human capital at time $$t$$; $$X_t$$ are household characteristics at time $$t$$; and $$\eta_{t+1}$$ are random shocks to the child’s development. Pathways through which childhood human capital outcomes can then be affected might be through changes in parental investment, unexpected shocks, and/or changes in the production function $$f_{t+1} (\ldots)$$.

The economic literature has tried to estimate this production function to improve understanding the drivers of developmental inequality. A recent paper by Attanasio et al. (2020) does so in the context of a parenting intervention in Colombia. The authors estimate the production function for child cognitive and socio-emotional skills, with the main inputs being baseline child skills, maternal skills (the authors were only able to capture the skills of the main child caregiver and explicitly note these limitations), and material and quality time investments, treated as endogenous. Attanasio et al. find important effects on estimating the investment function: Children with better initial cognitive skills receive more investments, and caregivers (mothers) with higher skill levels invest more in their children, given the child’s initial skills. Furthermore, a child’s current stock of skills fosters the development of future skills, and parental investments—particularly the authors’ measure of material investments—are an important determinant of the child’s future skills.

1.2. Measures of Human Capital

The evidence detailed in this document includes measures of human capital such as child nutritional outcomes, health outcomes, and educational outcomes. Although the definition of human capital included in previous sections encompasses levels of skill, health, and education, nutritional outcomes are also commonly used within the literature to assess levels of human capital. Previous evidence has established that childhood nutritional status significantly impacts cognitive and physical development, educational outcomes, and future economic outcomes. Additionally, when assessing the potential impact of interventions on human capital, we have included measures of household expenditure on the above aspects of human capital—nutrition, education, and health. Measures of household investments are included as an indirect measure of the impact on human capital.

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17 Though the authors also find mean reversion, illustrating the continued importance of investing in children’s skills and parental investments.
18 In terms of underlying mechanisms, Attanasio et al. find that the intervention they were evaluating significantly increased parental investments among treated families, which the authors attribute as the underlying driver of the observed impact on children’s cognitive and socio-emotional skills.
Box 1: Indicators of Human Capital

Childhood nutritional status is routinely assessed with anthropometric measures—measures of the body. Routine anthropometric indicators include stunting (low height-for-age), wasting (low weight-for-height), height-for-age z-score, and weight-for-height z-score. Stunting is largely considered an indicator of chronic undernutrition, whereas wasting indicates acute undernutrition. A z-score is a measure of the number of standard deviations away a child’s anthropometric measurements are from the WHO reference value for optimal child growth. A child with a z-score below -2 is considered moderately undernourished and, a child with a z-score below -3 is considered severely undernourished.

Nutritional status in childhood and adulthood is assessed indirectly through feeding practices and levels of household food security. Infant and young child feeding practices are assessed according to WHO/UNICEF recommendations. WHO/UNICEF recommends that children under six months of age be exclusively breastfed. Once complementary feedings begin, a child should be fed an adequate number of high-quality meals. Diet quality is largely assessed according to dietary diversity—the number of different food groups from which one eats daily.

Educational status, in childhood or adulthood, is assessed through measures of school attendance and/or performance. Indicators measured during childhood include current school enrollment, school attendance, and test scores. Indicators assessing educational status in adulthood or late childhood include grades completed or years of schooling.

Health status is assessed directly through measures of morbidity or mortality and indirectly through healthcare service usage. In childhood, morbidity is assessed through the incidence of illnesses such as diarrheal disease or respiratory infections. Additional assessments of health status include measures of cognitive development.

Household investments are largely assessed according to self-reported expenditures collected through household questionnaires. In particular, evidence examining the potential impact of interventions on human capital focuses on food, education, and/or health expenditure.

II. THE IMPACT OF SHOCKS ON HUMAN CAPITAL

2.1. The Impact of Early Exposure to Shocks on Human Capital

2.1.1. Climate Shocks and Health, Educational, and Economic Outcomes

Extreme covariate shocks, such as famines, have been shown to negatively affect human capital in the long run, even if experienced in early childhood or in utero. The most prominent example, the Dutch Hunger Winter of 1944–1945, was caused by a food transport embargo in certain provinces imposed by German occupiers. Based on birth records, adults in utero at the time of the famine were more likely to suffer from a variety of diseases (heart and central nervous system disorders, as well as
antisocial behavior) and a faster cognitive aging process. Similar settings have led to similar conclusions. A 19th-century crop failure in wine-growing regions of France, which negatively impacted income levels, led to affected cohorts being 0.5–0.9 centimeters shorter in adulthood than non-affected adjacent cohorts—a significant effect relative to the two-centimeter height increase over the 19th century. Drought experiences in utero in rural India have long-lasting detrimental effects on the nutritional status of children. Similar long-term adverse outcomes of in utero exposure to famines have also been found in the African context, studying the 1983 Ghanaian famine’s effect on later-life cognitive outcomes. Consistent associations between prenatal famine exposure and adult body size, diabetes, and schizophrenia across different settings are standard findings in the literature.

**Even reductions in nutritional intake much smaller than those caused by famine have been shown to have long-lasting impacts in adulthood.** Several authors show that in utero exposure to fasting during Ramadan has adverse effects on adult educational attainment, test scores, anthropometrics, mental disability, and wealth measures in Uganda, Iraq, Indonesia, England, and Denmark. A recent working paper using a global sample illustrates that early life nutritional deprivation, as a result of reduced fish stock due to climate-change-induced increases in water acidity, selectively affects the weakest children. In coastal areas, a 0.01 unit increase in acidity causes two additional neonatal deaths per 1,000 live births.

