Effect of an economic transfer program on mental health of displaced persons and host populations in Democratic Republic of Congo: a randomised controlled trial

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1

Summary

Background. Humanitarian crises affect over 200 million people globally and exact a large toll on population mental health. We assessed the impact of an economic transfer program on the mental health of internally displaced persons and host populations in eastern Democratic Republic of Congo (DRC).

Methods. We conducted a randomised trial among vulnerable households residing in 25 villages in North Kivu Province, DRC, where a large United Nations program responds to population displacement by providing economic transfers in the form of vouchers for essential household items (EHI). Households that were in need of assistance but outside the program's standard eligibility criteria were randomly assigned (1:1) to a "voucher" or to "no intervention". Households in the voucher group received US$50-92 worth of vouchers to use at a fair where EHI, such as blankets, clothes, buckets, and pans, were sold. The head woman of each household was interviewed just before the fair, six weeks and one year after the fair. The primary outcomes were standardized indices of adult's mental health, children's physical health, social cohesion, and resilience. Effects were assessed in least-squares regression models adjusting for baseline levels. The trial was registered at https://osf.io/2faj4 and https://osf.io/dyb9g.

Findings. Between August 2017 and March 2018, we enrolled 976 households in the study. 488 were randomly assigned to the EHI voucher and 488 to no intervention. 88% of respondents were female. At baseline, 33% of respondents had an anxiety/depression score suggesting clinical significance. At six weeks, the voucher group had a 0.32 standard deviation units (SDU)

improvement on the mental health index (95% CI 0.18 to 0.46), and, after one year, the voucher

group had a 0.19 SDU improvement (95% CI 0.02 to 0.34). There were no effects on the child

health, social cohesion, or resilience indices.

Interpretation. Economic transfers can improve the mental health of vulnerable populations in

humanitarian crises.

Introduction

The mental health burden of conflict-induced humanitarian crisis is severe.[1] The prevalence of mental disorders (depression, anxiety, post-traumatic stress disorder (PTSD), bipolar disorder, and schizophrenia) is over 20% in conflict settings, over three times greater than non-conflict settings.[2] One in ten people affected by conflict has a moderate to severe mental disorder at any point in time, and conflict creates a fivefold increase in years lost to disability due to depression and PTSD.[2]

Conflict harms mental health through forced displacement and is associated with decreased household consumption,[3,4] reduced social cohesion,[5] lower self-reported physical health, increased hypertension and tachycardia,[6] and higher crude mortality rates.[7] The causes of mental morbidity among internally displaced persons (IDP) – those forcibly displaced within their home country – may be related to traumatic experiences with violence, as well as to the stresses of chronic poverty, less access to healthcare, food insecurity, and the challenges of living in new settlements with lower social cohesion.[2,5,8–10]

In 2019, humanitarian crises affected 215 million people in more than 31 countries.[11] Approximately 40 million people were internally displaced, and an additional 25 million fled to other countries, the highest number of refugees since World War II. Much of the acute trauma of displacement occurs among those living in chronic poverty. One-third of the people living on less than US$1.90 per day live in countries for which the United Nations (UN) has appealed for humanitarian funding for consecutive years.[11] The UN has appealed for funding for the DRC for every year since 1992, as the country has experienced two international wars (1996-1997; 1998-2003) and nearly continuous armed conflict in its eastern region. The country is home to

4

over three million IDPs, and over 70% of the population lives below the poverty line.[12,13] In the eastern region, 41% of the population met symptom criteria for major depressive disorder and 50% for PTSD.[14]

Economic assistance in the form of cash and vouchers has the potential to empower recipients to meet their most pressing needs for food, medicine, clothing, and everyday tasks like cooking and cleaning. This can in turn reduce daily stressors, protect dignity, and promote social cohesion, which may contribute to improvements in mental health. Whereas prior studies have assessed the efficacy of providing services that specifically target the mental health of conflict-affected populations,[15] there is limited causal evidence on the impact of economic transfers on mental health outcomes in these settings.[16,17] In humanitarian contexts, where the use of economic transfers is increasingly popular,[11] unconditional transfers have been shown to improve child health,[18,19] increase food consumption and dietary diversity,[20–23] and improve social cohesion,[24,25] and may be complementary to clinical approaches to addressing mental health needs.

We aimed to evaluate the efficacy of one key form of unconditional humanitarian assistance – vouchers for essential household items – to improve mental health. In addition, we explore potential pathways, including children's physical health, social cohesion, and overall changes in resilience (ability to cope), for recently displaced persons and vulnerable members of their host communities in the DRC.

RESEARCH IN CONTEXT

Evidence before this study

5

A recent systematic review[16] of the effects of economic transfers on individual and household outcomes in humanitarian emergencies used the following search terms for articles published between January 2000 and November 2014: (Cash OR CCT OR voucher* OR coupon* OR CFW) AND (humanitarian emergency OR emergency response* OR emergency relief OR emergency aid OR emergencies OR humanitarian OR disaster* OR Relief Planning OR Relief Work OR Mass Casualty OR rescue work OR earthquake* OR flood* OR tsunami* OR Avalanche*OR Landslide* OR Rockslide* OR Mudslide* OR cyclone* OR Cyclonic Storm* OR hurricane OR Tidal Wave* OR Tidal waves OR typhoon* OR Volcanic Eruption* OR drought* OR famine* OR Starvation OR food insecurity OR war OR armed intervention OR armed conflict OR conflict affected OR displaced OR displacement OR refugee*). This yielded 4,094 studies, of which 108 were experimental or quasi-experimental and thus retained for analysis. Only nine studies were found in peer-reviewed publications, and just five assessed the effects of economic transfers in humanitarian emergencies.

On 1 December 2019, we used the same search terms in PubMed to search for articles published between November 2014 and November 2019. The search yielded 340 additional articles, of which four assessed the effects of transfer-based approaches in humanitarian emergencies. Thus, in total, we are aware of nine related studies.

