The value of communication during a Pandemic

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Abstract

We show that communication interventions – which have become globally pervasive during the COVID-19 pandemic – promote individuals' consumption and psychological well-being. Partnering with a major telecommunication company, we field communication programs that provide either a "lump-sum mobile phone calling credit" or "monthly tranches of mobile phone calling credit" to a nationally representative set of low-income adults in Ghana during the crises. Individuals' inability to make unexpected calls, unexpected need to borrow SOS airtime, and to seek digital loans decreased dramatically relative to a control group. As a result, the programs led to a significant decrease in mental distress (-9.8%) and the likelihood of severe mental distress by -2.7 percentage points (quarter the mean prevalence), with null impact on consumption expenditure. Monthly mobile credits are more likely than lump-sum mobile credits to "sustain" larger impacts, suggesting that individuals may face time inconsistency and /or social pressure problems. We emphasize the value of communication and need for many installments of communication transfers during pandemics.

Keywords: Communication (L63, O12), ICT-Mobile Credit, COVID-19 Economics, Well-being (I38), Mental Health (I15), Pandemics

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I Introduction

Simply imagine that you're unable to communicate- make a phone call, use the web, access

social media etc- when the need arises unexpectedly. Does this matter, particularly during a pandemic? What are the potential impacts of such communication barriers on individuals' psychological and economic well-being? Should communication interventions during pandemics come in as a one-time large transfer or many small tranches?

Throughout the world, major communication interventions have been initiated in the public and private sectors in response to the COVID-19 pandemic. In the United States, ATT Inc. provided free 10GB of internet data per month for 60 days as a temporary relief to eligible customers to enable them to stay connected under lockdown measures, starting March 27, 2020 (ATT Inc. 2020).[1] In Ghana, the government reduced the Communication Service Tax (CST) from 9% to 5%, which reflected a reduction in the cost of mobile talk time and data purchases, effective September 15, 2020 in response to the economic and social hardships induced by the pandemic (Ghana Revenue Authority 2020). The need for such communication programs is particularly crucial in developing countries where the informal sector is large and the COVID-19 crisis presents a substantial threat to individuals who face credit, savings and psychological stressors and constraints (Banerjee, Niehaus and Suri 2019). Despite the increase in these communication based programs globally, there is relatively little evidence on their impacts on wellbeing during a pandemic.

Administrative data on mobile financial transactions from a major provider in Ghana sheds light on the potential value of communication during the pandemic. Figure A.2 shows the distribution of transactions and illustrates that while overall market activity decreased following the onset of the pandemic, interestingly and in contrast, the demand for mobile

[1] As the leading provider of mobile services in the US with about 40% share of the market, ATT Inc.'s initiative affected a significant number of people, particularly those in the low-income. Others telecommunication companies e.g., Comcast Corp. have deployed similar interventions, providing essential internet and mobile services without charge to low-income families, including seniors, veterans and people with disabilities (Comcast Corp. 2020). We provide a global review of COVID-19-induced communication programs in Tables A.1 and A.2.

airtime-related activities (as measured by the purchase of data and airtime amounts, and thus their demand) sharply increased over the period. This descriptive evidence documents the importance of communication during the pandemic, and is congruent with our baseline surveys: 68% of subjects indicated that their need to call or connect with others (family, friends, employers) had increased due to the COVID-19 pandemic and its disruptions. Yet, between 52% and 62% indicated that sometimes when the unexpected need arises, they are not able to call or connect with their family and friends due to economic hardships associated with the pandemic. Thus, programs that directly mitigate such binding communication barriers will likely have larger impacts on individual and societal wellbeing.

We use a randomized controlled trial to estimate the impacts of a short-term "mobile phone calling credit" among a nationally representative set of low-income households in Ghana during the COVID-19 pandemic. We draw on an existing nationally representative baseline frame (Ghana Living Standards Survey 7 [GLSS7]), and focus on 1131 individuals or households that work in the informal sector and are located in the bottom 75th percentile of the income distribution. This sample is low-income, where income and psychological constraints (Mullainathan and Shafir 2013) can easily bind due to pandemic-induced economic losses.

We partnered with a major local telecommunication company to run our experiment by randomly assigning these individuals to two candidate communication programs: 40GHS (US$7.0) lump-sum mobile credit versus 20GHS (US$3.5) monthly tranches of mobile credit over two months; and then measuring how these affect individuals' ability to mitigate unexpected communication constraints during the pandemic, with impacts on wellbeing: mental health, domestic violence, and consumption expenditures. The different programs about communication provide a means of examining how communication programs may be delivered during pandemics and testing the possibility of wastage in communication credit transfers and individual's myopic decision-making based on their decisions.

The pandemic uncovered a lot of mental health crises, which have potentially large short

and long-term impacts on human capital development. Mental health disorders account for 13% of the overall global disease burden (Collins et al. 2011) and translate to significant economic losses particularly in low-income environments (Adhvaryu et al. 2019 and references therein). The direct economic impacts of COVID-19 in these environments cannot be underestimated, e.g., earnings and consumption shortfalls (Banerjee et al. 2020), food insecurity (Laborde et al. 2020), among other meaningful negative impacts.

Programs that facilitate communication during pandemics could be transformative for people, particularly if bound by internal constraints. Not having to worry about the inability to stay connected could free up the mental and emotional bandwidth (Mullainathan and Shafir 2013) needed to thrive through the pandemic and prevailing uncertainty. The provision of communication credits during these hardships can also directly free up an individual's resources that would have been allocated otherwise to communication for other consumption expenses. Our interventions are both designed to relax such communication constraints and to test their impact on mental health, domestic violence, and consumption expenditures. Relative to the first program (lump-sum credit), the second program (two installments mobile credit) highlights people's myopic decision-making (Haushofer and Shapiro 2013) and whether the communication programs during pandemics should come in as a one-time large communication transfer or many small tranches. Our main (final) dataset is unique due to its size and national representativeness, the expansive set of outcomes, the administrative data on mobile financial transactions, and 1×3 random variation for communication at the individual level.

We find four set of results:

- (i) Drastic decrease in unexpected communication constraints – Experimental interventions mitigate subjects inability to meet unexpected communication needs and stay connected (-37pp=-74% for inability to make unexpected calls, -22pp=-78% for unexpected need to borrow airtime, and -3.5pp=-44% to seek digital loans). These effects are

larger and more sustained overtime for the installment communication credit program compared to the lump-sum credit.

- (ii) Meaningful improvement in psychological well-being – Measured using the Kessler Psychological Distress Scale (K10). Mental distress decreased (-9.8%). Severe mental distress decreased (-2.7pp=-26%) relative to a control group. The installment communication credit program has larger and more sustainable effects compared to the lumpsum credit. Relatedly, only the installment program led to a significant decrease in the overall likelihood of subjects threatening their partners by 6.3% (but with no impacts on the overall likelihood of subjects hitting their partners).
- (iii) Null improvement in direct economic well-being – The overall effect is null on total consumption, which is reassuring since the size and specificity of our intervention was not large enough to meaningfully change consumption. Only the installment communication intervention increased consumption expenditures, but the size is very small economically and only in endline wave 2.
- (iv) Suggestive evidence of myopic decision making – This follows from the evidence that "installment" credits are more than "lumpsum" credits to produce larger and sustained impacts over the trajectory.
- (v) Heterogeneity:
  - Poverty - The estimated modest reduction in domestic violence is more significant for the very poor (similarly for mental health improvements).
  - Informality - Individuals in the informal sector experienced significantly larger and better mental health improvements.
  - Gender - Female respondents experienced "slightly" better mental health effects (but this is not statistically significant).

– Lockdown - Individuals located in previously lockdown areas are more eager to re-allocate their budgets to more consumption (utilities and durables, as expected). These are individuals who might still be battling the persistent economic impacts of the COVID-19-driven lockdowns.

We show robustness of the various findings to the post-double selection LASSO estimation procedure (Belloni et al. [2014]), including adjustments for attrition (Lee [2009], Behaghel et al. [2015]).

We make four main contributions. Mitigation of pandemics can be a daunting task. Policy makers battle on various fronts: tackling the spread of the pandemic while easing the potential welfare impacts of the negative income shock and constraints on individuals and households. Our programs relax binding communication constraints (inability to meet unexpected communication needs and stay connected) and allow us to provide the first experimental evidence on the impact of communication interventions from a nationally representative set of low-income individuals on overall wellbeing and gender relations during pandemics. The provision of phone credit may also be a way to get people to shelter in place or lockdown which could reduce infection during the pandemic. Thus, our results add to the space of potentially resilient policy initiatives aimed at tackling pandemics (mitigating their impacts).

We add to several distinct literatures. First is the economics literature on interpersonal transfers post semi-covariate unexpected shocks (Blumenstock, Eagle and Fafchamps 2015, Pulver 2009, Jack and Suri 2016). We look at a fully-covariate and prolonged shock and randomized communication transfers. There is almost no work on mental health and economic impacts of ICT (Jensen 2007). We offer a short-run view of what ICT does during a pandemic, connecting ICT and mental health. Lastly, we add to the growing research on mental health and economic impacts of disease epidemics (Adhvaryu et al. 2019, Berkouwer