**Surviving a famine has detrimental effects beyond health; it also affects labor market outcomes.** Using the 1959–1961 famine in China, authors show that those who experienced the famine in early childhood were the most affected and estimate that individuals in the 1959 birth cohort would have not only grown an average of 3.03 centimeter taller in adulthood in the absence of the famine, they would have also worked longer hours and earned higher incomes. This illustrates the long-term relationship of famine-related health outcomes with labor market outcomes.

**Similarly, positive, and negative weather conditions around the time of birth, which are becoming more frequent due to climate change, can have long-lasting effects on adult outcomes.** Positive weather conditions around the birth of the 1953–74 birth cohorts in Indonesia decreased the likelihood of female self-reported poverty and poor health, increased female height, and increased completed years of schooling, alongside improved economic status. High temperatures in early childhood in Mexico are associated with lower adult height, particularly in poorer districts, which is attributed to less effective coping strategies in poorer districts, such as the inability to protect from the heat through air conditioning or crop losses and associated nutritional deficits. Recent evidence on mechanisms for

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these long-term effects exist from the impact of experiencing a cyclone, flood, or drought in Mozambique on consumption and human capital accumulation.33 Children aged 5–17 showed a reduction in school participation and a more than fourfold increase in morbidity in flooded districts.

Furthermore, exposure to climate shocks in adolescence is associated with an increased likelihood of child marriages as a mechanism for households to manage a decrease in household income. In particular, households may use child marriages to decrease household size and expenditure on food and education. In Indonesia, an increase in the frequency/intensity of earthquakes, tsunamis, floods, storms, landslides, eruptions, droughts, fires, flash floods, and tides is associated with an increase in the likelihood of child marriage.34 In Sub-Saharan Africa, exposure to droughts is associated with an increased risk of child marriage.35 Child marriages are associated with poor human capital outcomes in both the short- and long-term.36 Girls who marry early have an increased risk of experiencing domestic violence, school dropouts, and oppression.37

2.1.2. Health/Conflict-Related Shocks and Health, Educational, and Economic Outcomes

In utero maternal exposure to an extreme event such as war or pandemic can be felt decades later among affected populations, which provides a stark warning about the ongoing COVID-19 pandemic. Examples include the Korean War (1950–1953), which led to lower educational attainment, labor market performance, and other socio-economic outcomes among the 1951 birth cohort (the worst period of the war, according to the authors) in 1990 and 2000.38 Similar traumatic events in utero, such as the 1918 global influenza pandemic or the Chernobyl disaster, have long-lasting impacts on human capital in adulthood. Maternal exposure to health shocks during pregnancy affects maternal health and, consequently, human capital. Males affected by influenza in utero in the US were 15 percent less likely to graduate from college and had five to nine percent lower wages. Prenatal maternal exposure to the Chernobyl disaster among Swedes led to lower levels of cognition in adulthood, even though the levels of radiation were not considered harmful and no other effects on health outcomes could be detected.

Parental exposure to war or intimate partner violence is further associated with harsh parenting. In Southern Rwanda, children with one or more parents exposed to the genocide or its associated traumas were more likely to experience child maltreatment.41 Similar results were obtained in Afghanistan and Sri Lanka.41 Child maltreatment increases the risk of mental illness, substance abuse, heart disease, and cancer.42

The COVID-19 pandemic, including restrictions imposed on mobility to curb the spread of the disease, is likely to have long-lasting impacts on human capital outcomes. Evidence suggests that COVID-19 and related mobility restrictions have had strong effects, for example, on consumption due to a reduction in incomes, increasing intimate partner violence due to increased stress and restricted mobility, and children’s human capital directly due to school closures and increased child marriages. In Guatemala, the introduction of COVID-19 lockdowns resulted in an increase in cases of domestic violence. In Kenya, COVID-19 restrictions and school closures were associated with a twofold increase in the likelihood of teen pregnancies and a threefold increase in the probability of adolescents dropping out of school. In Indonesia, a qualitative study suggests that an increase in child marriages following the introduction of COVID-19 restrictions may be associated with a desire among adolescents to escape household chores, the difficulties of online schooling, a lack of emotional/mental support from parents, and/or as a way for households to manage financial difficulties.

The COVID-19 pandemic has also sparked Africa’s first recession in 25 years. GDP per capita is expected to contract by 6.5 percent in Sub-Saharan Africa, potentially pushing up to 43 million people into extreme poverty in Africa. Income losses have been more significant for low-income and informal workers in jobs that cannot be done from home, such as hospitality, retail, and distribution. This means that a new set of poor households is emerging, which differs from the current poverty profile. For instance, pre-COVID, only two in 10 poor Africans lived in urban areas. Post-COVID-19, the ratio is three in 10, a 10-percentage-point increase in the share of the urban poor.

2.1.3. Maternal Exposure to Concurrent Shocks and Health, Educational, and Economic Outcomes

Maternal stress has been linked to a higher likelihood of preterm birth, developmental delays, and behavioral abnormalities. Using potential exposure to hurricanes for identification, those exposed to higher maternal stress levels in utero in reaction to the threat of a hurricane were more likely to experience complications during delivery and labor and to require a ventilator as a child. Maternal stress during pregnancy can have measurable effects on the grandchildren of those who experienced the stressor. The increased burden of child rearing placed on women during the ongoing COVID-19 pandemic as a result of school closures and increased uncertainty around income generation will likely have increased maternal stress, with implications for those currently in utero.

Climate shocks, which are known to give rise to multiple forms of violence against women—emotional, mental, and physical—are also significant stressors for women. Within populations exposed to the 2010 earthquake in Haiti, there was an increased risk of violence against women in the one to two years following the climate shock. Similar results were obtained in India in response to a tsunami in 2004.