One study assessed impacts on adults' mental health, and found no effect on depression.[19] Two studies assessed changes in children's physical health, both finding some improvements in response to unconditional transfers.[18,19] Two studies looked at impacts on social cohesion, and particularly on differential effects for DPIs and locals/hosts. One found that recipients were more likely to be helped by locals, and less likely to be insulted by them.[24] The other found no

6

effect on local recipients, but displaced recipients experienced increases in personal agency, the emergence of attitudes accepting diversity, and confidence in institutions and social participation.[25]   Four studies assessed impacts on food security, with one finding that transfers increased food security overall, and the others finding no effect.[20–22,24]

Added value of this study

To the best of our knowledge, this is the first randomised study to assess vouchers for essential household items, the first on the effects of unconditional transfers on mental health in a humanitarian context, the first on unconditional transfers to internally displaced persons living with host families in a low-income country, and the first comparison of an unconditional transfer group to a pure control group in the Democratic Republic of Congo. We found large improvements in mental health in both the short and longer term and no direct effects on child health. We found that aid did not create social tension. We also found positive changes in some resilience indicators, which we interpret as improvements in coping mechanisms.

Implications of all available evidence

The available evidence suggests that economic assistance in humanitarian settings has the potential to improve mental health in both the short and longer term. However, more research is needed to understand how the magnitude, modality, and timing of the assistance, severity of crisis, and background conditions shape these outcomes.

Methods

Study design

We partnered with the Rapid Response to Movements of Population (RRMP) program, jointly managed by the United Nations Children's Fund (UNICEF) and the United Nations Office for the Coordination of Humanitarian Affairs (OCHA) in the DRC. RRMP provides humanitarian assistance, including vouchers for essential household items (EHI). RRMP's core objectives are to improve wellbeing and reduce vulnerabilities of displaced people, their host families, and returnees. RRMP typically reaches over one million people per year. We carried out a randomised controlled trial during 2017-2018 with a 1:1 allocation ratio to vouchers or a control group.

All participants provided verbal informed consent. We obtained ethical review approval from the Catholic University of Bukavu (UCB/CIE/NC/006/2017) and Institutional Review Board (IRB) approval from New York University Abu Dhabi (#064-2017).

Participants

Across seven intervention sites, comprising 25 villages that recently began hosting displaced persons, RRMP staff conducted brief interviews with all households. Household vulnerability scores were calculated by RRMP based on ownership and quality of water containers, pans, buckets, farm tools, mattresses, sheets, and women's and children's clothing, as well as the number of household members with physical disabilities and children raised by a single parent. As a function of the amount of resources available and the level of need for each site, RRMP set

8

a vulnerability score cutoff value to determine eligibility for assistance. Only households beyond

the vulnerability cutoff received assistance; others did not. For this study, we recruited up to

140 households in each site with vulnerability scores immediately below the cutoff.

We focus on eastern DRC's North Kivu province, a region with many population displacements.

Humanitarian actors have been present in the province for over 20 years in response to armed

conflict, forced displacement, and infectious disease epidemics. In North Kivu, during 2013,

demographic and health survey (DHS) data show mothers reported that 15% of children under

five years old had diarrhoea in the prior two weeks, 24% suffered from fever and 38% from

cough.[26] Nearly 25% of adults reported no schooling, and only 5% had completed 12 or more

years of school. Only 8% of households have access to electricity.

Randomisation and masking

We used block randomisation, using the 25 villages as blocks. We created the randomisation

sequence using Stata 15.0 (StataCorp, College Station, TX) statistical software. Within each

village, we randomly assigned study households to a "voucher" or "no intervention".

Research assistants who interviewed study participants at baseline, six-week follow-up, and

one-year follow-up were blinded to households' treatment status. For the voucher use survey,

to assess what items treatment households bought at fairs, interviewers were not blinded.

Procedures

After beneficiary households were selected, RRMP posted public lists of households eligible for

EHI vouchers (including treatment households in our study sample). The female head of each

treatment household received the vouchers at a subsequent fair organized by RRMP, 1-3 days

9

after the lists were posted. The vouchers were distributed in detachable paper booklets with values ranging from US$0.50 to US$15, totalling US$50-92; the amount varied by site and household size.

EHI fairs were temporary markets with 40-80 local vendors. Access to the fair was restricted to voucher recipients. RRMP provided vendors with a list of the types of preferred EHI. RRMP together with representatives of the beneficiaries and vendors set price ceilings. Some items were not permitted (e.g. food, livestock, medicines, and weapons). RRMP carried out awareness and sensitization activities before or during the fair on good practices associated with the use of certain items.

Outcomes

We pre-registered four primary outcomes: adult mental health, child physical health, social cohesion, and resilience. We used multiple measures for each outcome, as described below (see **Table A1** for variable definitions).

For adult mental health, we used three cross-culturally validated instruments. We used the Hopkins Symptom Checklist (HSCL) for anxiety and depression, regularly used to measure mental health in humanitarian contexts,[27] including in DRC.[9,28] We did not ask about two standard items, "Feeling blue", and "Thought of ending your life"; the first could not be unambiguously translated, and the second was deemed to cause undue stress. For each of the 23 remaining items, like "Suddenly scared for no reason", or "Trembling", we asked how often the respondent had experienced such events in the preceding two weeks. In addition, we used the World Health Organization's five-item Well-Being Index (WHO-5), which consists of simple,

10

non-invasive, and positively-worded questions. A systematic review of the literature found that the WHO-5 has strong validity both as a screening tool for depression and as an outcome measure in clinical trials and has been applied successfully across a wide range of contexts.[29] Finally, we asked respondents the World Value Survey's life satisfaction question, "All things considered, how satisfied are you with your life as a whole these days on a scale of 1 to 10?".

For child physical health, we collected eight measures. We asked respondents about diarrhoea, cough, and fever in the previous two weeks for children under five years old, following typical DHS style questions.[26] In addition, local nurses, recruited and trained by the research team, measured their weight, height and mid-upper arm circumference, to create three standard z-score indicators for malnutrition: weight-for-height, height-for-age, and arm-circumference-for-age.[30] Nurses also administered finger or heel pricks for rapid diagnostic tests for malaria and measures of haemoglobin levels (grams per decilitre). If children tested positive, they were referred to the nearby health care facility where they could be treated free of charge.