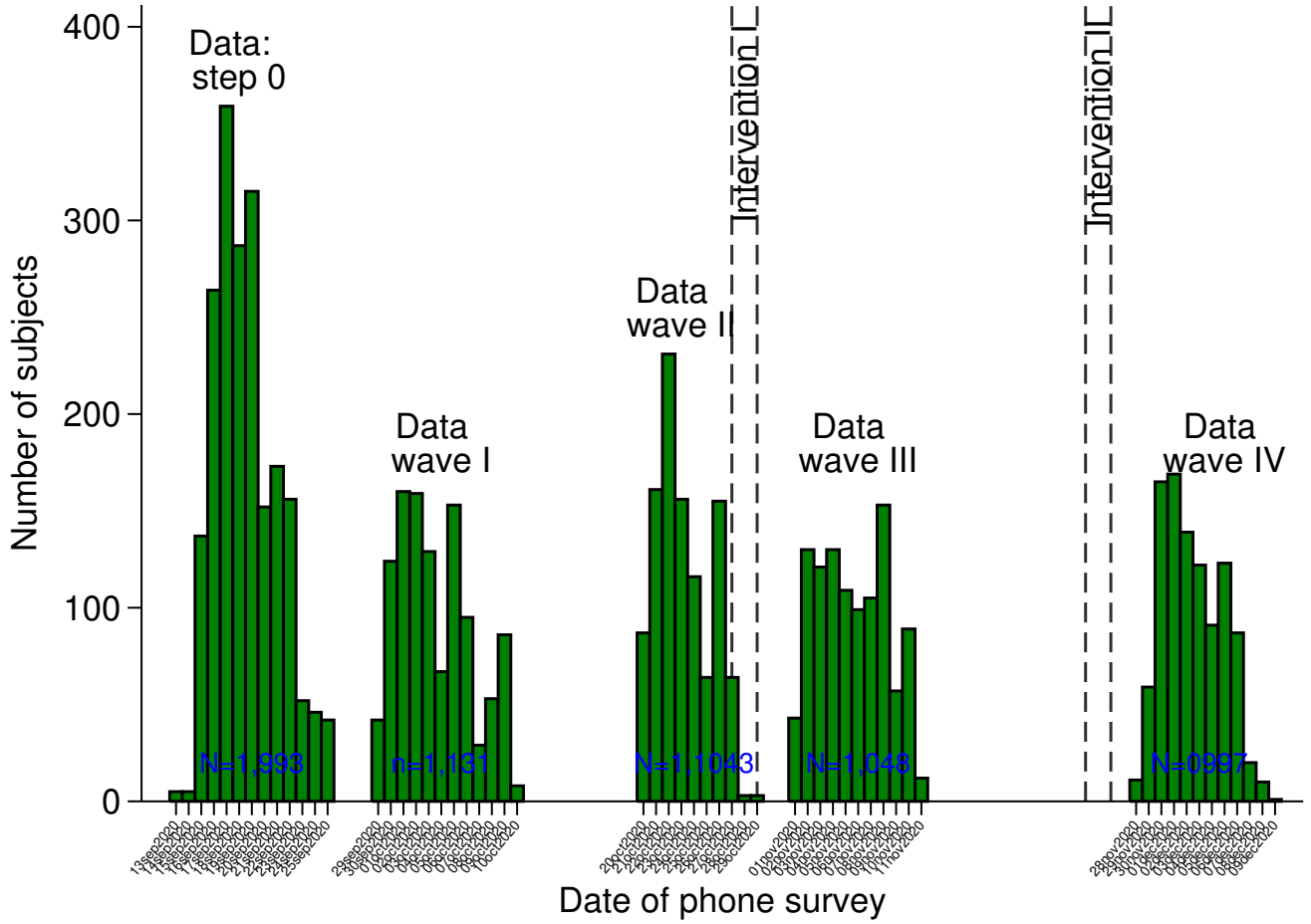
et al. 2020, Banerjee et al. 2020, Archibong and Annan 2020). We cleanly isolate ICT and document how to rely on it to mitigate mental health impacts of pandemics or epidemics.

II Experiment: Design

II.1 Brief Global Review: Communication Interventions

Despite their prevalence, we are not aware of any review that highlights COVID19-induced communication interventions. We begin with a careful and ambitious (yet incomplete) global search of communication-related initiatives that were introduced in response to the COVID-19 pandemic. Details are shown in Tables A.1 and A.2. Our review shows that several communication interventions in different forms and scales (spatial and temporal) have taken place during the crises. Despite their prevalence and potential importance, there is poor evidence on the impacts of such programs during the pandemic on individuals' economic and psychological well-being.

Figure 1: **Data collection and timetable**



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II.2 Context

Our study is set in Ghana. Mobile phone connection penetration is very high: mobile cellular subscriptions is 134 per 100 people in 2019 (rising from 70 per 100 people in 2010), even among the poor (World Bank 2020). We draw on an existing nationally representative baseline frame (GLSS7), which is housed by the implementer of our surveys (Ghana Statistical Service [GSS]). We focus on poor and largely married (91%) individuals (household heads), with over 22%+ poverty rates and have mobile phone and connection access.

Similar to many countries, the pandemic in Ghana has had economic impacts well beyond its health impacts due to the restrictions on mobility and interactions that it triggered. Following the arrival of the first COVID-19 case in Ghana (March 03), the President Nana Akufo-Addo announced a lockdown in the two most economically active regions (specifically, the Greater Accra Metropolitan Area and the Greater Kumasi Metropolitan Area) on March 30, which was later followed with a nation-wide closing of all schools and ban on other activities that extends to these affected regions.

People were advised to stay-at-home and were permitted to leave their homes for essential items such as food, medicine, and water, or to visit the bank and public toilets. Inter-city travel for private and commercial purposes, except for essential goods and services, were suspended. Intra-city travel vehicles reduced their number of passengers to observe social distancing. The borders were closed to all, but returning Ghanaians and foreign nationals with Ghanaian residence permits, who were subject to a 14-day mandatory quarantine *if* the returnees show symptoms of the virus. Over April 20, the lockdown was removed and some of the restrictions were relaxed, yet individuals continue to battle with the persistent impacts of these restrictions and prevailing uncertainty.

Subjects in our surveys are much aware of the pandemic and its associated restrictions on economic activities. Nearly 100% of subjects indicated being aware of COVID-19 and the restrictions, and 79% trust the government and the media to provide accurate statistics

(cases, deaths) of the pandemic. Meanwhile, 68% of subjects reported their need to call or connect with others (family, friends, employers) has unexpectedly increased, yet over 52-62% are sometimes unable to connect as a result of the pandemic and its hardships. This is meaningful as 77% of the respondents are self-employed, 18% are located in previously lockdown regions, and 80% are involved either fully or partially in the informal sector. Table A.6 contains more detailed summaries.

II.3 Measurements

We define the various outcome measures: communication constraints-mitigation, mental health, domestic violence, and consumption expenditures. Communication constraints-(un)mitigation measures the incidence of "(un)mitigated" mobile calls and transfers – asking whether subjects' were unexpectedly confronted with the need to call or connect with others (family, friends, work) but unable to because they *lacked* enough communication resources to remedy the costs. Under such dire and unexpected situations (as it has been during the pandemic), individuals either borrow airtime (i.e., in-kind SOS credit with a service charge of 10% and fully repayable once subscribers recharge their phone accounts with an amount that is more than the outstanding SOS credit amount) or seek digital loans (i.e., short-term digital but cashable loans with an interest of 6.9% over 30 days) from Telecommunication providers. We therefore measure communication constraints-(un)mitigation also based on the incidence of borrowing airtime or seeking digital loan due to unexpected circumstances to connect with others.

Consumption expenditures are measured across food (inside and outside home), utilities, personal care, education, health, and durables (economic well-being). Mental health is measured by the incidence of mental distress (using Kessler Psychological Distress Scale (K10)) (psychological well-being). K10 values can range from 0 (minimum) to 50 (maximum), and values above 30 are classified as severe mental distress (Adhvaryu et al. [2019]). Gender relations reflect domestic violence (DV) and specifically elicit from an individual whether

he/she either threatened or hit his/her partner. "Direct elicitation" of DV is preferred because any potential bias in responses is likely one-sided (under-reports, if any). We take advantage of our short research instrument, which is limited in space, to measure additional variables: subjects' characteristics (poverty, age, gender, educational-level, occupation, etc), awareness and beliefs about COVID-19, and foregoing COVID-19 impacts and communication constraints. We adapted a recently develop short-cut—yet rigorous, inexpensive, simple and transparent—measure of poverty called the "Simple Poverty Scorecard" (Schreiner 2015, Annan 2020). These variables are used to test for randomization balance and explore heterogeneity in treatment effects.

II.4 Intervention and Timetable

We evaluate the impacts of two communication programs: lumpsum mobile credit versus tranches of mobile credit. Our goal is to mitigate binding communication constraints during the pandemic that make (potentially marginal) subject's unable to connect with others when the unexpected need arises. The timetable of baseline and endline activities is displayed in Figure 1. We use the administrative (transaction-level) data to calculate the 50th (75th) percentile purchase for airtime and data combined over the data period to be 188GHS (308GHS) per month. We set the total value of our communication credit intervention for each subject to 40GHS: 21% of the median monthly purchase or equivalently 13% of the 75th percentile monthly purchase. We estimate this amount as sufficient to cover the most basic unexpected communication needs over a month or two. We first conduct three baseline survey waves prior to the deployment of the communication interventions, which include:

- **Treatment program I (Lump-sum):** individuals received 40GHS as mobile credit for one time (not discounted).
- **Treatment program II (Tranches):** 40GHS was split into two and subjects received this as mobile credit in installments (20GHS for two times).

- **Control program:** individuals received no mobile credit.

The communication credit could be used to either make a phone call, transfer airtime, visit the web, or access other social media services. After fielding the first round of interventions (lumpsum and first installment), we conduct two survey waves (endlines) (see, Figure 1). We plan to conduct additional endline survey waves to explore the potential long-term effects of our communication interventions.

II.5 Treatment Assignment

We use a 1x3 factorial design, randomizing a total of 1131 representative subjects into 3 experimental communication programs: lumpsum mobile credit (376 individuals), tranches or installments of mobile credit (371 individuals), and control program (384 individuals). We stratified based on districts, and all misfits are resolved and randomly assigned. The values of the two treatment programs are equal. We partnered with a major Telecommunication company to directly deliver the mobile credits.

II.6 Balance and Validity of Design

II.6.1 Balance

We base our treatment analysis on a comparison of subjects that received the communication treatments with those that did not receive the treatments. Successful randomization of treatments, and thus identification requires that the assignments to treatments (i.e., lumpsum credit versus tranches credit) are independent of any relevant subject-level statistics. To test that these subjects are comparable, we run the regression

$$y_{id} = \alpha + \beta \mathbf{M}_i + \epsilon_{id}$$

on the baseline data (waves 1 and 2), where $\mathbf{M}_i = 1$ if subject i in district d received a

communication credit treatment, 0 otherwise. We consider the various treatments separately and together (meta) for a number of different outcomes, and show that subjects show no observable differences across the two groups. Tables A.3 and A.4 report the pre-treatment balance results, and provides strong evidence in favor of balance with no difference across subjects i in assigned (treated) and non-assigned (control) programs.

II.6.2 Attrition

Our randomization is based on the selected subjects that draws on the baseline GLSS data files and step 0. Table A.5 displays the breakdown of response rates and attrition between baselines and endlines. Here, attrition may be linked to subjects non-response and inability to reach the participants either because their phone numbers are inactive or out of network coverage area. To maximize response rates, trained field officers conducted multiple phone calls (see, Figure A.3) at different time horizons of the day, varying either weekdays or weekends, combined with step 0 that introduced the project and solicited consent of the subjects. If we aggregate all the data rounds, we record an overall attrition rate of 6.5%, which is low given uncertainty during the pandemic. Attrition looks non-differential across treatments. In our empirical estimations, we evaluate and formally show robustness to attrition by treatment status.

III Experiment: Results

We present and discuss the treatment effects. Since all our treatments are about communication (or mobile calling) credit provision, we first report the (combined) meta effect of communication credit assignment, and then the separate effects for the different treatments.