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2.2. The Impact of Shocks on Human Capital in the Sahel

Countries in the Sahel are particularly vulnerable to shocks and the associated impact on human capital. However, to date, only a small body of literature estimates the region-specific human capital impacts of shocks. Most evidence specific to this region has focused on examining the impact of climate shocks on human capital. A smaller body of evidence estimates the human capital impacts of conflict and health-related shocks. The most recent evidence details the short-term impacts of COVID-19. In addition to the above, a large proportion of available evidence is specific to Burkina Faso, followed by studies examining data from Mali and Senegal. Studies have examined the short and long-term impacts of climate, conflict, and health shocks on direct outcomes such as child nutritional status, educational outcomes, and household food security and indirect outcomes such as mental health and use of healthcare services.

2.2.1 Climate Shocks and Child Nutrition

In the Sahel, exposure to climate shocks is associated with linear and ponderal growth faltering and, in some instances, an increased likelihood of childhood stunting. In Senegal, it has been estimated that nearly 25 percent of all variation in weight for age is attributable to childhood exposure to drought, particularly between the ages of 1 to 5 years. The impact of exposure to drought on child growth further increases when a child is concurrently exposed to other shocks. In rural Burkina Faso, positive rainfall shocks are associated with an increase in future height-for-age z-scores (HAZ). Negative rainfall shocks are associated with a decrease in future HAZ. Notably, the impact of negative shocks on HAZ (0.34 decrease) is larger than the impact of positive shocks on HAZ (0.27 increase). Additionally, whereas exposure to rainfall shock while a child is in utero or under 12 months is significantly associated with HAZ, exposure to rainfall shock in older children has no significant association with HAZ. This highlights the importance of mitigating exposure to shocks in early childhood and addressing the impact of shocks on maternal nutrition.

Evidence suggests two potential pathways through which climate shocks may impact child nutritional outcomes in the Sahel - food insecurity and poor child health. Following the 2014 drought in Senegal, 71 percent of rural households reported significant increases in food prices, a 31-percentage point increase from the preceding year. These findings are similar to those of a more rigorous study of numerous countries in the Sahel. Yobom (2020) examined the impact of floods/droughts on the four dimensions of food security—access, availability, utilization, and stability. Earlier exposure to floods is associated with negative impacts on present measures of food utilization and food stability. Additionally, the negative association with food stability is more severe than that with food utilization.

2.2.2. Climate Shocks and Child Morbidity/Mortality

Beyond the impact of climate shocks on child nutritional outcomes and its determinants, evidence suggests that in the Sahel climate shocks are associated with both child mortality and morbidity. In Burkina Faso, Mali, and Senegal, warmer temperatures and climate classifications are associated with increased odds of diarrheal disease. Children living in the driest climate classifications have an 80 percent higher likelihood of suffering from diarrheal disease than children in a humid climate class. Dunn (2016) also suggests a non-linear association between levels of rainfall and the incidence of diarrheal disease—children exposed to moderate levels of rainfall had the lowest likelihood of incidence

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of diarrheal disease. Furthermore, birth month exposure to dust/sandstorms (harmattan) is associated with an increased likelihood of neonatal mortality in Burkina Faso. Karimi et al. (2020) suggest that the impacts of postnatal exposure are more severe than prenatal exposure and that increasing the level of exposure to particulate matter is associated with increased likelihood of neonatal mortality. Garcia-Pando et al. (2014) similarly found that wind and dust data were good predictors of annual variability in the incidence of meningitis in Niger.

2.2.3. Climate Shocks and Educational Outcomes

Several studies have also highlighted the negative impact of climate shocks on educational outcomes in the Sahel. Early childhood exposure to locust invasions in Mali is negatively associated with long-term school enrollment in boys and girls and grade attainment in girls. Within this cohort, the negative association was larger in boys than girls. The negative impact of exposure to locust invasions on school enrollment was most severe in children who were in utero and up to two years old during the locust invasion. Similarly, a 2019 study found that exposure to famine is associated with a decrease in male educational attainment in Mali and that men are consequently more likely to spend less time in school. However, exposure to famine was associated with an increase in female educational attainment, literacy rate, and school enrollment. Although these findings were statistically significant, the authors suggest that they may have been further magnified by a relatively small population in rural regions and/or low levels of educational attainment in females prior to the famine. Potential pathways for impact include changes in demand for labor or available income—especially within households whose primary income is agriculture based.

2.2.4. Conflict-Related Shocks and Mental Health, Use of Healthcare Services, and Mortality

Beyond climate shocks, a relatively small body of literature has examined the impact of increasing instability in the Sahel, and the associated conflict-related shocks, on indirect determinants of human capital. A 2013 study of Malian refugees based in Burkina Faso found that 85 percent of study participants who were recently exposed to a conflict-related shock had post-traumatic stress disorder (PTSD). The prevalence of PTSD was highest in women and the older population. Additionally, 75 percent of the study population was either depressed or suffered from a mental illness. In particular, the death of a family member was one of two traumas most likely to be associated with PTSD in this population. In Burkina Faso, the occurrence of terrorist attacks was associated with deteriorated use of maternal healthcare services in the short term. The impact of exposure to terrorist attacks on the use of maternal healthcare services was further intensified if an individual was exposed to multiple terrorist attacks. Furthermore, long-term, repeated exposure to terrorist attacks is associated with a decrease in the number of c-sections, assisted deliveries, and antenatal care visits within a region. In Chad, in comparison to non-displaced populations, internally displaced populations noted a higher prevalence of child mortality (1.8 percent versus 0.3 percent) and under-five mortality (four percent versus 0.5 percent and 0.7 percent).