For social cohesion, we asked about the number of village associations in which the household was a member, requests for contributions (of labour or money) to the village in the prior two weeks, thefts from the household in the prior month, and the level of trust in (i) family members, (ii) another family in the village, and (iii) an IDP family in the village, to go to the market on behalf of the respondent.

For household resilience, we assessed three dimensions: household finances, consumption, and negative coping strategies. For finances, we asked about household savings and income in the preceding four weeks. We asked about debt, and coded greater debt as indicative of lower

11

resilience. We also created a household asset index based on the ownership of 19 different items. For consumption, we asked eleven standard food security questions about how many days in the last week certain conditions held, such as "A household member had to gather wild food", "A household member had to hunt or harvest immature crops because of food shortage", etc. We also measured the household's dietary diversity, asking how many times in the past week ten different food items were consumed. Finally, for negative coping strategies, we asked about children taken out of school, and the use of alcohol or tobacco in the preceding week.

Statistical analysis

For sample size calculations, we used diarrhoea prevalence, a core component of physical health likely to be influenced by EHI, using the DHS data for Eastern DRC.[26] Population-level data on the other outcomes, and specifically mental health, were not available. DHS data on mothers' reports of symptoms two weeks prior to the survey, for rural children under five years of age living in North Kivu, showed that 16% had diarrhoea (std dev=13%). To be conservative, we assumed that the prevalence of diarrhoea was slightly higher for displaced populations; assuming a baseline prevalence of 20%. The minimum detectable effect (MDE) decreased rapidly up to a sample size of 500 households, to an MDE of ten percentage points, or more than 50% reduction in diarrhoea from baseline, with power 0.8 and a significance level of 0.05. We judged that a smaller reduction in diarrhoea prevalence would still be meaningful; therefore, we aimed for a sample size of 1,000 households (500 voucher; 500 control), which would allow us to detect a reduction in diarrhoea prevalence of seven percentage points or larger.

12

We used intention-to-treat analyses to test for differences in outcome measures between the voucher group and the control group. We reported treatment effects for all 23 individual outcome measures, and calculated a summary index of each of the four outcome families to avoid over-rejection of the null hypothesis due to multiple inference. To generate a summary index, we rescale each outcome so that higher values imply better outcomes, and take the average of standardized values relative to the endline control group.[31] Treatment effects are estimated as the difference in the summary index between treatment and control groups, implying that treatment effects are expressed in standard deviation units (SDUs) relative to the control group. We estimated effects in the short (six-week follow-up), and longer term (one-year follow-up), respectively, using least squares models with fixed effects for randomisation blocks (villages). When variables were measured at baseline, we include those values in the regression model. We adjusted p-values for multiple hypothesis testing using step-down resampling.[32] We adjusted estimates across summary indices and survey round. For individual outcome estimates, we adjusted comparisons within each family and survey round. All analyses were done in Stata (Version 15.0).

The study was pre-registered at https://osf.io/2faj4 (short term effects) and https://osf.io/dyb9g (longer term effects).

Role of the funding source

The funder of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report.

Results

We focused on RRMP interventions implemented between August 2017 and March 2018 (see

Table A2 for full implementation schedule). In total, RRMP carried out seven EHI voucher

interventions in North Kivu province, covering 25 villages. Of the 21,448 households

interviewed by RRMP staff, we targeted 976 for this study (see consort diagram in **Figure 1**), of

which 488 households were randomly assigned to the control group, and 488 to the EHI

voucher group.

For the baseline survey, we successfully identified and interviewed 866 (89%) of the targeted

households (424 from the control group and 432 from the treatment group). For the voucher

use survey, conducted 3-8 days after the fair, we interviewed 434 treatment households (89%

of households assigned to voucher group). Loss to follow-up was 10% after six weeks and 24%

after one year. Loss to follow-up was not associated with treatment assignment at baseline, six-

week follow-up, or one-year follow-up (**Table A3**).

At baseline, there were no systematic differences by treatment status (

Table 1). Respondents were 35 years old on average, lived with 5.5 other household members, and 88% were female. 60% of respondents were IDPs, having arrived in the hosting village less than 12 months prior to the intervention.

At baseline, the mean anxiety/depression score on the HSCL was 1.53; 284 respondents (33%) had a score over the commonly used cutoff (>1.75) that indicates clinically significant anxiety or depression.[28] Mean WHO-5 Well-Being score was 0.96 (1 = "Some or little of the time") out of four (0 = "Not at all"; 3 = "Most or all of the time"), and mean life satisfaction was 3.1 out of 10. Thirty-one percent of children under five years old had diarrhoea in the prior two weeks, 56% fever, and 48% cough. Respondents were members of 0.58 associations on average. 249 (29%) had been asked to contribute to the village in the previous two weeks, and 228 (27%) reported that something had been stolen from their household in the last month. The mean reported trust in family, IDPs, or other families to go to the market on the respondent's behalf was 3.7 (3 = "Neither trust nor distrust"; 4 = "Completely trust").

Households owned 22 assets, on average, with the most common items being clothing and pots. Only 7% of households owned a radio. Mean household income was US$12 in the month prior to the survey, and households had US$6.4 in savings and US$18 in debt. The mean food insecurity score was 2.10, meaning that the typical household undertook an activity in response to insufficient food (e.g. skipping meals) more than two days out of the previous week. The mean dietary diversity score was 1.98, meaning that households consumed foods in each of ten categories just under two days in the previous week. Households consumed alcohol or tobacco 0.43 days in the past week. Just under half (49.5%) of children 5-18 years old were in school.

At the fairs, treatment households used EHI vouchers to purchase clothes (86% of treatment households), cloth (74%), pots and pans (56%), soap (51%), mattresses (35%), blankets (33%), luggage (27%), and buckets and basins (27%) (**Table A4**). Other items purchased included plates, bowls, jugs, footwear, bedsheets, thermoses, batteries, and solar panels. The highest average expenditures were US$17.39 on clothes, US$13.06 on cloth, US$9.90 on mattresses, US$9.30 on buckets and basins, and US$5.29 on chairs, beds or tables.