III.1 Empirical Specifications

We estimate treatment effects using the model:

$$y_{idt} = \beta \mathbf{M}_{id} + \mathbf{X}'_{ivd}\xi + \eta_d + \mu_t + \epsilon_{idt}$$

which links various outcome(s) y_{idt} of subject i in district d at date t to the random treatment variable(s) $\mathbf{M}_{id}$, district-level (stratification unit) dummies η_d, date of survey fixed effect μ_t, and additional vector of controls $\mathbf{X}_{ivd}$ which include the baseline outcomes. For the meta effects, $\mathbf{M}_{id}$ is a 0-1 indicator for whether a subject received any of the communication programs, and thus β captures the (meta) treatment effect. For the separate effects, $\mathbf{M}_{id}$ is a 0-1 indicator for whether a subject received a specific communication program. We denote by β_1 and β_2 the separate treatment effects for lumpsum and tranches programs, respectively (i.e., $\beta = (\beta_1, \beta_2)'$).

We take a theory-driven approach and use machine learning (specifically LASSO) to select what out of the long list of controls $\mathbf{X}_{ivd}$ we should include. We do this using the post-double-selection LASSO technique of Belloni et al. (2014). The post-double-selection LASSO for estimating the impacts deals with potential covariate imbalance (*if* any), and thus we achieve good estimation performance, in addition to minimizing researcher degrees of freedom and the possibility for *p*-hacking. All standard errors are clustered at the district-level to account for arbitrary correlations (Cameron and Miller 2015). To evaluate and show robustness for "potential" attrition bias, we report Lee (2009) attrition bounds (trimming based on observed attrition rates; see, Table A.5), Imbens and Manski (2004) confidence sets, and Behaghel et al. (2015) attrition bounds (trimming based on the number of times subjects were called before answering the phone survey; see, Figure A.3).

III.2 Treatment Effects

III.2.1 I. Meta Treatment Effects - Unsaturated

Do communication credit interventions matter for individuals communication? We begin by asking whether the communication programs mitigated subjects' communication constraints. Table 1 pools all the survey rounds and shows the meta effects for alternative communication outcomes. Relative to a control group, individuals inability to make unexpected calls for the past 7 days decreased (-37pp = -74% of control mean), inability to make unexpected

calls due to COVID-19 decreased (-17pp = -38%), unexpected need to borrow SOS airtime decreased dramatically (-22pp = -78%), and to seek digital loans decreased (3.5pp = 44%) as a result fo the communication programs. Figure 2 shows the effects over the trajectory survey-by-survey. The trajectory effects are similar with slightly larger impacts in the second survey wave. These results strongly confirm that the interventions mitigated subjects' binding communication barriers over the pandemic period, showing economically very large and statistically significant decrease in individuals inability to communicate and /or stay connected.

Do pandemic-triggered communication interventions matter for well-being? We next evaluate how the communication programs impacted various well-being outcomes. Table 2 pools together all the survey rounds and shows the meta effects on consumption expenditures. Similarly, Table 3 displays the meta results for mental health and domestic violence. Overall, we find null effect on total expenditures, which is reassuring since the size and specificity of our intervention was not very large enough that it would be plausible to find meaningful impacts on consumption. There are, however, economically very small positive effects on only utilities and durables. In contrast to the null effect on consumption, we find meaningful impacts psychological well-being: mental health and domestic violence. Mental distress (measured by logK10) decreased by -9.8%. Individuals were -6.3% less likely to threaten their partners relative to the control group, but with no effect on the likelihood of hitting their partners. Figure 3 shows similar and consistent effects over the trajectory, and further indicates that severe mental distress decreased (about -2.7pp = -26% of control mean prevalence) in the first survey wave. This effect on severe mental distress was not sustained in the second wave, which we explain in the next results section.

III.2.2 II. Separate Treatment Effects - Saturated

How should communication interventions be delivered during pandemics: one-time large lumpsum or many small installments? Tables 4 and 5 pool all the survey rounds and report the separate treatment effects for each communication program. Table 4 shows that the installment program produces significantly larger mitigation of the communication constraints compared to the lumpsum (p-value < 0.01). Similarly, Table 5 shows larger treatment effects of the installment intervention on mental distress, severe mental distress (measured by K10 values > 30), and on domestic violence measures.

Individuals in the installment credit were less likely (-2.7pp = -26%) to suffer the incidence of several mental distress. There is no pooled effect of the lumpsum credit on severe mental distress, which explains why the meta effect was not sustained in the second wave (Table 3). For consumption, the separate effects are null and indistinguishable across the two communication treatments, which is not surprising because of the the overall null effect on consumption expenditures (Table 2). Figure 5 displays the effects of the separate programs over the trajectory survey-by-survey. What is significant to note is that the installment program has larger and more sustainable effects compared to lumpsum, except for consumption. This provides suggestive evidence of myopic decision making and may reflect either time inconsistency and/ or social pressure problems from receiving one-time large transfers.

III.3 III. Mechanisms

We examine heterogeneity in treatment effects along four dimensions: poverty, informality, gender, and lockdown. The estimates show that our communication impacts operate through the following relevant channels. For poverty, the estimated modest reduction in domestic violence is more significant for the very poor (similarly for mental health improvements), while for informality, individuals in the informal sector experienced significantly larger and better mental health improvements. Next, for gender, the female subjects experienced slightly

better mental health effects (but this is not statistically significant), while for lockdown, individuals located in previously lockdown areas are more eager to re-allocate their budgets to more consumption (utilities and durables, as expected). The latter reflects individuals who might still be battling the persistent economic impacts of the COVID-driven lockdowns. These results are in the right direction, and thus reassuring and provides corroborative support for our main findings.

IV Conclusion

The COVID-19 pandemic uncovered a lot of economic and mental health crises, more particularly for people bound by credit, savings and psychological constraints. This paper provides new experimental evidence on the impact of providing communication transfers during a pandemic. We randomly assigned a nationally representative set of low-income individuals to two candidate communication programs: 40GHS (US$7.0) lump-sum mobile credit versus 20GHS (US$3.5) monthly tranches of mobile credit over two months, and then measured how these affect individuals ability to mitigate unexpected communication constraints during the pandemic, with impacts on well-being: mental health, domestic violence, and consumption expenditures.

Communication during pandemics meaningfully matters for well-being. Our mobile credit interventions led to a notable decrease in unexpected communication constraints: subjects were better able to mitigate their inability to meet unexpected communication needs and stay connected. As a result, the programs led to meaningful well-being improvements particularly on mental health, but modestly on domestic violence and null on overall consumption expenditures. Policy and design: pandemics-triggered communication initiatives that relax potential communication constraints improve psychological well-being and to a modest degree domestic violence. These programs are, however, more valuable *if* they come in as many

installments of communication transfers rather than one-time during pandemics.

Our study presents a simple and targeted field experiment to evaluate the value of communication during pandemics by looking at several outcomes (un-mitigated communication to well-being measures). We randomize mobile phone credit to low-income individuals which may be a way to get people to shelter in place or lockdown and as a result, could reduce infection rates during pandemics. Future work will explore these issues, particularly around the role of communication policy in mitigating the effects of epidemics.

References

[1] Adhvaryu, Achyuta, James Fenske and Anant Nyshadham, 2019. "Early Life Circumstance and Adult Mental Health." *Journal of Political Economy*, 127(4): 1516-1549.

[2] Annan, Francis. 2020. "Misconduct and Reputation under Imperfect Information. Working Paper, Georgia State University.

[3] Archibong, Belinda and Francis Annan. 2020. "Schooling in Sickness and in Health: The Effects of Epidemic Disease on Gender Inequality. Working Paper, Georgia State University.

[4] Banerjee, Abhijit, Paul Niehaus and Tavneet Suri. 2019. "Universal Basic Income in the Developing World." *Annual Review of Economics*, 11(): 959-983.

[5] Banerjee, Abhijit, Michael Faye, Alan Krueger, Paul Niehaus and Tavneet Suri. 2020. "Effects of a Universal Basic Income during the Pandemic." Working paper, UC San Diego.

[6] Belloni Alexandre, Victor Chernozhukov, and Christian Hansen. 2014. "Inference on Treatment Effects after Selection among High-Dimensional Controls." Review of Economic Studies 81(2): 608-650.

[7] Berkouwer S., K. Lee, E. Miguel, and C. Wolfram. 2020. "Resilience to Economic Shocks through Continued Electricity Access." *JEEA Ongoing*.

[8] Blumenstock J., N. Eagle, and M. Fafchamps. 2016. "Airtime Transfers and Mobile Communications: Evidence in the Aftermath of a Natural Disaster." *Journal of Development Economics*, 120(C): 157–81.

[9] Laborde, David, Will Martin, Johan Swinnen and Rob Vos. 2011. "COVID-19 Risks to Global Food Security." *Science*, 369 (6503): 500-502.

[10] Lee, David. 2009. "Training, Wages, and Sample Selection: Estimating Sharp Bounds on Treatment Effects." *Review of Economics Studies*, 76(3): 1071-1102.

[11] Haushofer, Johannes and Jeremy Shapiro. 2013. "Household Response to Income Changes: Evidence from an Unconditional Cash Transfer Program in Kenya." Unpublished Mimeo.

[12] Mullainathan, Sendhil and Eldar Shafir. 2013. *Scarcity: Why Having Too Little Means So Much*, Time Books, Henry Holt and Company LLC.

[13] Ghana Revenue Authority. GRA. 2020. https://gra.gov.gh/news/amendments-to-the-communications-service-tax-act-2008-act-754/

[14] Collins, Y. Pamela, Vikram Patel, Sarah S. Joestl, et al. 2011. "Grand Challenges in Global Mental Health." *Nature*, 475 (7354): 27-30.

[15] Schreiner, Mark. 2015. "Simple poverty scorecard--Poverty-assessment tool for Ghana." Available here: http://www.simplepovertyscorecard.com/GHA_2012_ENG.pdf.

[16] Jensen R. 2007. "The digital provide: Information (Technology), Market Performance, and Welfare in the South Indian Fisheries Sector." *Quarterly Journal of Economics*, 122(3), 879–924.

[17] Jack W., and T. Suri. 2016. "The long-run poverty and gender impacts of mobile money." *Science*, 354 (6317), 1288–1292.

[18] Pulver C. 2009. "The Performance and Impact of MPESA: Preliminary Evidence from a Household Survey." *Presentation to FSD-Kenya*.