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2.2.5. Health Shocks, Food Security, and Poverty

More recent research has started to investigate the short-term impacts of COVID-19, a health shock, on food security and poverty. In Burkina Faso, 77 percent of women in urban regions and 73 percent in rural regions reported partial or complete income loss as a result of the COVID-19 pandemic and associated restrictions. Additionally, 11 and 19 percent of women, in urban and rural regions respectively, reported experiencing food insecurity as a result of the COVID-19 pandemic. Reported food insecurity reduced with increasing pre-pandemic wealth. Similar findings were obtained in Burkina Faso. Ouoba et al. (2022) found that 53 percent of the study population reduced both meal frequency and meal size in response to the COVID-19 pandemic and associated restrictions.

2.2.6. Overview of Available Literature

Although the above research is rigorous and provides further insight into the impact of shocks on human capital in the Sahel, it is important to note a few opportunities for additional research. First, most studies examine the immediate or short-term impacts of shocks on human capital. There is a need to further examine the long-term human capital implications of experiencing shocks in early life. Second, most of the above studies examined the impact of climate shocks on human capital. While important, there is also a need to better understand the impacts of other shocks that are experienced within this region. Third, most of the studies examined the association of interest in Burkina Faso and Mali. Further research is needed to examine whether the above findings also apply to countries such as Mauritania, where research is limited. Despite these limitations, the above research is both robust and informative. Furthermore, the available research provides a sufficient evidence base from which policy options can be identified.

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III. INTERVENTIONS TO LIMIT THE IMPACTS OF SHOCKS ON HUMAN CAPITAL

Given the magnitude and severity of the impact of early-life shocks on human capital, varying social protection interventions have been identified to mitigate the short- and long-term effects. Specifically, interventions aim to minimize or eliminate the impact of shocks on household income, asset portfolio, and investments in food, education, and/or health. As detailed in earlier sections, these factors are determinants of the level of human capital in both childhood and adulthood. Table 1 provides an overview of both the purpose and design of the interventions examined in this section. The intervention titles formatted in bold refer to a broader category of interventions in detail.

Table 1: Successful Interventions Detailed in this Section

<table>
<thead>
<tr>
<th>Interventions</th>
<th>Purpose</th>
<th>Design</th>
<th>Case Study</th>
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<tr>
<td>Mental Health Interventions</td>
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</tbody>
</table>

*Note: Purpose details the investment(s) which interventions sought to either maintain or increase.*

3.1. Cash Transfer Interventions

Cash transfer interventions are the most widely implemented and researched social protection interventions in LMICs. Within Latin America, cash transfer programs are mostly conditional on health or educational requirements being met. In the African context, cash transfer programs are largely unconditional. Studies have examined the impact of cash transfer programs on general and mental health outcomes, nutritional outcomes, sexual and reproductive health, healthcare utilization, and educational outcomes.

Systematic reviews examining the impact of cash transfer programs on child nutritional outcomes largely suggest a small positive effect. Manley et al. (2022) summarized and further analyzed existing literature detailing the impact of cash transfer programs on child nutritional outcomes in LMICs.67

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Manley et al. (2022) identified 73 cash transfer programs—almost half of which were conditional on health/academic requirements being met. Programs were based in Sub-Saharan Africa (42 percent), Latin America (32 percent), and Asia (23 percent). On average, participants received US$90—a 27 percent increase in household income. A meta-analysis of data from the included programs suggests a statistically significant impact of cash transfer programs on HAZ (0.024 increase), the prevalence of stunting (1.35 decrease), and the prevalence of wasting (1.31 decrease). Three proposed pathways of impact include an increase in the consumption of animal-source food, increased dietary diversity, and a decrease in the incidence of diarrhea.

Although available evidence suggests a small positive impact of cash transfer programs on child nutritional outcomes in LMICs, it is important to note that program design, implementation, and the target population are important determinants of program effectiveness. For example, Manley et al. (2020) observed significant heterogeneity in the impact of cash transfers on HAZ and WAZ. The impact of cash transfers on HAZ was modified by the mother's age, and the impact of cash transfers on WAZ was modified by program conditionality. Larger improvements to HAZ were observed in older mothers and, in comparison to unconditional cash transfer programs, larger improvements to WAZ were observed as a result of conditional cash transfer programs. Additionally, the impact of cash transfers on child growth and the incidence of undernutrition varied according to whether or not the program targeted a certain child age group. Programs that targeted children under 24 months only significantly impacted the prevalence of stunting. Programs that did not target children under 24 months significantly impacted linear and ponderal growth, the prevalence of wasting, and the prevalence of stunting. However, the impact of cash transfer programs on the prevalence of stunting was larger when programs targeted children under 24 months.

Meta-analysis of available evidence suggests that the type of behavioral change communication (BCC) component implemented alongside a cash transfer program may impact program effects on child growth and undernutrition. This evidence suggests that WASH/hygiene BCC may have the largest impact on both child growth and undernutrition. BCC focused on infant and young child feeding resulted in improvements to HAZ (0.06 increase). BCC focused on household nutrition was associated with improvements in HAZ (0.07 increase) and the prevalence of stunting (2.11 decrease). Education about WASH and hygiene was also associated with improvements in both HAZ (0.06 increase) and the prevalence of stunting (3.26 decrease). BCC about healthcare was not associated with any statistically significant improvements to HAZ or the prevalence of stunting and wasting.

Research also suggests that the impact of cash transfer programs on nutritional outcomes varies within subpopulations. When disaggregated by geographical region, Manley et al. (2022) found that cash transfer programs in Sub-Saharan Africa only significantly impacted the prevalence of wasting. Whereas a significant impact on the prevalence of stunting was observed in Latin America, and a significant impact on the prevalence of wasting was observed in South Asia. This is similar to the findings reported by Onwuchekwa et al. Their systematic review assessed the impact of conditional cash transfer (CCT) programs on child health in Sub-Saharan African countries. Only one of the three studies reporting the impact of CCTs on child nutrition identified statistically significant improvements in child anthropometric measures.