We found positive and large treatment effects on the mental health summary index at six weeks (mean index difference 0.32 SDUs [95% CI 0.18 to 0.46]) and at one year (mean index difference 0.18 SDUs [95% CI 0.02 to 0.34]). For individual measures at six months, the WHO-5 index was 1.09 for control households and 1.29 for treatment households; a difference of 19% (p<0.01; **Table 2**). The difference in life satisfaction was 3.29 in the control group to 3.88 in the treatment group; a difference of 18% (p<0.01; **Table 2**). There were no significant differences in the anxiety/depression score (HPCL). After one year, there were no significant differences in individual index components between treatment and control households.

We found no treatment effects on child health at six weeks (mean index difference -0.02 SDUs [95% CI -0.18 to 0.14]; **Table 2**) or at one year (mean index difference 0.05 SDUs [95% CI -0.13 to 0.23]; **Table 2**). The proportion of children in a household with diarrhoea, cough, fever, or malaria was statistically indistinguishable between treatment and control households at six weeks and one year. The same holds for length-for-age, weight-for-height, and mid-upper arm circumference (MUAC)-for-age z-scores, as well as haemoglobin levels and the incidence of malaria. Repeating this analysis at the child level yields similar results (**Table A5**).

There were no negative treatment effects on social cohesion at six weeks (mean index difference 0.10 SDUs [95% CI -0.04 to 0.24]) or one year (mean index difference 0.04 SDUs [95% CI -0.10 to 0.18]). At six weeks and one year, there were no statistically significant differences between treatment and control households in terms of group membership, requests for contributions to the village, trust, or theft.

Finally, there was no overall treatment effect on resilience at six weeks (mean index difference 0.03 SDUs [95% CI -0.11 to 0.17]), nor at one year (mean index difference -0.13 SDUs [95% CI -0.27 to 0.01]). There were, however, important improvements in several index components at six weeks: treatment households had 13.3% more assets (1.36 vs 1.2; mean difference 0.16 [95% CI 0.08 to 0.24]), higher dietary diversity (increasing from 2.15 to 2.28; mean difference 0.13, [95% CI 0.03 to 0.23]) and were 43% more likely to be in debt (US$23.24 vs US$16.27; mean difference US$6.97 [95% CI 2.38 to 11.56]). In addition, the use of alcohol or tobacco increased from 0.26 days to 0.46 days per week (mean difference 0.2 [95%CI 0.08 to 0.36]). At one year, treatment households reported using alcohol or tobacco 0.55 days per week, compared to 0.29 days for control households (mean difference 0.26 [95%CI 0.08 to 0.44]).

For the RRMP funding year that we study (2017/2018), UNICEF estimated that US$3,918,388 was transferred to 269,677 beneficiaries via EHI fairs, or US$14.53 per beneficiary. This excludes implementation costs, which are estimated to be US$1,713,204. Estimated total cost per beneficiary are thus US$20.88.

Discussion

Unconditional transfers of vouchers for EHI to recently displaced persons and vulnerable host households improved recipients' mental health after six weeks and one year. We found no effects at either follow-up on the summary indices of child health, social cohesion, or resilience. We did observe changes in individual resilience indicators related to asset ownership, dietary diversity, debt, and consumption goods (alcohol and tobacco), suggesting that these humanitarian transfers increased households' ability to cope.

Economic assistance is increasingly used as a key tool for policy makers and donors in various settings.[12] Yet, few randomised controlled trials of economic assistance have assessed impacts in humanitarian contexts.[16,17] We are the first study to show that transfers improve mental health in a humanitarian context. One other study, in rural Nicaragua, found no effect on mental health from household transfers of US$145-300.[19] Our finding is consistent with a meta-analysis of 12 transfer studies in non-humanitarian contexts in developing countries that found a mean improvement in mental health of 0.11 SDUs.[33] This study thus points to the potential for transfer interventions to improve mental health in humanitarian settings, and contributes to the call for more context-specificity of mental health studies.[10]

The absence of evidence for positive effects on child physical health is in line with a study in rural Burkina Faso, which found no effect of a transfer of US$204 per household on weight-for-age, height-for-age, or MUAC.[23] In contrast, in rural Pakistan, transfers of US$84-168 increased weight-for-height children at six months; however, no effects remained at 12 months.[18] In rural Nicaragua, transfers of US$145-300 per household increased children's height-for-age, and improved performance on a variety of cognitive and socio-emotional tests, with benefits persisting for two years.[19]

18

We report no change in social cohesion. In contrast, earlier work found improvements in social cohesion due to unconditional transfers. In Ecuador, refugee recipients showed increases in personal agency, the emergence of attitudes accepting diversity, confidence in institutions, and social participation.[25] In Lebanon, recipients had fewer disputes with other household members, were more likely to receive help, and were less likely to have been insulted by village members. Both studies, however, also contained other measures of social cohesion that showed no effect.

The studies from Ecuador and Lebanon reported improvements in resilience, specifically food security. In contrast, the Burkina Faso study found no effect on food security.[20,23,24] The Burkina Faso study did find an improvement in dietary diversity, similar to the studies from Pakistan and Ecuador.[18,20,23] This study reports no effects on food security and a positive effect on dietary diversity in the short term only. The Lebanon study found that transfers increased school attendance, while we found no effect. The increase in alcohol or tobacco consumption that we found is troubling at first glance, but the magnitude of the effect is small. Furthermore, this finding may reflect an increase in socializing, as alcohol is often served at gatherings in eastern DRC. A systematic review of the effect of transfers on consumption of alcohol or tobacco in non-crisis settings found that only one of eleven studies showed an increase, while only two showed a decrease and eight showed no effect.[34]

This study has several limitations. We enrolled households who were not the most vulnerable households in the village, according to RRMP criteria. The most vulnerable households automatically received EHI vouchers as part of the RRMP program. The results we report may thus not capture the impact on vulnerable households at the extremes of the distribution.