[19] World Bank. 2020. "World Development Indicators". Available here: https://data.worldbank.org/indicator/IT.CEL.SETS.P2?locations=GH

Main Results for Text

POOLED ENDLINE SURVEYS

Table 1: **Mitigation of communication constraints**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Unable to Call, 7days 0-1		Unable to Call, COVID19 0-1		Borrow SOS Airtime 0-1		Seek Digital Loan 0-1	
Treatment: Communication Credit (β)	-0.371***	-0.356***	-0.194***	-0.175***	-0.226***	-0.223***	-0.0336***	-0.0352***
	(0.0238)	(0.0246)	(0.0262)	(0.0259)	(0.0177)	(0.0188)	(0.0117)	(0.0125)
Observations	2,045	2,019	2,045	2,019	2,045	2,019	2,045	2,019
District FE	No	Yes	No	Yes	No	Yes	No	Yes
Date FE	No	Yes	No	Yes	No	Yes	No	Yes
Controls	None	Post-Double LASSO	None	Post-Double LASSO	None	Post-Double LASSO	None	Post-Double LASSO
Mean of dep. variable (control)	0.498	0.498	0.452	0.452	0.288	0.288	0.079	0.079
Lee (2009) Attrition Bounds	[-0.424, -0.363]		[-0.239, -0.178]		[-0.282, -0.221]		[-0.079, -0.030]	
Imbens-Manski (2004) CS	[-0.458, -0.335]		[-0.273, -0.148]		[-0.314, -0.197]		[-0.092, -0.015]	

Note: District is the randomization strata. Controls include: subject's age, 0-1 indicator for whether married or not, 0-1 indicator for whether belongs to akan ethnic group or not, 0-1 indicator for whether self employed or not, household size, 0-1 indicator for whether operates in the informal sector, monthly personal income over an ordinal scale of 1 to 5, 0-1 indicator for whether attained junior high school (JHS) education, and subject's gender. The double-post LASSO specification considers all subject controls, and individual district and survey date fixed effects in the possible control set. Observations are at the subject × date level. Clustered standard errors (at the district level) are reported in parentheses. *** p<0.01 (1% level), ** p<0.05 (5% level), * p<0.1 (10% level). 90% confidence sets (CS) around attrition bounds are reported in brackets. Behaghel et al. (2015) attrition bounds (not reported) are tighter.

Table 2: **Impacts of communication programs on consumption expenses**

	(1) Total (GHS) Expenditure	(2) Food-In (GHS)	(3) Food-Out (GHS)	(4) Utilities (GHS)	(5) Personal care (GHS)	(6) Educ. (GHS)	(7) Health (GHS)	(8) Durables (GHS)
Treatment: Communication Credit (β)	7.582	-6.261	1.267	4.826**	1.692	1.101	-3.680	8.575***
	(12.22)	(6.212)	(3.869)	(1.927)	(2.504)	(2.074)	(4.145)	(2.702)
Observations	2,019	2,019	2,019	2,019	2,019	2,019	2,019	2,019
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Date FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Post-Double LASSO	Post-Double LASSO	Post-Double LASSO	Post-Double LASSO	Post-Double LASSO	Post-Double LASSO	Post-Double LASSO	Post-Double LASSO
Mean of dep. variable (control)	219.1	125.2	45.95	8.297	8.299	6.943	21.98	2.306
Lee (2009) Attrition Bounds	[-26.423, 24.892]	[-22.275, 0.426]	[-9.990, 7.319]	[-3.339, 5.251]	[-2.645, 3.171]	[-6.296, 1.679]	[-13.572, -1.858]	[-1.425, 9.093]
Imbens-Manski (2004) CS	[-40.599, 37.968]	[-29.700, 7.406]	[-15.275, 11.894]	[-5.524, 7.454]	[-4.842, 5.434]	[-8.295, 4.307]	[-17.586, 2.486]	[-3.177, 11.415]

Note: District is the randomization strata. Controls include: subject's age, 0-1 indicator for whether married or not, 0-1 indicator for whether belongs to akan ethnic group or not, 0-1 indicator for whether self employed or not, household size, 0-1 indicator for whether operates in the informal sector, monthly personal income over an ordinal scale of 1 to 5, 0-1 indicator for whether attained junior high school (JHS) education, and subject's gender. The double-post LASSO specification considers all subject controls, and individual district and survey date fixed effects in the possible control set. Observations are at the subject × date level. Clustered standard errors (at the district level) are reported in parentheses. *** p<0.01 (1% level), ** p<0.05 (5% level), * p<0.1 (10% level). 90% confidence sets (CS) around attrition bounds are reported in brackets. Behaghel et al. (2015) attrition bounds (not reported) are tighter.

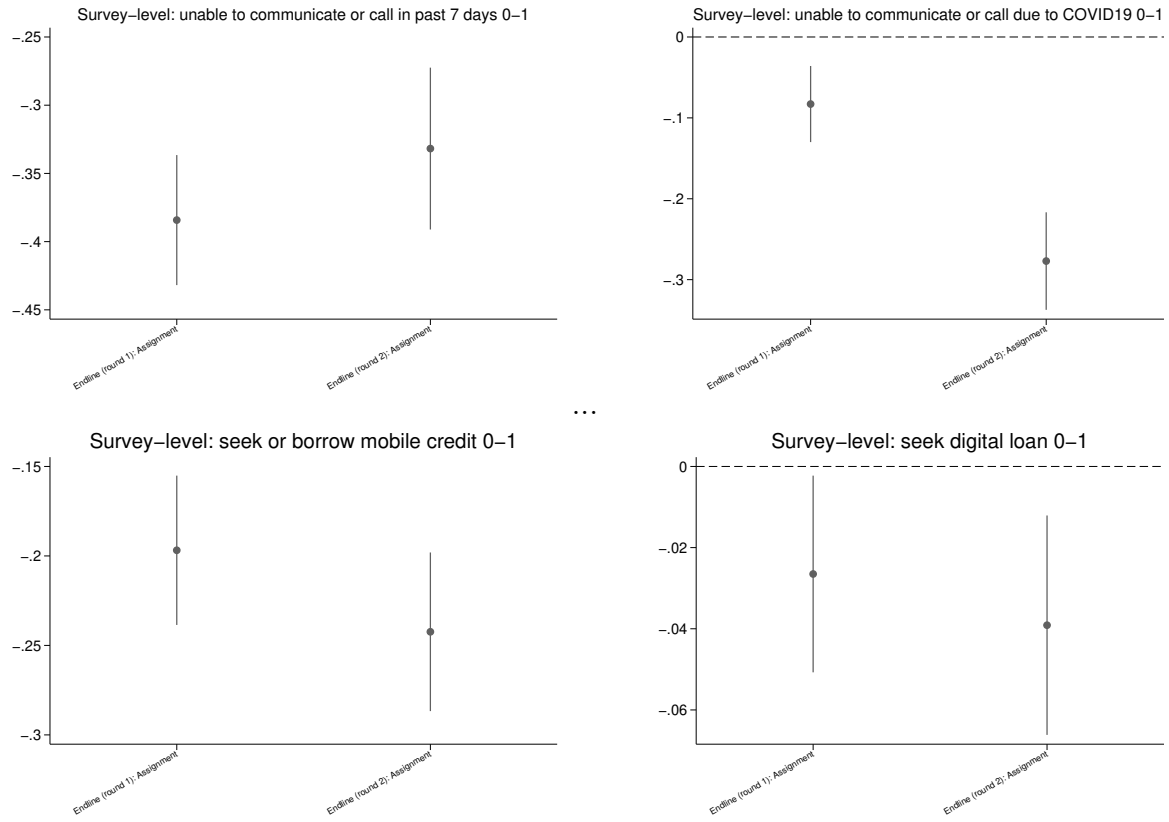
Table 3: **Impacts of communication programs on mental health and domestic violence**

	(1) Threatened Partner 1-4	(2) Hit Partner 1-4	(3) log K10	(4) Severe Distress 0-1
Treatment: Communication Credit (β)	-0.0788**	-0.0427	-0.0980***	-0.0051
	(0.0378)	(0.0354)	(0.0140)	(0.0085)
Observations	2,019	2,019	2,019	2,019
District FE	Yes	Yes	Yes	Yes
Date FE	Yes	Yes	Yes	Yes
Controls	Post-Double LASSO	Post-Double LASSO	Post-Double LASSO	Post-Double LASSO
Mean of dep. variable (control)	1.247	1.166	2.704	0.101
Lee (2009) Attrition Bounds	[-0.197, -0.056]	[-0.158, -0.017]	[-0.147, -0.112]	[-0.025, -0.003]
Imbens-Manski (2004) CS	[-0.238, -0.014]	[-0.198, 0.023]	[-0.168, -0.093]	[-0.033, 0.006]

Note: District is the randomization strata. Controls include: subject's age, 0-1 indicator for whether married or not, 0-1 indicator for whether belongs to akan ethnic group or not, 0-1 indicator for whether self employed or not, household size, 0-1 indicator for whether operates in the informal sector, monthly personal income over an ordinal scale of 1 to 5, 0-1 indicator for whether attained junior high school (JHS) education, and subject's gender. The double-post LASSO specification considers all subject controls, and individual district and survey date fixed effects in the possible control set. Observations are at the subject $\times$ date level. Clustered standard errors (at the district level) are reported in parentheses. *** p<0.01 (1% level), ** p<0.05 (5% level), * p<0.1 (10% level). 90% confidence sets (CS) around attrition bounds are reported in brackets. Behaghel et al. (2015) attrition bounds (not reported) are tighter.