Cash transfer programs also appear to positively impact educational outcomes. A meta-analysis of 35 cash transfer programs based in 25 LMICs suggests that cash transfer programs are associated with increased odds of school enrollment (Odds Ratio: 1.36) and school attendance (Odds Ratio: 1.59). The

impact of cash transfers on school enrollment and attendance further increase when the program is conditional and when program conditions are both monitored and reinforced. When disaggregated according to sex, the impact of cash transfers on school enrolment is larger in girls than boys (Odds Ratio: 1.54 versus 1.47) and secondary school enrollment versus primary school (Odds Ratio: 1.31 versus 1.47). These findings are similar to those of Garcia et al. (2017).71 Despite the positive impact of cash transfers on school attendance and enrollment, it is important to note that Baird et al. (2014) found no significant impact on test scores. This highlights the need to, alongside increasing access to schools, ensure that the quality of schools and schooling is adequate.

Box 2: Concern Worldwide Conditional Cash Transfer Program (Niger)

In 2012, Concern Worldwide—an international humanitarian organization, introduced a conditional cash transfer (CCT) program in rural Niger. The CCT program was introduced in response to government predictions of an impending drought and famine. Concern Worldwide purposively identified 81 villages which were particularly vulnerable to food insecurity. Within these villages, households were identified from the two lowest wealth quintiles.

Households received approximately US$250 monthly for a three-month period. Where possible, cash transfers were distributed to female beneficiaries. Every month, prior to receiving the cash transfer, mothers were required to attend nutrition education courses where they were taught about infant and young child feeding practices, food safety, and management/treatment of diarrhea in children. Children between 6 and 24 months whose households were enrolled in this program observed a 1.35-kilogram increase in average weight, 1.83 increase in weight-for-height z-scores, and a 7-millimeter increase in mid-upper arm circumference.

Earlier research conducted in collaboration with The Abdul Latif Jameel Poverty Action Lab examined the relative effectiveness of cash transfer programs in Niger according to the mode of cash distribution—in person versus electronically. Evidence suggests that the electronic distribution of cash through mobile money may be the most cost-effective option, with greater improvements in food purchases and consumption observed. Research posits that this may be due to a few factors—women having more autonomy to decide how the money will be used due to the ability to conceal cash transfers, lower personal costs in obtaining the money—particularly travel costs, and lower program/implementation costs once the necessary mobile money infrastructure is established.

Source

*Beyond conditional and unconditional cash transfers, cash plus programs have been introduced to improve the impact of cash transfer programs in LMICs and ensure long lasting impact on human capital.* Cash plus programs are unconditional cash transfer programs implemented alongside complementary programs/services that address the needs of the target population and facilitate household-level investments in human capital. Roelen et al. (2017) broadly categorize complementary programs/services as the following: additional benefits or in-kind transfers, behavioral change

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communication, psychosocial support, facilitating access to services, or linking individuals to services. The following section details interventions that can either be implemented singly or as complementary programs alongside cash transfer interventions. A combination/package of these interventions can be implemented concurrently or staggered during a predetermined period to maximize their impact on human capital. The staggered introduction of complementary packages is known as a graduation approach/program which seeks to lift individuals from extreme poverty sustainably. Figure 2, sourced from de Montesquiou et al. (2014), provides a sample rollout of the graduation approach, detailing a possible combination of complementary packages/services and the timing of each component. The most appropriate package and timing of interventions depend on the needs of the population and the context in which they operate.

In the Sahel, where the population is particularly vulnerable to climate shocks, institutions such as FAO have introduced cash-plus programs that include both cash transfers and the provision of livestock. Beneficiaries also receive training on how to best care for livestock, home visits to vaccinate animals, and tailor assistance where necessary. This format of cash-plus programs has been piloted in Burkina Faso, Mali, Niger, and Mauritania.

Figure 2: de Montesquiou et al. (2014) Sample Rollout of the Graduation Approach

### 3.2. Public Work Programs

In addition to cash transfer programs, public work programs (PWPs) are commonly introduced in LMICs to mitigate the impact of shocks on human capital. Although a thorough examination of PWPs is beyond the scope of this literature review, it is important to note their use and impact in LMICs. PWPs are government interventions that provide individuals with employment opportunities for payment in-

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cash or in-kind (food items/vouchers, subsidies). To minimize disruptions to the local labor market, payments are usually around market wage. PWPBs are typically used to develop public infrastructure; however, variations exist. Short-term PWPBs are largely used to encourage consumption smoothing in response to shocks, whereas long-term PWPBs mainly center around addressing chronic poverty. Similar to cash transfer programs, PWPBs are occasionally implemented alongside complementary programs to increase future employability, increase future income levels, or improve human capital outcomes. Complementary packages can include skills training, microcredit schemes, subsidized fertilizer, or health education.

A systematic review of the evidence examining the impact of PWPBs in low-income and lower-middle-income African countries suggests heterogenous impacts on household expenditure, nutrition, and education outcomes. Available evidence demonstrates that within this region, the impact of PWPBs on consumption and expenditure is inconclusive; the impact on food security and nutrition outcomes is inconsistent; and the impact on education outcomes is largely statistically insignificant. A small number of rigorous studies limits the available evidence outside of Ethiopia and significant heterogeneity in the program design—including the duration of the program, payment schemes/relative amounts, and the type of complementary packages.