19

However, this claim relies on the assumption that the RRMP measurement of vulnerability is accurate. Vulnerability is difficult to measure in the best circumstances, and RRMP staff were tasked with interviewing many households in a short time span in challenging conditions. In addition, we can compare the study households to the broader Congolese population using the 2013–14 DHS. Our sample is, on average, less educated and more likely to be widowed, and mothers report much higher prevalence of common symptoms such as cough (48% in our sample; 31% in DHS), fever (56% in our sample, 30% in DHS) and diarrhoea (30% in our sample; 17% in DHS) among their children under five years old in the previous two weeks. This suggests that our sample is more vulnerable than the average household in DRC, one of the poorest and least healthy nations on Earth.

As our sample was not representative of the village population, we did not estimate general equilibrium effects, i.e. the impact of RRMP on villages as a whole. These effects could be important given the scale of the intervention and severity of poverty in these areas.

We did not estimate spillover effects from voucher households to other households. We articulate some possible channels here. Direct spillovers may have occurred through sharing of EHIs between treatment and control households within the same village, which would reduce the treatment effect on our assets measure (and thus our resilience index). If those assets, or the act of sharing, indirectly increased child health, mental health, or social cohesion, then the treatment effects on those outcomes will be underestimated. Other indirect spillovers may have occurred through reduced infectious disease transmission. Malaria, pneumonia, and diarrhoeal diseases are common throughout eastern Congo. If EHIs reduced the prevalence of infectious diseases among recipients, this may have lowered the risk of infection for others.

20

In addition to spillovers, there are other possible reasons why we did not observe benefits for child health. First, few of the EHI directly targeted child health or nutrition (**Table A4**). Food and medicine were not sold at the fairs. Bed nets were rarely purchased. Soap and water-storage devices may not have been purchased or used enough to decrease exposure to pathogens. Households may not have been able to sell EHI to purchase food or medicine, or to trade for them directly. We cannot rule out the possibility that larger voucher amounts, or vouchers in contexts where food or medicine are more abundant, would improve child health.

This study also has several strengths. We focus on an important and understudied aspect of humanitarian crisis, mental health, which has strong long-term impacts on livelihoods. We studied an intervention as it was implemented at scale, implying that our results are more generalizable than results from small-sample researcher-designed programs. Loss to follow-up did not differ between treatment and control groups. Our study population consisted of subsistence farmers living in chronic poverty and insecurity with little access to markets and public services. There are hundreds of millions of people living in similar conditions around the world, including in places like Yemen, South Sudan, Northern Nigeria, and Afghanistan.[12] Lessons from our study are hence relevant for other programs that aim to improve the health and wellbeing of other populations living in chronic poverty and insecurity.

This study shows that a low-cost intervention that provided vouchers for EHI to recently displaced households and members of their host villages improved the mental health of the recipients in the short and longer terms. There were no negative effects on social cohesion. Our findings suggest that economic transfers, which improve households' ability to cope in the face of recent trauma, can ameliorate mental disorders. Our results indicate that economic transfer

21

programs could be attractive to policy makers and humanitarian organizations working with populations that have been forcibly displaced.

Contributors

JQ conceived this study and initiated interaction with RRMP. All authors designed the study. JQ and GB led the data collection. JQ and PW did the data cleaning and statistical analyses. All the authors interpreted data, drafted and critically revised the article and approved the final version.

Declaration of interests

We declare no competing interests.

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Figure 1. Trial profile

Program staff assigned vulnerability scores to 21,448 households out of a total population of 61,385 households in 25 villages across seven intervention sites.

20,472 households ineligible for this study:
- 15,289 households had vulnerability scores above the cutoff and were automatically enrolled in the RRMP program
- 5,182 households had vulnerability scores that were too low (we only recruited up to 140 households in each site with vulnerability scores immediately below the cutoff)

976 households participated in the lottery

| 488 assigned to control group | 488 assigned to voucher group |

| 64 could not be located at baseline | 66 could not be located at baseline |

| 424 completed baseline survey | 432 completed baseline survey |

| 53 lost to follow up | 44 lost to follow up |

| 381 completed 6-week follow-up | 388 completed 6-week follow-up |

| 60 lost to follow up | 66 lost to follow up |

| 321 completed 1-year follow-up | 322 completed 1-year follow-up |

26

Table 1. Baseline characteristics

	Control group (n=432)		Treatment group (n=424)	
Age of respondent	36.4	14.5	34.8	13.1
Household size	6.5	2.4	6.6	2.7
Gender of respondent				
Male	51	12%	53	13%
Female	381	88%	371	88%
Anxiety/depression score	1.53	0.55	1.50	0.58
Well-being score	0.93	0.60	0.99	0.62
Life satisfaction score	3.07	1.67	3.17	1.71
Diarrhea in children <5y in last 2 weeks	209/672	31%	194/654	30%
Fever in children <5y in last 2 weeks	371/671	55%	371/654	57%
Cough in children <5y in last 2 weeks	304/671	45%	337/654	52%
Associations in which household is a member	0.55	0.78	0.60	0.84
Requests for contributions to the village in last two weeks	0.25	0.43	0.33	0.47
Trust in village score	3.69	0.84	3.71	0.87
Had something stolen form household in last month	0.27	0.44	0.26	0.44
Number of household assets	20.42	15.30	20.35	14.76
Household income in last month (US$)	12.88	19.32	11.79	14.05
Household savings (US$)	5.27	44.19	7.60	59.46
Household debt (US$)	20.75	50.29	15.28	26.03
Dietary diversity score	2.00	0.81	1.96	0.78
Food insecurity score	2.14	0.94	2.08	0.90
Days consumed alcohol or tobacco in last week	0.40	1.15	0.40	1.15
Proportion of children 5-18 in school	0.49	0.50	0.50	0.50

Data are n (%) or mean (SD). See Table A1 for variable definitions. Measures of diarrhea, fever and cough are for each child under 5 years old, hence the greater number of observations. *In the control group, 420 households had members between 5 and 18 years old; in the treatment group, 409 households did.