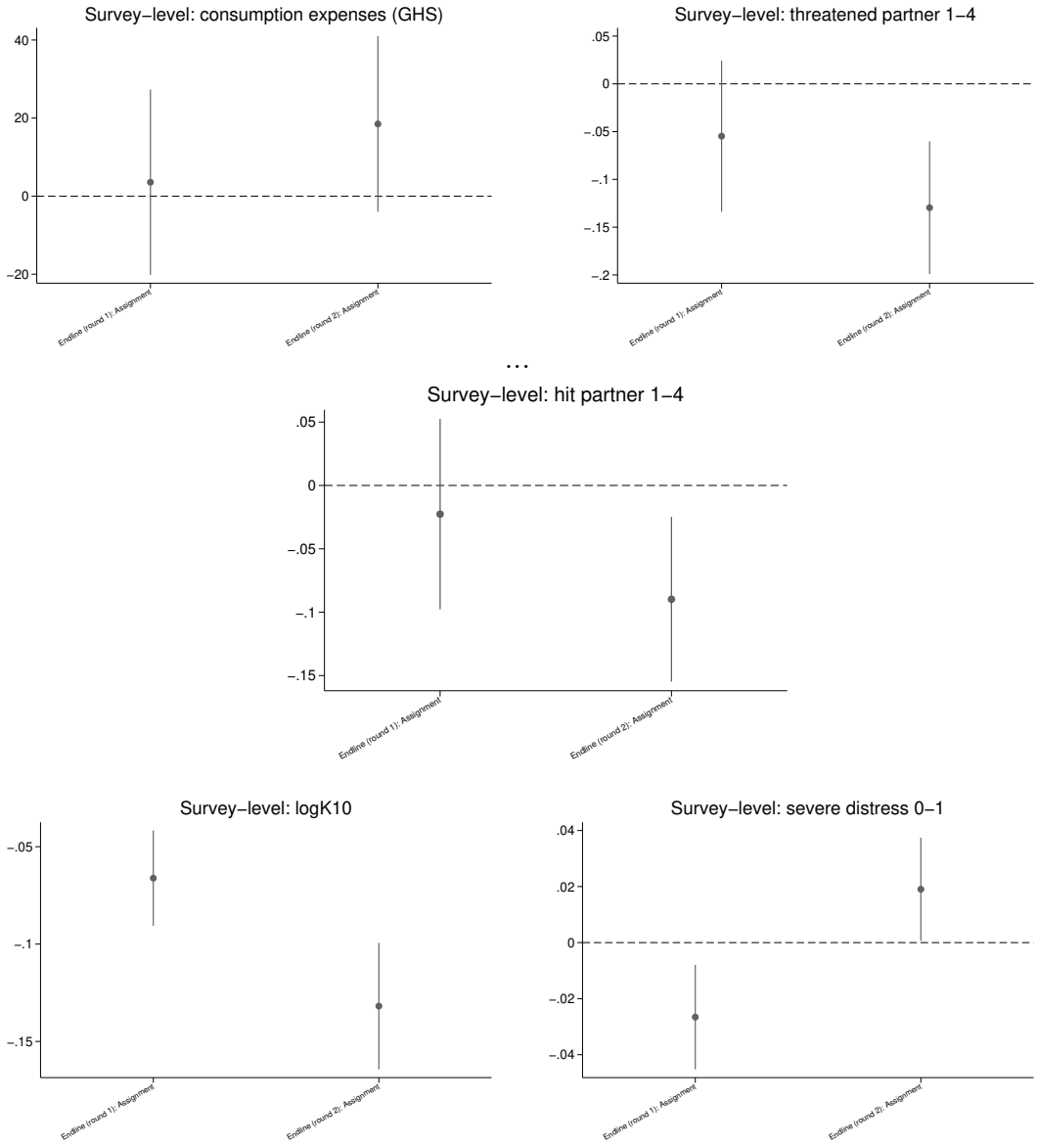
EFFECTS OVER TRAJECTORY

Figure 2: **MITIGATION OF COMMUNICATION CONSTRAINTS**



Note: District is the randomization strata. Controls include: subject's age, 0-1 indicator for whether married or not, 0-1 indicator for whether belongs to akan ethnic group or not, 0-1 indicator for whether self employed or not, household size, 0-1 indicator for whether operates in the informal sector, monthly personal income over an ordinal scale of 1 to 5, 0-1 indicator for whether attained junior high school (JHS) education, and subject's gender. The double-post LASSO specification considers all subject controls, and individual district and survey date fixed effects in the possible control set. Observations are at the subject $\times$ date level. Standard errors are clustered at the district level. 90% confidence intervals are displayed around the estimates.

Figure 3: **IMPACTS OF COMMUNICATION PROGRAMS ON WELL-BEING MEASURES**



Note: District is the randomization strata. Controls include: subject's age, 0-1 indicator for whether married or not, 0-1 indicator for whether belongs to akan ethnic group or not, 0-1 indicator for whether self employed or not, household size, 0-1 indicator for whether operates in the informal sector, monthly personal income over an ordinal scale of 1 to 5, 0-1 indicator for whether attained junior high school (JHS) education, and subject's gender. The double-post LASSO specification considers all subject controls, and individual district and survey date fixed effects in the possible control set. Observations are at the subject × date level. Standard errors are clustered at the district level. 90% confidence intervals are displayed around the estimates.

POOLED ENDLINE SURVEYS

Table 4: **Mitigation of communication constraints**

	(1) Unable to Call, 7days 0-1	(2) Unable to Call, COVID19 0-1	(3) Borrow SOS Airtime 0-1	(4) Seek Digital Loan 0-1
Treatment: Lumpsum	-0.280***	-0.125***	-0.183***	-0.0228*
Credit (β_1)	(0.0286)	(0.0313)	(0.0215)	(0.0134)
Lee (2009) Attrition Bounds	[-0.108, -0.069]	[-0.038, 0.001]	[-0.088, -0.049]	[-0.033 0.005]
Imbens-Manski (2004) CS	[-0.137, -0.042]	[-0.069, 0.030]	[-0.114, -0.029]	[-0.055, 0.0197]
Treatment: Tranche	-0.439***	-0.225***	-0.266***	-0.0447***
Credit (β_2)	(0.0254)	(0.0273)	(0.0197)	(0.0144)
Lee (2009) Attrition Bounds	[-0.310, -0.289]	[-0.197, -0.176]	[-0.190, -0.169]	[-0.056, -0.035]
Imbens-Manski (2004) CS	[-0.337, -0.268]	[-0.229, -0.148]	[-0.214, -0.153]	[-0.078, -0.022]
Observations	2,019	2,019	2,019	2,019
District FE	Yes	Yes	Yes	Yes
Date FE	Yes	Yes	Yes	Yes
Controls	Post-Double LASSO	Post-Double LASSO	Post-Double LASSO	Post-Double LASSO
Mean of dep. variable (control)	0.458	0 .415	0.265	0.073
p-value (test: β_1=β_2)	0.000	0.000	0.000	0.008

Note: District is the randomization strata. Controls include: subject's age, 0-1 indicator for whether married or not, 0-1 indicator for whether belongs to akan ethnic group or not, 0-1 indicator for whether self employed or not, household size, 0-1 indicator for whether operates in the informal sector, monthly personal income over an ordinal scale of 1 to 5, 0-1 indicator for whether attained junior high school (JHS) education, and subject's gender. The double-post LASSO specification considers all subject controls, and individual district and survey date fixed effects in the possible control set. Observations are at the subject × date level. Clustered standard errors (at the district level) are reported in parentheses. *** p<0.01 (1% level), ** p<0.05 (5% level), * p<0.1 (10% level). 90% confidence sets (CS) around attrition bounds are reported in brackets. Behaghel et al. (2015) attrition bounds (not reported) are tighter.

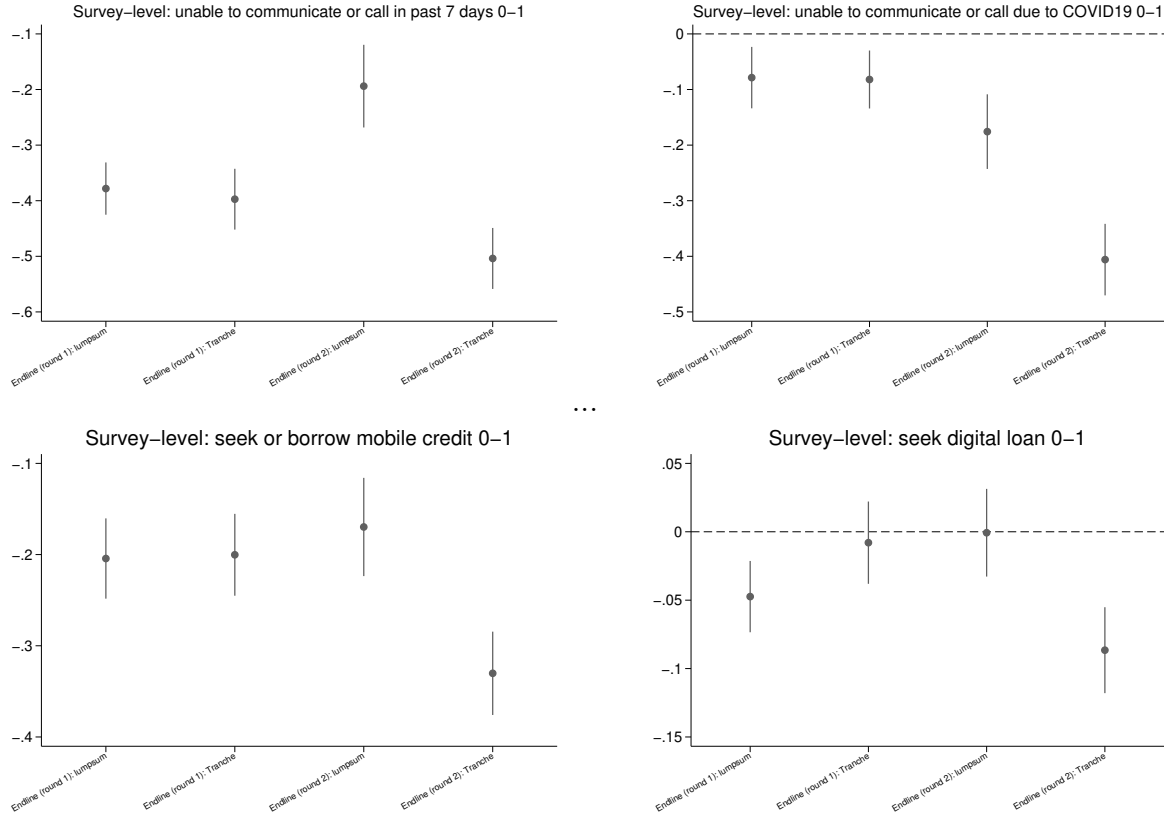
Table 5: **Impacts of communication programs on well-being measures**

	(1) Total (GHS) Expenditure	(2) Threatened Partner 1-4	(3) Hit Partner 1-4	(4) log K10	(5) Severe Distress 0-1
Treatment: Lumpsum	6.715	-0.0432	-0.0195	-0.0584***	0.0121
Credit (β_1)	(14.16)	(0.0415)	(0.0409)	(0.0154)	(0.0105)
Lee (2009) Attrition Bounds	[18.915, 16.809]	[-0.084, 0.031]	[-0.079, 0.035]	[-0.022, 0.008]	[-0.010, 0.028]
Imbens-Manski (2004) CS	[33.490, 30.054]	[-0.117, 0.072]	[-0.111, 0.075]	[-0.045, 0.027]	[-0.031, 0.039]
Treatment: Tranche	11.83	-0.121***	-0.121***	-0.141***	-0.027***
Credit (β_2)	(14.17)	(0.0450)	(0.0450)	(0.0160)	(0.00749)
Lee (2009) Attrition Bounds	[-15.773, 7.861]	[-0.171, -0.086]	[-0.136, -0.052]	[-0.134, -0.119]	[-0.032, -0.031]
Imbens-Manski (2004) CS	[-32.233, 21.343]	[-0.254, -0.045]	[-0.219, -0.012]	[-0.153, -0.102]	[-0.040, -0.023]
Observations	2,019	2,019	2,019	2,019	2,019
District FE	Yes	Yes	Yes	Yes	Yes
Date FE	Yes	Yes	Yes	Yes	Yes
Controls	Post-Double LASSO	Post-Double LASSO	Post-Double LASSO	Post-Double LASSO	Post-Double LASSO
Mean of dep. variable (control)	219.573	1.247	1.166	2.704	0.152
p-value (test: β_1=β_2)	0.703	0.023	0.116	0.000	0.000

Note: District is the randomization strata. Controls include: subject's age, 0-1 indicator for whether married or not, 0-1 indicator for whether belongs to akan ethnic group or not, 0-1 indicator for whether self employed or not, household size, 0-1 indicator for whether operates in the informal sector, monthly personal income over an ordinal scale of 1 to 5, 0-1 indicator for whether attained junior high school (JHS) education, and subject's gender. The double-post LASSO specification considers all subject controls, and individual district and survey date fixed effects in the possible control set. Observations are at the subject × date level. Clustered standard errors (at the district level) are reported in parentheses. *** p<0.01 (1% level), ** p<0.05 (5% level), * p<0.1 (10% level). 90% confidence sets (CS) around attrition bounds are reported in brackets. Behaghel et al. (2015) attrition bounds (not reported) are tighter.