3.3. Contributory Schemes

Contributory schemes, specifically insurance schemes, are an additional avenue through which the impact of shocks on human capital could be mitigated. Within this context, the most relevant contributory schemes in LMICs are health, livestock, and climate insurance. Health insurance schemes, specifically those targeting low-income populations and/or those in the informal sector, are the most prominent social insurance schemes targeting the most vulnerable populations in LMICs.

3.3.1. Health Insurance

Several studies suggest that community-based health insurance schemes have had positive impacts on educational outcomes and catastrophic health expenditures. Woode et al. (2017) estimate that children between 13–18 years old whose parents are enrolled in Mutuelles de Santé, a community-based health insurance scheme in Rwanda, have higher school attendance and are better protected against parental health shocks. Among children aged 7–15 years, Strobi (2017) illustrates that Mutuelles de Santé insurance coverage increases household educational expenditure, with a slightly larger increase in girls compared to boys. Additionally, within this same age group, households with health insurance observe an increase in the number of school years completed, with a slightly larger effect in girls than boys. Furthermore, within this group, Mutuelles de Santé coverage was associated with a statistically significant decrease in the number of hours worked by boys. Woldemichael (2020) similarly found decreased catastrophic spending and a reduced poverty gap within households enrolled in Mutuelles de Santé.

Building on earlier research, Fadiallah et al. (2018) identified barriers and/or facilitators of the effectiveness of community-based health insurance programs in LMICs. Barriers and facilitators of

program effectiveness were identified at four levels—individual, interpersonal, community, and systems. A few determinants of program effectiveness included participant understanding of health insurance, trust in the insurer, household size, community involvement, administrative/management structure, amount/timing of the premium, and cost-sharing.

**Box 3: Mutuelles de Santé (Rwanda)**

Mutuelles de Santé is a community-based health insurance scheme that was first introduced nationwide in 2005 and reached 90 percent coverage as of 2012. Starting in 2015, management of Mutuelles de Santé was transferred from the Ministry of Health to the Ministry of Finance and Economic Planning.

This scheme targets low-income households or individuals who are employed within the informal sector. Households are required to enroll into this scheme jointly. However, payment is calculated per household member. Children under three months old are insured through their parents and are not required to pay an annual premium. In order to receive immediate coverage, households are encouraged to pay their premiums before July 1—the beginning of the fiscal year. Payments after this date result in a one-month delay in coverage.

Three categories of payment exist according to household income levels. The first category of members, with the lowest income levels, do not pay an annual premium or co-payments. These costs are covered by the Rwandan government and/or donors. The second and third categories of members pay an annual premium. The premium amount increases with increasing income level classification. Furthermore, second and third category members pay a base fee for healthcare services at primary healthcare facilities and a 10 percent co-pay at secondary and/or tertiary healthcare facilities. Members receive coverage for both healthcare services and medication.

The effectiveness and sustainability of community-based health insurance scheme such as this one is heavily dependent on local buy-in at all levels and the identification of reliable and sustainable financing mechanisms.

**Sources:**
Rwanda Social Security Board. 2022. CBHI Scheme. [https://www.rssb.rw/scheme/cbhi-scheme](https://www.rssb.rw/scheme/cbhi-scheme)

### 3.3.2. Index-Based Insurance

Index-based insurance schemes are another way to mitigate the impact of shocks, particularly climate and agricultural shocks, on household expenditure and poverty levels. Index-based insurance schemes require a particular algorithm/threshold to be met before cash payments are automatically distributed to beneficiaries. For example, in the case of weather index-based insurance programs, payments may be distributed once a certain temperature is reached or level of rainfall occurs. The effectiveness of these interventions is heavily dependent on adequate demand for the insurance scheme and appropriate indexes to ensure that payments are made in time to mitigate the impact of shocks on households.
A relatively new and promising body of evidence suggests the potential benefits of index-based livestock insurance on household spending. Among households experiencing shocks—particularly in rural regions—selling livestock is usually one of the first few strategies to manage the financial effects. Index-based livestock insurance (IBLI) schemes are interventions that could potentially eliminate or minimize this asset loss or changes in household expenditure. In Kenya and Ethiopia, IBLI coverage was associated with a 45 percent decrease in catastrophic losses following exposure to shocks.\(^{81}\) In response to a 2011 drought in Kenya, households with IBLI coverage reported that they were less likely than those without coverage to sell livestock or reduce food consumption. It is important to ensure sufficient demand for such an intervention before implementation.

Although Index-Based Insurance schemes have the potential to mitigate the impact of shocks on human capital, uptake remains low in LMICs. Determinants of index-based insurance uptake include the perceived quality of the available insurance schemes, availability of alternative methods to smooth consumption following exposure to shocks, understanding of insurance schemes, trust in the implementing body, and the premium cost.\(^{82}\) Beyond these broad categories of determinants, studies have identified country/region-specific determinants of index-based insurance demand. Evidence from Nigeria, Burkina Faso, and Togo has identified factors such as marital status, age/sex of the household head, and educational levels.\(^{83,84,85}\) Additionally, Ali et al. (2020) suggest that an individual’s demand for index-based insurance also depends on the specific asset and the climatic event being insured against.\(^{86}\) There was more perceived value in insuring crops that were most vulnerable to climate shocks and insuring against climatic events that were both most frequent and most costly. Empirical analysis and modeling approaches such as the ones detailed above provide an invaluable opportunity to design population-specific insurance schemes with an increased likelihood of higher demand.

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Box 4: The Kenya Livestock Insurance Program (Kenya)

In 2015, the Kenyan government introduced a social protection program to prevent the loss of livestock and an increase in food insecurity in the most vulnerable populations as a result of droughts. This initiative is a public-private partnership between the Kenyan government and private insurance companies. When first introduced, Kenya purchased insurance coverage for 5,000 vulnerable households in arid and semi-arid countries. Insurance coverage was initially for five tropical livestock units—a standardized indicator—and was later increased to 10 tropical livestock units.