27

Table 2. Effect of vouchers on child health, mental health, social cohesion, and resilience

	Six week follow up						One year follow up					
	Control	T-C	95% CI	p	p-adj.	N	Control	T-C	95% CI	p	p-adj.	N
Mental health mean	0.00	0.32	(0.18 to 0.46)	0.02	0.07	769	0.00	0.18	(0.02 to 0.34)	0.02	0.07	643
Anxiety/depression	1.38	-0.05	(-0.13 to 0.03)	0.29	0.27	769	1.48	-0.07	(-0.15 to 0.01)	0.11	0.27	643
Well-being	1.09	0.2	(0.1 to 0.3)	0.00	0.00	769	1.10	0.06	(-0.06 to 0.18)	0.31	0.30	642
Life satisfaction	3.29	0.59	(0.35 to 0.83)	0.00	0.00	769	3.09	0.17	(-0.05 to 0.39)	0.11	0.27	633
Child health mean	0.00	-0.02	(-0.18 to 0.14)	0.85	0.92	606	0.00	0.05	(-0.13 to 0.23)	0.54	0.78	506
Diarrhoea	0.32	0.01	(-0.05 to 0.07)	0.73	0.98	512	0.27	0.02	(-0.06 to 0.1)	0.54	0.97	382
Fever	0.55	-0.04	(-0.12 to 0.04)	0.30	0.81	511	0.44	0.03	(-0.07 to 0.13)	0.65	0.97	380
Cough	0.46	0.01	(-0.07 to 0.09)	0.88	0.98	511	0.42	0.01	(-0.09 to 0.11)	0.47	0.97	381
Height-for-age	0.26	0.17	(-0.03 to 0.37)	0.09	0.54	511	0.41	0.15	(-0.09 to 0.39)	0.86	0.97	460
Weight-for-height	-2.46	-0.04	(-0.29 to 0.21)	0.77	0.98	505	-2.63	0.06	(-0.21 to 0.33)	0.20	0.80	463
MUAC-for-age	-0.34	-0.07	(-0.23 to 0.09)	0.39	0.86	507	-0.61	0.15	(-0.03 to 0.33)	0.66	0.97	467
Haemoglobin	10.95	-0.12	(-0.32 to 0.08)	0.20	0.72	506	10.45	0.08	(-0.14 to 0.3)	0.09	0.54	453
Malaria	0.10	-0.03	(-0.07 to 0.01)	0.14	0.65	509	0.08	-0.02	(-0.06 to 0.02)	0.49	0.97	456
Social cohesion mean	0.00	0.1	(-0.04 to 0.24)	0.15	0.36	769	0.00	0.04	(-0.1 to 0.18)	0.86	0.85	643
Member	0.49	0.07	(-0.03 to 0.17)	0.16	0.42	769	0.56	-0.06	(-0.18 to 0.06)	0.31	0.63	643
Contributions	0.24	0.08	(0.02 to 0.14)	0.01	0.04	769	0.41	-0.02	(-0.1 to 0.06)	0.58	0.81	643
Trust	3.83	-0.01	(-0.13 to 0.11)	0.87	0.87	768	3.86	0.01	(-0.11 to 0.13)	0.81	0.82	642
Theft	0.26	-0.02	(-0.08 to 0.04)	0.51	0.75	767	0.32	0.06	(-0.02 to 0.14)	0.12	0.38	641
Resilience mean	0.00	0.03	(-0.11 to 0.17)	0.61	0.85	769	0.00	-0.13	(-0.27 to 0.01)	0.07	0.17	643
Assets	1.20	0.16	(0.08 to 0.24)	0.00	0.00	769	1.40	0.01	(-0.09 to 0.11)	0.87	1.00	643
Savings	1.41	0.32	(-0.64 to 1.28)	0.52	0.76	769	7.31	-0.36	(-8.53 to 7.81)	0.93	1.00	643
Income	14.24	-0.01	(-2.42 to 2.4)	1.00	1.00	769	17.16	-0.92	(-4.13 to 2.29)	0.57	1.00	643
Dietary diversity	2.15	0.13	(0.03 to 0.23)	0.02	0.07	769	2.10	-0.03	(-0.17 to 0.11)	0.62	1.00	643
Food insecurity	1.79	-0.07	(-0.19 to 0.05)	0.24	0.55	769	2.00	0.03	(-0.11 to 0.17)	0.72	1.00	643
Kids in school	0.48	0.05	(-0.01 to 0.11)	0.06	0.20	642	0.56	-0.01	(-0.07 to 0.05)	0.80	1.00	530
Debt	16.27	6.97	(2.38 to 11.56)	0.00	0.01	767	33.94	1.1	(-8.74 to 10.94)	0.82	1.00	642
Alcohol, Tobacco	0.26	0.20	(0.04 to 0.36)	0.01	0.07	768	0.29	0.26	(0.08 to 0.44)	0.01	0.03	641

Notes: Indices are calculated by rescaling each outcome in each family (e.g. mental health) so that higher values imply better outcomes, then standardizing relative to the endline control group, following Kling et al. (2007). If a household was missing an observation for one of the index components, we took the average of the remaining non-missing individual variables for that household. Treatment effects are from intention-to-treat analyses with fixed effects at the randomization block level (n=25). For all outcome variables, except anthropometry, hemoglobin, and malaria, we control for baseline values. Treatment effects are in standard deviation units relative to the control group. "Control" column indicates average value of the dependent value in the control condition at 6 weeks and 1 year, respectively. The number of observations for child health measures are lower because these are only collected for those households with at least one child younger than five years old. The column 'p-adj' contains p-values adjusted for multiple hypothesis testing using the free step-down resampling methodology of Westfall and Young (1993). The mean effects estimates are adjusted for comparisons to each other, by survey round (n=4 each round). The index components are adjusted for comparisons within each family, for each survey round (e.g. n=3 for mental health at six week follow-up). See Table A1 for variable definitions. MUAC = middle upper arm circumference.