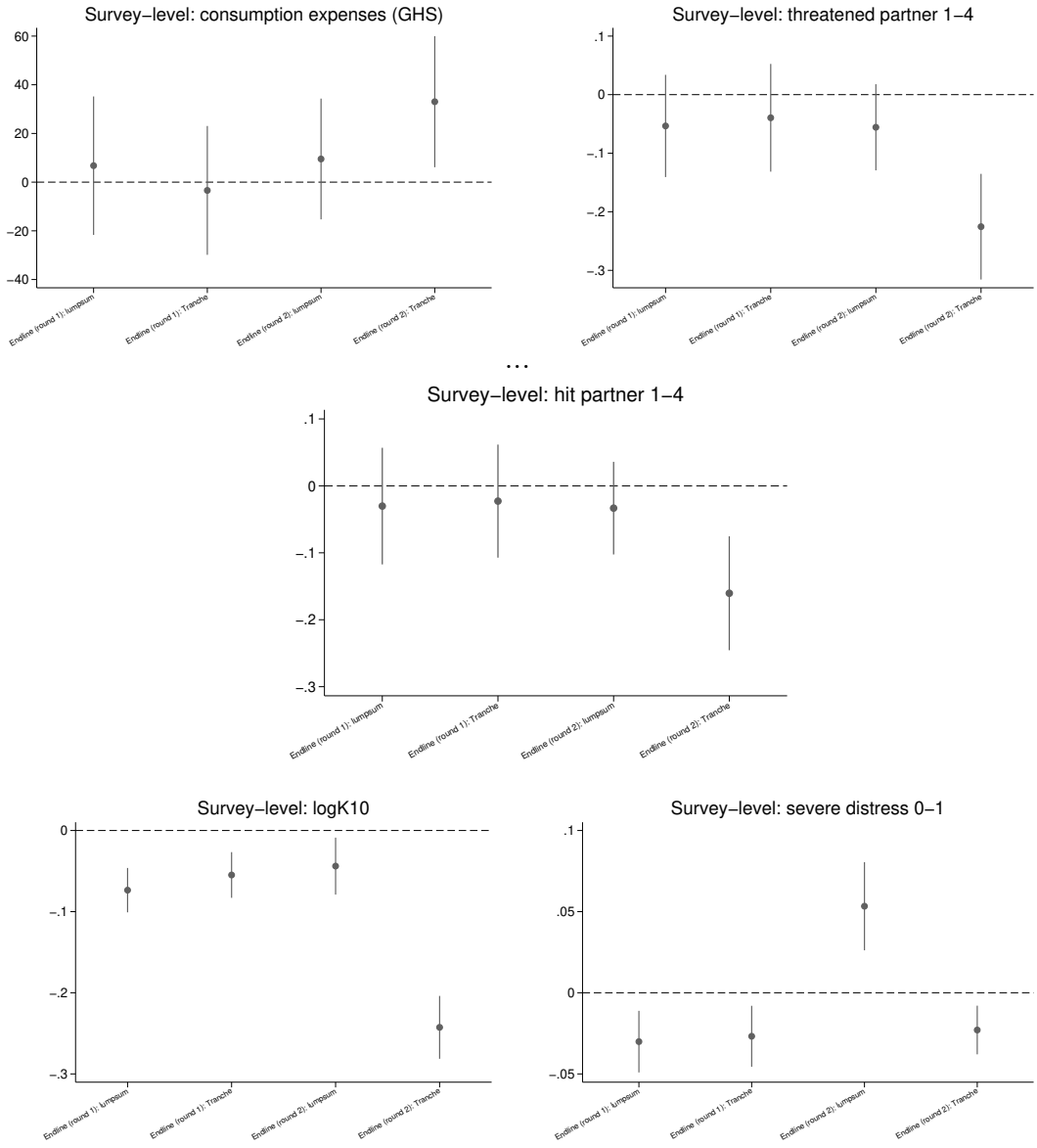
EFFECTS OVER TRAJECTORY

Figure 4: **MITIGATION OF COMMUNICATION CONSTRAINTS**



Note: District is the randomization strata. Controls include: subject's age, 0-1 indicator for whether married or not, 0-1 indicator for whether belongs to akan ethnic group or not, 0-1 indicator for whether self employed or not, household size, 0-1 indicator for whether operates in the informal sector, monthly personal income over an ordinal scale of 1 to 5, 0-1 indicator for whether attained junior high school (JHS) education, and subject's gender. The double-post LASSO specification considers all subject controls, and individual district and survey date fixed effects in the possible control set. Observations are at the subject $\times$ date level. Standard errors are clustered at the district level. 90% confidence intervals are displayed around the estimates.

Figure 5: **IMPACTS OF COMMUNICATION PROGRAMS ON WELL-BEING**



Note: District is the randomization strata. Controls include: subject's age, 0-1 indicator for whether married or not, 0-1 indicator for whether belongs to akan ethnic group or not, 0-1 indicator for whether self employed or not, household size, 0-1 indicator for whether operates in the informal sector, monthly personal income over an ordinal scale of 1 to 5, 0-1 indicator for whether attained junior high school (JHS) education, and subject's gender. The double-post LASSO specification considers all subject controls, and individual district and survey date fixed effects in the possible control set. Observations are at the subject × date level. Standard errors are clustered at the district level. 90% confidence intervals are displayed around the estimates.

V Appendix

V.1 Global Review of Communication Programs – Motivating Evidence I

Table A.1: **A Global review of COVID-19 communication interventions**

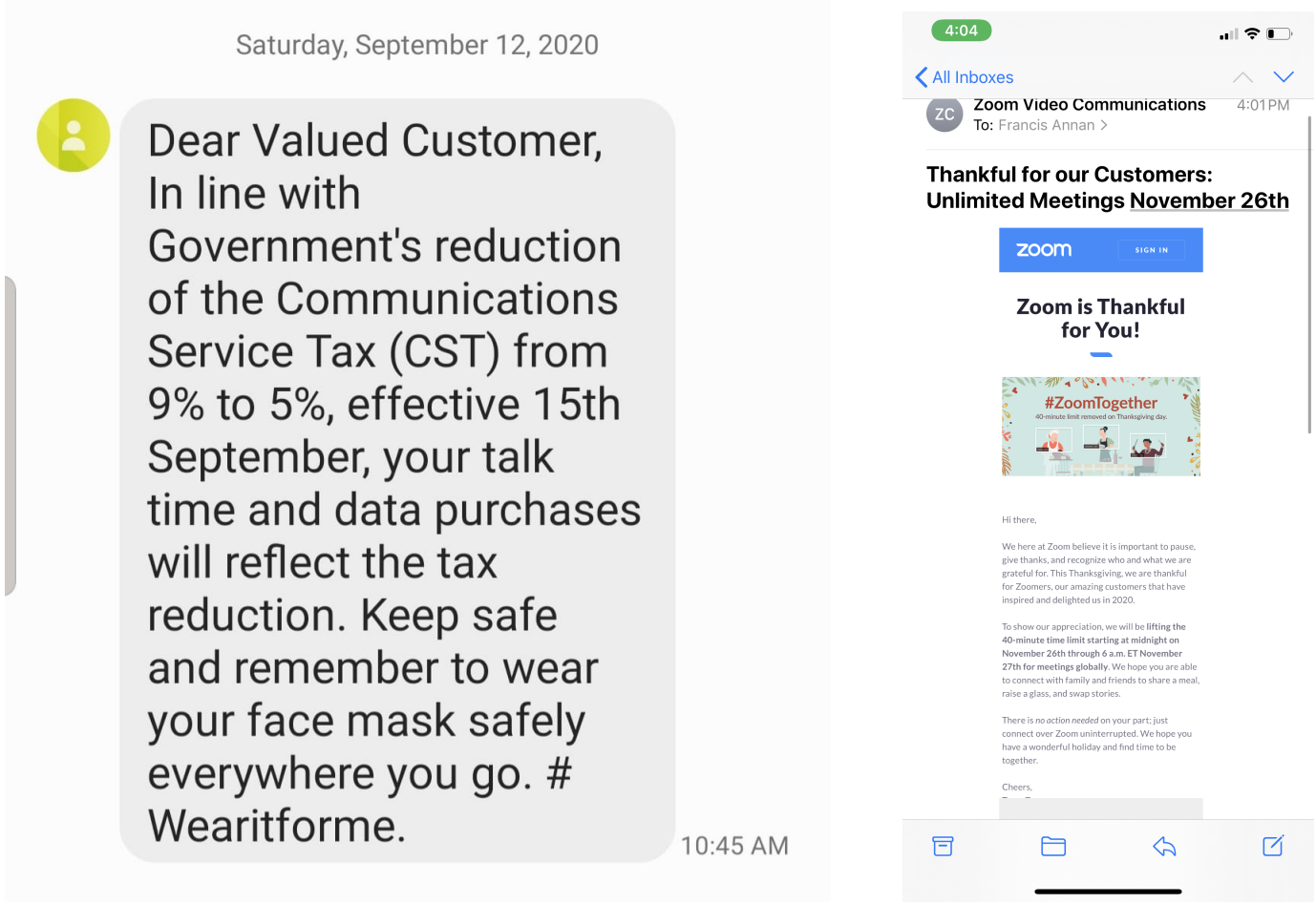
Setting	Entity	Details and source(s)	Date started	Date ended
United States	Government **FCC**	*FCC launched the program Keep Americans Connected in which communications companies agreed on not terminating the internet services of Americans in case they do not keep up to date with payments of internet and telephone bills in response to the COVID-19 crisis. The companies opened their Wi-fi hotspots for the population.	03/13/2020	06/30/2020
		*FCC also maintained other communication initiatives during the pandemic such as granting ATT to use additional spectrum in Puerto Rico and Virgin Islands in order to improve and expand the internet connectedness in these territories.	03/26/2020	Ongoing
		*FCC waived temporarily its rules to Inteliquent to Zoom and WebEx in order to stimulate and help consumers who now need strictly in these services to study and work. **Source:** https://www.fcc.gov/keep-americans-connected	03/27/2020	06/01/2020
	Companies	**ATT Inc.:** *Provided free 10GB of internet data per month for 60 days as a temporary relief to eligible customers to be able to stay connected during the difficult times, starting March 27, 2020. **Source:** https://about.att.com/newsroom/2020/covid_19_att_prepaid.html	03/27/2020	MM/DD/YYYY
		Comcast Corp.: Provided essential internet and mobile services without charge to low-income families, including seniors, veterans and people with disabilities in the United States. **Source:** https://corporate.comcast.com/covid-19	MM/DD/YYY	Ongoing
		Amazon: *Donated 8,200 laptops to students who attend public schools in Seattle and 4,000 laptops for high school students across the US through the Amazon Future Engineer program.	04/06/2020	–
		*Made many videos on Amazon Prime free for anyone during the stay at home orders period. Content included cartoons and family friendly movies. In addition to that, Amazon made many of its books free for the public who could download them as PDFs. **Source:** https://www.aboutamazon.com/news/company-news/amazons-covid-19-blog-updates-on-how-were-responding-to-the-crisis	DD/03/2020	Ongoing
		Microsoft: *Microsoft has supported the local education of Washington state during the Pandemic by making the Virtual Classroom and Teams available for free. It has also created training sessions for teachers of the state and helped schools in the districts to increase their phone lines to accommodate more parents and studentsâ phone calls. *Microsoft is also working with the Washington stateâs government to build more broadband spots around the state to help more people have access to the internet through the Airban initiative. The company also brought emergency coverage to 29 school districts of the state. **Source:** https://news.microsoft.com/on-the-issues/2020/04/17/microsoft-covid-19-washington-state/	03/16/2020	Ongoing
Ghana	Government	The Government reduced the Communication Service Tax (CST) from 9pct to 5pct which reflected a reduction in the cost of mobile talk time and data purchases, effective September 15, 2020 in response to COVID-19 **Source:** https://gra.gov.gh/news/amendments-to-the-communications-service-tax-act-2008-act-754/	09/15/2020	Ongoing
Brazil	Government	*The government signed an agreement with Cisco in late May in order to launch the program âBrasil Digital e Inclusivoâ (Digital and Inclusive Brazil) that has as its goal to accelerate the technological and digital development of the country. As a response to the COVID-19 crisis, the program aims to facilitate and accelerate telemedicine in the country.	05/27/2020	Ongoing
		*13.6 million of Brazilians live in the âfavelasâ (slums) and usually have restricted access to technology and communication systems. In this way, in order to bring awareness about the pandemic to the most vulnerable in Brazil, NGOs, journalists and activists have used alternative methods of communication in the population.	DD/03/2020	Ongoing
		*The Brazilian government launched a program to distribute technological equipment and access to the internet for students of the public school system in the country. The initiative will cost approximately $R2.5 billions and the Brazilian Agency of Communications (Anatel) will be responsible to implement it and distribute the materials. **Source:** https://newsroom.cisco.com/feature-content?type=webcontent&articleId=2076852	09/18/2020	Ongoing
Ecuador	Government	Similar to the most Favelas communities in Brazil, Ecuador also has a significant population that has limited access to technology and communication channels. These are indigenous communities in which the government and other organizations such as UNESCO have approached in regards to the pandemic in a very strategic way. They have been taking advantage of the communication channels that the indigenous communities have even though they are very scarce. Webpages directed to these communities that address COVID were created, audios and videos were produced by UNESCO and the organizations as well as others have been conducting cultural activities with the communities in order to bring awareness and information about the pandemic. **Source:** https://en.unesco.org/news/media-and-communications-indigenous-peoples-pandemic	03/DD/2020	Ongoing
Global /United States	Company-**Zoom**	**ZoomTogether** Zoom removed the 40 minutes time limit for free accounts during Thanksgiving as an initiative to help families and friends communicate during the holiday season even if they were distant to each other During Thanksgiving Day, anyone was able to make video conferences longer than 40 minutes through Zoom without being interrupted. **Source 1:** https://www.cnn.com/2020/11/17/tech/zoom-time-limit-thanksgiving-trnd-wellness/index.html	11/26/2020	11/27/2020