Calculating agents were identified to monitor, via satellite, the amount of vegetation available for livestock to consume and create an associated index of drought. Once a predetermined index threshold is reached within and communicated to relevant stakeholders, insurance companies provide payments directly to policyholders. Different payment amounts are calculated according to the index thresholds reached; payments are proportional to the value of the index. Households then use the payments to smooth consumption prior to exposure to drought. Payments are made through mobile transfers or checks.

The program is now extending and transitioning to only partially subsidized schemes to increase the program’s financial sustainability and cover.

Sources

3.4. Food Distribution Interventions

Beyond mitigating the impact of shocks on food consumption through insurance schemes or cash transfer interventions, food distribution interventions are used to attenuate this effect, particularly within the critical period for growth and development—under five years old. Such food distribution interventions can be broadly separated into two categories—food distribution programs targeting non-school-aged children and food distribution programs targeting school-aged children.

3.4.1. Supplementary/Complementary Feeding

Child feeding programs targeting non-school-aged children, largely within the critical growth period of the first 1,000 days of life, are commonly referenced as complementary/supplementary feeding programs. Evidence suggests that the provision of complementary food in LMICs, with or without the provision of nutrition education, is associated with significant improvements in linear and ponderal growth in children—an additional 0.54 centimeter in linear growth and 0.25 kilogram in ponderal growth.87 Another systematic review similarly found an associated increase in HAZ and WAZ.88

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Box 5: The Rainbow Project Supplementary Feeding Program (Zambia)

In 2011, the Rainbow Project, an NGO, introduced a supplementary feeding program in two Zambian districts. Thirteen centers were opened in the above districts in collaboration with the local government and district health facilities. Community-based organizations coordinated daily management of the centers with assistance from community volunteers. Furthermore, each center worked closely with the nearest healthcare facility. This program was implemented alongside the growth monitoring and promotion program implemented throughout Zambia.

The supplementary feeding program targeted children under five years old who were moderately or severely wasted (low weight-for-height) or clinically underweight (low weight-for-age) and did not suffer from any additional medical complications. Each center had the capacity to manage 25–30 children. Consequently, children were placed in one of two priority groups. The first priority was given to children who were wasted and second priority to children who were underweight.

Six main services were provided through each center—weekly growth monitoring, nutrition education, cooking demonstrations, onsite provision of a meal to the children, distribution of high energy protein supplements (HEPS) for the children under five years old and a basket of local foods for the whole household, and home visitations. Children are fed onsite to monitor their appetite and determine if they need to be referred to a healthcare facility. Home visits, performed by community volunteers, ensure that the food distributions are used as intended and determine whether households require additional social services. Cooking demonstrations follow recipes developed by the Ministry of Health, which involve preparing local foods in a nutritious manner.

Regarding the distribution of food, the amount of HEPS provided depended on whether ready-to-use-therapeutic foods (RUTF) were available or not. If RUTF were available, each child would receive two kilograms of HEPS monthly. If RUTF were unavailable, each child would receive four kilograms of HEPS monthly. Baskets of local food include a combination of maize flour, oil, groundnuts, sugar, and beans. This program was implemented alongside rigorous community sensitization, involvement, and outreach activities.

Sources

3.4.2. School Feeding

Unlike food distribution interventions targeting non-school-aged children, interventions targeting school-aged children seek to improve nutrition and education outcomes. School feeding programs provide children with nutritious meals/snacks during school hours or take-home food items. These interventions are regularly introduced alongside complementary programs such as deworming treatments or micronutrient supplementation. A systematic review examining the impact of school feeding programs on educational outcomes in Africa found improvements in school attendance,

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89 Alderman, H. & D. Bundy. 2012. “School Feeding Programs and Development : Are We Framing the Question Correctly?” Published by Oxford University Press on behalf of the World Bank.
enrollment, and test scores in children between 2 and 12 years old. Evidence about the impact of school feeding programs on child nutrition suggests a small positive impact on micronutrient status and a mixed impact on linear and ponderal growth. Evidence is largely heterogeneous due to variations in the design and implementation of school feeding programs in different contexts.

In addition to the short-term impacts of school feeding programs, empirical analysis of a long-term school feeding program in India—Mid-Day Meal (MDM)—suggests that the impacts of this intervention on nutritional outcomes are both long-lasting and multi-generational. Through the MDM program, school-aged children between ages 6 and 10 are provided a nutritious meal with at least 450 kilocalories and 12 grams of protein. HAZ was higher for children born to mothers living in regions with high MDM coverage. The multi-generational impact is likely through improvements in maternal height, fertility behavior, health-seeking behavior, and educational attainment.

Box 6: School Feeding Program (Ghana)

The Ghana School Feeding Program (GSFP) was piloted in 2005 and has since been implemented throughout the country. This program is overseen by the Ministry of Local Government and Rural Development and implemented by the Ghana School Feeding Program Secretariat. Kindergarten and primary school children are provided with one nutritious hot meal every school day. Schools/communities are identified for inclusion in this program according to factors such as poor educational outcomes, high rates of poverty and gender inequality, and the existence/willingness to introduce complementary nutrition or health education interventions.

Meal specifications are determined with the following in mind: the Food and Agriculture Organization’s dietary recommendations for children and the seasonality of local food items. The preparation of school meals is outsourced to local catering companies, and food items required to prepare the meals are sourced from local smallholder farmers.