28

APPENDIX EXHIBITS

Table A1. Variable definitions

Family	Outcome	Description	BL	6w	1y
Mental Health	Anxiety / depression	Modified version of Hopkins Symptom Checklist (HSCL). Continuous 0 to 3. Average across 23 statements. Over the last two weeks have you experienced: 1) Suddenly scared for no reason, 2) Feeling fearful, 3) Faintness, dizziness or weakness, 4) Nervousness or shakiness inside, 5) Heart pounding or racing, 6) Trembling, 7) Feeling tense or keyed up, 8) Headache, 9) Spell of terror or panic, 10) Feeling restless or can't sit still, 11) Feeling low in energy, slowed down, 12) Blaming yourself for things, 13) Crying easily, 14) Loss of sexual interest or pleasure, 15) Poor appetite, 16) Difficulty falling asleep, staying asleep, 17) Feeling hopeless about future, 18) Feeling lonely, 19) Feeling of being trapped or caught, 20) Worry too much about things, 21) Feeling no interest in things, 22) Feeling everything is an effort, 23) Feeling of worthlessness. Response options are: 0) Not at all, 1) Some or little of the time, 2) Occasionally or a moderate amount of time, 3) Most or all the time.	1	1	1
Mental Health	Well-being	WHO-5 well-being index. Continuous 0 to 3. Average across the following statements. Over the last two weeks: 1) I have felt cheerful and in good spirits, 2) I have felt calm and relaxed, 3) I have felt active and vigorous, 4) I woke up feeling fresh and rested, 5) My daily life has been filled with things that interest me. Response options: 0) Not at all, 1) Some or little of the time, 2) Occasionally or a moderate amount of time, 3) Most or all the time.	1	1	1
Mental Health	Life satisfaction	Continuous 1 to 10. Response to "All things considered, how satisfied are you with your life as a whole these days on a scale of 1 to 10?" 1= very dissatisfied, and 10= very satisfied.	1	1	1
Child Physical Health	Diarrhoea	Continuous 0 to 1. Share of children (under 5 years of age) that had diarrhoea in the last two weeks. As reported by the respondent.	1	1	1
Child Physical Health	Fever	Continuous 0 to 1. Share of children (under 5 years of age) that had fever in the last two weeks. As reported by the respondent.	1	1	1
Child Physical Health	Cough	Continuous 0 to 1. Share of children (under 5 years of age) that had a cough in the last two weeks. As reported by the respondent.	1	1	1
Child Physical Health	Weight to height z-score	Continuous -5 to 5. For all children under the age of five years, measured their weight and then compute it as a z-score of the WHO's average measures for children of the same height.	0	1	1
Child Physical Health	Height to age z-score	Continuous -6 to 6. For all children under the age of five years, measured their height and then compute it as a z-score of the WHO's average measures for children of the same age in months.	0	1	1
Child Physical Health	Arm circumference to age z-score	For all children under the age of five years, measured their upper arm circumference and then compute it as a z-score of the WHO's average measures for children of the same age in months.	0	1	1
Child Physical Health	Haemoglobin	Continuous in grams per decilitre (g/dL). Child's haemoglobin level as measured in blood sample.	0	1	1
Child Physical Health	Malaria	Binary. Positive or negative result of malaria Rapid Diagnostic Test.	0	1	1
Social Cohesion	Membership	Continuous 0 to 11. Number of associations the household is a member of: 1) Credit or savings, 2) Farming, 3) Protection/ security, 4) Women, 5) Youth, 6) Religious, 7) Conflict resolution, 8) Development, 9) Health, 10) Education, 11) Other	1	1	1
Social Cohesion	Contribute	Binary. In the last two weeks, have you been asked to contribute to the village? Yes=1, No=0	1	1	1
Social Cohesion	Trust	Continuous 1 to 5. Average across the following. How much would you trust (i) family members, (ii) another family in the village, and (iii) an IDP family in the village to go to the market for you if you can't go yourself? Response options: 1) Completely distrust, 2) Somewhat distrust, 3) Neither trust nor distrust, 4) Somewhat trust, 5) Completely trust	1	1	1
Social Cohesion	Theft	Binary. Has anything been stolen from your household in the past month?	1	1	1

30

Resilience	Assets	Continuous. Average number of items owned of the following list: identity card, chair, bicycle, motorcycle, hoe, cloth, generator (for electricity), flashlight, radio, mattress, blankets, jerry can, bed net (treated or not), tarp, clothes other, soap, buckets, pots and pans, luggage.	1	1	1
Resilience	Savings	Continuous in US dollars. How much does your household have in savings?	1	1	1
Resilience	Income	Continuous in US dollars. In the last 4 weeks, how much income did your household earn or receive? (Through labor, sales, remittances, etc.)	1	1	1
Resilience	Dietary diversity	Continuous. Average across the following: In the last seven days, how many days has your household eaten or consumed: 1) Corn, sorghum, rice, bread, 2) Cassava, plantains, other tubers, 3) Peanuts, beans, peas, lentils, etc., 4) Vegetables (and their leaves), 5) Fruits, 6) Meat, fish, chicken, eggs, 7) Milk, cheese, yogurt, other dairy, 8) Sugar, honey, other sweeteners, 9) Oils and fats, 10) Condiments, spices.	1	1	1
Resilience	Food insecurity	Continuous. Average across the following: In the last seven days, how many times: 1) Have adults cut the size of meals or skipped meals?, 2) Have adults gone a whole day without meals?, 3) Have children (<14) cut the size of meals or skipped meals?, 4) Have children (<14) gone a whole day without meals?, 5) Have household members had to eat less preferred or less expensive foods?, 6) Have household members had to borrow food or rely on help from a friend or relative to get enough food?, 7) Have household members had to purchase food on credit?, 8) Have household members had to gather wild food, hunt, or harvest immature crops because of food shortage?, 9) Have household members had to consume seed stock held for next season?, 10) Have household members had to go elsewhere to eat because there was not enough food in the house?, 11) Have household members had to go beg because there was not enough food in the house?	1	1	1
Resilience	Kids in school	Continuous 0 to 1. Proportion of children aged 5-18 in school per household.	1	1	1
Resilience	Debt	Continuous in US dollars. How much does your household owe in debts?	1	1	1
Resilience	Alcohol consumption	Continuous. In the last seven days, how many days has your household consumed alcohol or tobacco.	1	1	1