Table A.2: **CONT'D: A Global review of covid-19 communication interventions**

Setting	Entity	Details and source(s)	Date started	Date ended
Global	Company- **Google**	*Google has donated USD10 million for Distance Learning Fund that supports organizations across the globe which help students who have had to adapt to online learning but do not have access to resources to do so *Google has also partnered with many universities around the world and distributed AI tools and mechanisms to help them keep track of the development of COVID-19 in the world and spread information about it for all. **Source 1:** https://www.google.org/covid-19/#distance-learning **Source 2:** https://blog.google/outreach-initiatives/google-org/google-supports-covid-19-ai-and-data-analytics-projects/	03/DD/2020 DD/03/2020	- Ongoing
Global	Company- **Transperfect**	*Transperfect has been translating and delivering materials and information about COVID-19 across the globe. The work has been so helpful that the company won the International Business Award for COVID-19 Communication Initiatives. *The company produced videos of COVID-19 prevention tips in more than 11 languages and personalized it for companies for free. **Source:** https://www.prnewswire.com/news-releases/transperfect-wins-international-business-award-for-covid-19-communications-initiatives-301134747.html	DD/03/2020	Ongoing
Europe and United States	Companies- **Netflix, Youtube, Streaming services**	These companies have been slowing down and decreasing the streaming quality of their videos since March in Europe and also in the US. The initiative is an attempt to help with the internet traffic and higher latency and packet loss caused by the high usage of the internet by households after stay at home orders took place in Europe and in the US. **Source 1:** https://www.cnn.com/2020/03/19/tech/netflix-internet-overload-eu/index.html **Source 2:** https://latest-news-viral.blogspot.com/2020/03/streaming-in-time-of-covid-19-youtube.html	03/DD/2020	Ongoing
Global /India	Company- **Facebook**	*Facebook has been partnering with governments in order to spread accurate information about the pandemic. An interesting and important partnership was with Indiaâs government that has been relying a lot on social media in order to spread awareness and information about COVID-19. Other than social media, Indian local governments have also developed and used apps that monitor COVID-19 in the country, by using Information and Communications Technology (ICT) and Artificial Intelligence (AI). *These apps are helpful and very informative, but a significant part of the population in India does not have access to the internet which shows how the âDigital Divideâ in India has deepened the social, health and educational inequalities in the country. **Source 1:** https://about.fb.com/news/2020/11/coronavirus/; **Source 2:** https://www.bbc.com/news/world-asia-india-53471749 **Source 3:** https://www.weforum.org/agenda/2020/10/how-covid-19-deepens-the-digital-education-divide-in-india/ **Source 4:** https://academiccommons.columbia.edu/doi/10.7916/d8-bbw6-yt70 *Download the paper to see all the apps created* **Source 5:** ttps://www.weforum.org/agenda/2020/10/how-covid-19-deepens-the-digital-education-divide-in-india/	03/DD/2020	Ongoing

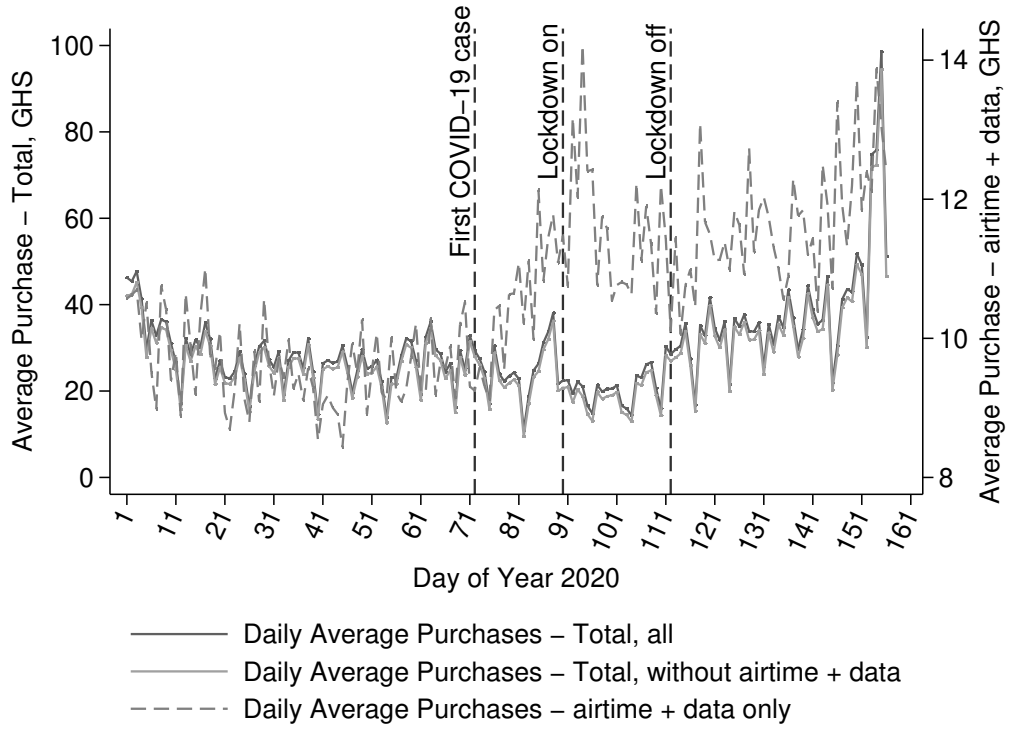
V.2 Exhibits

Figure A.1: **Communication programs**



V.3 Administrative Data – Motivating Evidence II

Figure A.2: **Mobile financial transactions during covid-19**



Note: Transaction data from a major local telecommunication company – based on 694,695 transactions (2,0751 random unique subscribers)