Sources:

3.5. Behavioral Interventions

3.5.1. Nutrition Education

Alongside or independent of the above interventions, behavioral interventions have been introduced to influence health and educational behavior and spending positively. Nutrition education is one of the most widely implemented behavioral interventions across LMICs. Nutrition education programs, commonly referred to as complementary feeding education, educate parents and caregivers about how to promote the overall well-being of their children and ensure that feeding practices are timely, adequate, and safe. Studies suggest that nutrition education is associated with improved child feeding practices, height, and weight gain, HAZ, and WAZ. However, the statistical significance and magnitude of effects vary across studies, largely due to inconsistencies in how nutrition education is designed and implemented. Furthermore, to date, most evidence base is specific to Latin American and Asian countries.

Box 7: Nutrition Education (Bangladesh)

In Bangladesh, a nutrition education program was designed to address harmful misconceptions and taboos surrounding childcare, health, and feeding and to encourage clinically recommended feeding practices and improved preventative healthcare behavior. This program was implemented alongside the Bangladesh Integrated Nutrition Project (BINP). The two main components of the BINP were bimonthly nutrition education for primary caretakers and food supplementation.

For this program, mothers attended weekly small group sessions for a three-month period and biweekly sessions for a remaining three-month period. Small group sessions were interactive—including participant-led discussions and, in some instances, cooking/feeding demonstrations. Mothers were taught by community healthcare workers/counselors. Given the social structure of the target population, monthly meetings were also held to educate decision-makers in households and communities—within this context that included male household heads and community leaders.

This program resulted in statistically significant improvements in child nutritional outcomes. Six months following the completion of the intervention, children in the intervention group had gained an average of 1.81 kilograms versus an average of 1.39 kilograms among those who were part of the control group. Additionally, Roy et al. (2007) noted significant improvements in health literacy among mothers and child feeding/care practices implemented within households. The success of this program highlights the important of designing behavioral interventions that are context specific—culturally relevant and socially and culturally feasible. The importance of this approach is also reflected in the findings of similar programs in Peru and Myanmar.

Sources:


3.5.2. Academic Nudges

Recent evidence also suggests that behavioral interventions may be used to encourage improved school attendance and academic outcomes. Nguyen (2008) conducted a study in Madagascar examining the impact of a behavioral intervention on educational outcomes in children. Teachers informed school children and their parents of the returns of education—such as increased salaries. In-person sessions/discussions were held with individuals who were termed role models. During these sessions, individuals of similar backgrounds as the students and parents would discuss the importance of education and its role in their current success. In particular, the provision of statistics improved student and parent perceptions about the benefits of schooling, school attendance, and test scores.\textsuperscript{97} These findings are promising and similar to those detailing the impact of a similar intervention in the Dominican Republic.\textsuperscript{98} It is also important to ensure that alongside such an intervention, the quality of schools and schooling are being monitored and improved.

**Box 8: Academic Nudges (Peru)**

In Peru, the Ministry of Education, alongside development partners and researchers, implemented a program to encourage improved educational outcomes. This program aimed to educate students about the benefits of higher education.

Information about higher education's social and financial benefits was presented to students in two ways—a video series and, if feasible, an app. Students watched the video series during the school day. The video series was formatted like a drama/soap opera and included information about salary ranges for different professionals and funding/scholarship opportunities for higher education. The app included similar information presented in a different format—infographics and activities. Students with devices that support the app are able to access this information at home alongside their parents. Otherwise, students are able to use tablets provided at schools.

This intervention resulted in a significant decrease in school dropout rates, an improved perception among students of the returns to education, and an improved perception among students and parents about the ability to pursue higher education. This program is now implemented throughout Peru in public schools.

**Sources:**


\textsuperscript{97} Nguyen, T. 2008. “Information, role models and perceived returns to education: Experimental evidence from Madagascar.” Unpublished manuscript.

3.5.3. Mental Health Interventions

Psychotherapy interventions targeting women, such as interventions addressing depression, have been shown to have large long-term effects on women’s empowerment and time- and monetary-intensive parental investments.99 A systematic review examining the impact of mental health interventions seeking to foster women’s empowerment found significant improvements in maternal and child health.100 Interventions implemented in Taiwan and the United States resulted in statistically significant improvements to levels of postpartum depression in mothers, childrearing self-efficacy, and infant cognitive development.

Box 9: The Thinking Healthy Program—Peer Delivered (Pakistan)

In rural Pakistan, a mental health intervention was introduced to address high rates of perinatal depression. The Thinking Healthy Program is an evidence-based intervention promoted by the World Health Organization to improve mental health outcomes. This intervention uses a simplified version of cognitive behavioral therapy to address mental health issues in mothers. The program costs approximately US$133 per participant.

Peers facilitated individual and group sessions with mothers who were diagnosed with depression. Sessions focused on improving mothers’ relationship with themselves, with their babies, and with their support systems. Mothers were enrolled in the program in their third trimester and continued until six months after childbirth. Mothers participated in 10 sessions and four group sessions which lasted between 30 and 45 minutes each. Most of the session were concentrated on pregnancy and the first three months postpartum. The program supported mothers through three key steps—identifying harmful thoughts and/or behaviors, identifying healthy actions or behaviors to replace harmful ones, and completing activities/homework to implement what they had been taught. All educational material was developed and presented in a culturally appropriate manner.

Community healthcare workers and local elders identified peer candidates. Women who were mothers, had similar socioeconomic backgrounds with mothers enrolled in the program, and had good communication skills were prioritized. Assessment of candidates and final selection were conducted by professionals at healthcare centers. Peers had no prior medical education but were provided with brief training for this program. Furthermore, peers worked closely with community health workers. Peers were supervised by program trainers whom therapists supervised. Peers were not paid.

Sources:


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