Notes: BL= Baseline survey; 6w = six week follow-up; 1y = one year follow-up

Table A2. Data collection sites and dates

#	Site	Territory	#Vills.	Baseline	Voucher use survey	Short term	Longer term
1	Butale	Masisi	2	Aug 9-12, 2017	Aug 12-16, 2017	Sep 13-18, 2017	Sep 18-23, 2018
2	Kibarizo	Masisi	3	Sep 8-13, 2017	Sep 13-16, 2017	Oct 20-26, 2017	Sep18-23, 2018
3	Kitsombiro	Lubero	3	Nov 21-26, 2017	Nov 30-Dec 12, 2017	Jan 11-17, 2018	Jun 25-30, 2019
4	Mbau	Beni	2	Dec 7-12, 2017	Dec 12-15, 2017	Jan 23-28, 2018	Sept 19-24, 2019
5	Kirumbu	Masisi	4	Jan 27-Feb 2, 2018	Feb 2-7, 2018	Mar 14-19, 2018	Dec 13-20, 2018
6	Pinga	Walikale	3	Feb 7-16, 2018	Feb 19 -23, 2018	Mar 29-Apr 9, 2018	Apr13-26, 2019
7	Nyabiondo	Masisi	8	Mar 30-Apr 4, 2018	Apr 5-7, 2018	May 19-27, 2018	Feb28-Mar 7, 2019

Notes: Vills. = research villages in the intervention site, which are also our randomisation blocks. The initial longer-term visits to Sites 1 and 2 lacked migration modules, so those sites were re-visited between November 7-10, 2018, to conduct the migration modules.

Table A3. Attrition

	Target	Number interviewed	Missing from Treatment	Missing from Control	Association between treatment and attrition	Standard error
Baseline	976	856	64	56	0.02	(0.02)
Six weeks after baseline	976	770	106	100	0	(0.02)
One year after baseline	976	690	138	148	-0.01	(0.03)

Notes: Target refers to the number of households participating in this study. The association between treatment (voucher) and attrition was estimated with a linear model of attrition as a function of treatment, controlling for randomisation block.

Table A4. Voucher spending at EHI fairs

EHI	Obs.	Share	Avg. expenditure by those HHs that purchased the item (US$)
Clothes	427	0.86	20.17
Cloth	427	0.74	17.64
Pots and pans	427	0.56	9.53
Soap	426	0.51	2.33
Mattress	424	0.35	27.99
Blanket	427	0.33	13
Buckets and basins	426	0.27	4
Luggage	427	0.27	14.14
Tarp	427	0.17	17.39
Radio	426	0.15	11.37
Flash light	427	0.11	4.57
Jerry can	427	0.1	3.1
Farming tools	426	0.04	4.18
Generator	425	0.01	14.67
Bed net	427	0.01	1.25
Chairs, beds or tables	427	0.01	11.5
Other items	419	0.69	13.53

Notes: Summary information from 434 interviews with voucher recipients 1-3 days after EHI fair. "Other ítems" includes plates, bowls, jugs, footwear, bedsheets, thermoses, batteries, and solar panels.

Table A5. Effect of vouchers on child health outcomes, child level analysis

	Baseline				Six weeks				T-C	95% CI		N	One year				T-C	95% CI		N
	Control		Treatment		Control		Treatment						Control		Treatment					
Diarrhea	209/672	31%	194/654	30%	171/553	31%	177/559	32%	0.00	-0.06	0.06	1112	106/373	28%	127/405	31%	0.04	-0.04	0.12	778
Fever	371/671	55%	371/654	57%	296/554	53%	293/559	52%	0.00	-0.06	0.06	1113	164/373	44%	186/405	46%	0.03	-0.05	0.11	778
Cough	304/671	45%	337/654	52%	248/554	45%	276/559	49%	0.05	-0.01	0.11	1113	153/373	41%	167/405	41%	0.01	-0.07	0.09	778
Height-for-age					0.2	1.3	0.4	1.3	0.14	-0.06	0.34	920	0.4	1.3	0.5	1.5	0.03	-0.19	0.25	741
Weight-for-height					-2.4	1.8	-2.5	1.9	-0.08	-0.33	0.17	885	-2.6	1.7	-2.6	1.8	0.06	-0.19	0.31	733
MUAC-for-age					-0.4	1.1	-0.5	1.1	-0.10	-0.26	0.06	884	-0.6	1.1	-0.6	1.1	0.09	-0.09	0.27	742
Hemoglobin					10.9	1.4	10.9	1.5	-0.09	-0.27	0.09	890	10.5	1.2	10.6	1.3	0.06	-0.16	0.28	663
Malaria					48/438	11%	39/ 467	8%	-0.03	-0.07	0.01	905	20/320	6%	20/350	6%	-0.01	-0.05	0.03	670

Notes: effect estimates ("T-C") are from linear regressions with robust standard errors clustered by household and fixed effects for villages (n=25). In the diarrhea/fever/cough regressions, we do not control for baseline values because we cannot link individual children across surveys.

35

Deviations from the Pre-Analysis Plan

This study was preregistered at https://osf.io/2faj4 (short term effects) and

https://osf.io/dyb9g (longer term effects). Below we discuss deviations from the pre-analysis

plan.

- We aimed to collect data from 1,000 households: 100 households in ten sites. Data,

  however, were only collected in seven sites. The reason is that at the moment when the

  grant period stopped (July 2018) only seven EFI voucher interventions had taken place in

  North Kivu. Between the registration of the pre-analysis plan and the start of the

  interventions and data collection, we decided to target 140 households per site. We

  thus targeted a total of 980 households.

- The preregistered social cohesion summary index initially contained additional

  individual measures to measure also dwelling-level (instead of village-level) social

  cohesion. However, because not all respondents life in multi-household dwellings, we

  focus on village-level social cohesion only.

- We preregistered analyses of heterogeneous effects across: 1) baseline

  poverty/vulnerability, 2) migrant/host status, 3) ethnic majority/minority status (relative

  to village), 4) discordant or concordant ethnicities within the dwelling, 5) assigned

  voucher amount per capita, 6) occupation of recipient, 7) education of recipient, 8)

  distance to market and 9) co-residence within dwellings. We do not focus on the

  heterogeneous effects in this manuscript.

36

- To adjust for multiple comparisons, we use the free step-down resampling methodology of Westfall and Young (1993) rather than Anderson (2008), because the latter does not account for dependencies across outcomes.

37