V.4 Balance and Attrition

Table A.3: **Balance test: pre-intervention treatment-control differences**

	Constant	**Lumpsum**	**Tranches**
Communication Measures (Wave 1)			
Unable to call in past 7days 0-1	0.647***	-0.027	-0.008
	(0.026)	(0.035)	(0.036)
Unable to call due to COVID19 0-1	0.584***	-0.018	-0.058
	(0.027)	(0.037)	(0.037)
Borrow airtime 0-1 (Wave 2)	0.296***	0.030	0.039
	(0.0257)	(0.036)	(0.036)
Seek digital loan 0-1 (Wave 2)	0.085***	0.002	0.004
	(0.015)	(0.023)	(0.022)
Well-being Measures (Wave 1)			
Total Expenditure (GHS)	319.802***	24.668	-7.345
	(24.197)	(33.046)	(31.539)
Food expenses inside home (GHS)	129.899***	-3.688	-6.042
	(6.464)	(8.067)	(6.464)
Food expenses outside home (GHS)	49.495***	7.588	3.010
	(4.369)	(4.962)	(5.226)
Utilities expenses (GHS)	7.071***	4.260	-2.373
	(1.846)	(4.126)	(2.265)
Personal care expenses (GHS)	8.352***	0.129	-0.457
	(2.446)	(2.500)	(2.791)
Education expenses (GHS)	6.991***	1.619	5.491
	(1.897)	(3.200)	(3.873)
Health expenses (GHS)	29.564***	-10.082	-3.584*
	(5.528)	(5.922)	7.764
Durables expenses (GHS)	3.017	15.436***	6.529**
	(1.833)	(5.604)	(3.101)
Threatened Partner (1(never) to 4 (very often) scale)	1.194***	0.036	-0.026
	(0.040)	(0.051)	(0.048)
Hit Partner (1(never) to 4 (very often) scale)	1.194***	0.036	-0.026
	(0.040)	(0.050)	(0.048)
log K10	2.833***	-0.012	-0.008
	(0.019)	(0.024)	(0.026)
Severe Distress 0-1	0.103***	-0.024	0.010
	(0.016)	(0.022)	(0.022)
I'm tired (mentally, emotionally, or socially) of COVID-19	0.527***	-0.001	0.036
	(0.026)	(0.035)	(0.039)
Corroborative Mental Health Measures (Wave 1)			
I'm depressed (1(disagree) to 5(agree) scale)	1.630***	-0.055	-0.005
	(0.050)	(0.066)	(0.075)
I'm relaxed (1(disagree) to 5(agree) scale)	2.882***	-0.043	0.062
	(0.086)	(0.095)	(0.093)
I'm satisfied with life, all else equal (1(disagree) to 5(agree) scale)	2.501***	-0.090	0.149
	(0.080)	(0.095)	(0.091)
I'm satisfied with finances, all else equal (1(disagree) to 5(agree) scale)	2.057***	-0.068	0.108
	(0.064)	(0.073)	(0.084)

Note: Observations are at the subject level. Each row is a separate regression. Clustered standard errors (at the district level) are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

Table A.4: **Balance test: pre-intervention treatment-control differences**

	Constant	**Lumpsum**	**Tranches**
Baseline Controls (Wave 1)			
Female 0-1	0.140***	0.006	-0.003
	(0.018)	(0.022)	(0.023)
Akan ethnic 0-1	0.383***	-0.023	-0.008
	(0.033)	(0.030)	0.034
Married 0-1	0.916***	0.023	0.001
	(0.014)	(0.017)	(0.020)
Attained Junior High School (JHS) 0-1	0.790***	-0002	-0.023
	(0.022)	(0.031)	(0.029)
Household size (number)	7.300***	-0.306	-0.885***
	0.273***	(0.343)	(0.249)
Self employed 0-1	0.808***	-0.061	-0.020
	(0.021)	(0.029)	(0.031)
Operates in informal sector 0-1	0.833***	-0.045	0.006
	(0.020)	(0.028)	(0.027)
Personal income (1 to 5 scale) (monthly)	1.610***	-0.001	0.017
	(0.056)	(0.067)	(0.072)
Self does housework during COVID19 0-1	0.171***	-0.011	-0.003
	(0.019)	(0.025)	(0.027)
In previously lockdown region 0-1	0.186***	0.008	-0.008
	(0.046)	(0.011)	(0.014)
Aware of COVID-19 0-1	0.994***	0.002	0.005
	(0.004)	(0.004)	(0.004)
Trust Government's estimates about COVID-19 0-1	3.343***	0.025	0.036
	(0.052)	(0.058)	(0.061)
Has relocated / moved in past 7days 0-1 (Wave 2)	0.012*	0.002	0.0023
	(0.007)	(0.0078)	(0.0067
More Baseline Controls (Wave 0)			
Poverty rate (%) (Schneider 2005)	24.035***	-2.272	-2.298
	(1.569)	(1.375)	(1.468)
Staying together with mother 0-1	0.065***	0.004	-0.001
	(0.013)	(0.017)	(0.018)
Has no religion 0-1	0.054***	0.004	-0.002
	(0.011)	(0.014)	(0.017)
Staying together with spouse 0-1	0.891***	-0.043*	-0.013
	(0.015)	(0.023)	(0.022)
Age at marriage (Years)	24.692***	0.186	0.472
	(0.273)	(0.383)	(0.370)
Joint F-test (linear), p-value		0.792	
Chi-squared test (probit), p-value		0.829	

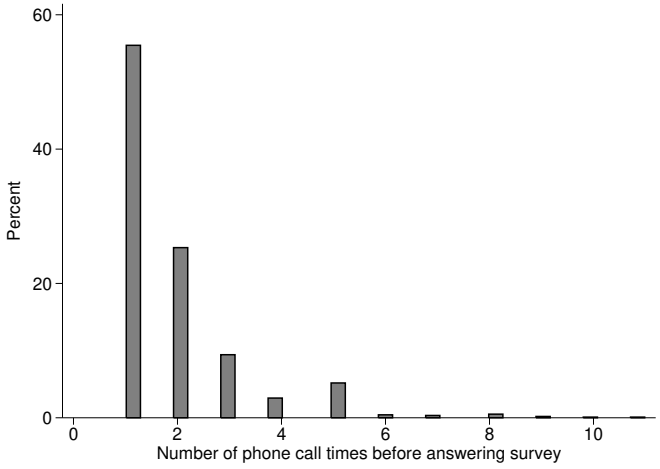
Note: Observations are at the subject level. Each row is a separate regression. The F and Chi-squared tests are conducted using the meta indicator **1(Communication Credit)** as the outcome and excluding all the communication and well-being outcomes. Clustered standard errors (at the district level) are reported in parentheses. *** p<0.01, ** p<0.05, * p<0.10.

Table A.5: **Attrition**

	Lumpsum	**Tranches**	**Control**	Total	Attrition
STEP 0				1,993	
**Verify phone numbers*					
**Measure poverty* (Schneider 2005)					
SELECT SAMPLE (*Randomized*)	376	371	384	1,131	
BASELINE I (*Wave 1)*	376	371	384	1,131	0
	(100%)	(100%)	(100%)	(100%)	(0%)
	(SD=0%)	(SD=0%)	(SD=0%)	(SD=0%)	(SD=0%)
BASELINE II (*Wave 2)*	352	340	351	1,043	88
	(93%)	(92%)	(92%)	(92%)	(8%)
	(SD=24%)	(SD=27%)	(SD=28%)	(SD=26%)	(SD=26%)
ENDLINE I (*Follow-up wave 3)*	355	344	349	1,048	83
	(94%)	(93%)	(91%)	(93%)	(7%)
	(SD=23%)	(SD=26%)	(SD=28%)	(SD=26%)	(SD=26%)
ENDLINE II (*Follow-up wave 4)*	343	335	319	997	134
	(91%)	(90%)	(83%)	(89%)	(11%)
	(SD=28%)	(SD=29%)	(SD=37%)	(SD=32%)	(SD=32%)

Note: Table reports the summary statistics for the subsample that was successfully reached for a follow-up and for the subsample that was not successfully reached in endline phone surveys. Shown for all panel waves.

Figure A.3: **Phone calls and reachability of subjects**



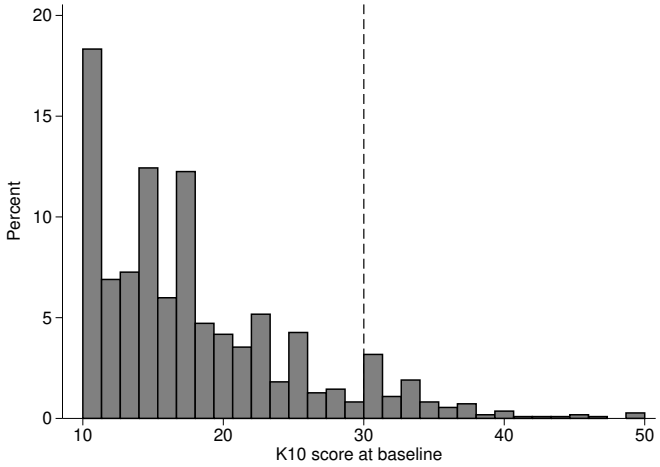
V.5 Descriptive Statistics

Table A.6: **Summary statistics of relevant variables**

	Mean	SD	N
Demographic Characteristics			
Female 0-1	0.146	0.354	1130
Akan ethnic 0-1	0.362	0.481	1130
Married 0-1	0.910	0.285	1130
Attained Junior High School (JHS) 0-1	0.784	0.411	1130
Household size (number)	6.906	4.087	1107
Self employed 0-1	0.762	0.425	1130
Operates in informal sector 0-1	0.799	0.400	1130
Personal income (1 to 5 scale) (monthly)	1.621	0.897	1130
Staying together with mother 0-1 (Wave 0)	0.067	0.250	1130
Has no religion 0-1 (Wave 0)	0.053	0.226	1130
Staying together with spouse 0-1 (Wave 0)	0.869	0.337	1130
Age at marriage (Years) (Wave 0)	24.93	4.971	1083
Poverty			
Poverty rate (%) (Schneider 2005) (Wave 0)	22.04	20.53	1130
Pandemic Basics			
Aware of COVID-19 0-1	0.996	0.060	1105
Trust Government's estimates about COVID19 0-1	0.798	0.401	1105
In previously lockdown region 0-1	0.183	0.386	1130
Self does housework during pandemic 0-1	0.168	0.374	1130
Has relocated / moved in past 7days 0-1 (Wave 2)	0.014	0.118	978
Key Communication Constraints			
Need to connect increased due to pandemic 0-1	0.701	0.457	1104
Unable to call in past 7days 0-1	0.627	0.483	1104
Unable to call due to COVID19 0-1	0.548	0.497	1104
Unable to make airtime transfers in past 7days 0-1	0.474	0.499	1104
Borrow airtime 0-1 (Wave 2)	0.320	0.466	978
Seek digital loan 0-1 (Wave 2)	0.087	0.283	978
Well-being Measures			
Total Expenditure (GHS) (weekly)	324.1	423.2	1102
Threatened Partner (1(never) to 4 (very often) scale)	1.194	0.701	1102
Hit Partner (1(never) to 4 (very often) scale)	1.194	0.701	1102
log K10	2.819	0.369	1102
Severe Distress 0-1	0.096	0.294	1102
I'm tired (mentally, emotionally, or socially) of COVID19 0-1	0.538	0.498	1104
I'm depressed (1(disagree) to 5(agree) scale)	1.598	0.941	1102
I'm relaxed (1(disagree) to 5(agree) scale)	2.885	1.382	1102
I'm satisfied with life, all else equal (1(disagree) to 5(agree) scale)	2.534	1.318	1102
I'm satisfied with finances, all else equal (1(disagree) to 5(agree) scale)	2.073	1.156	1102

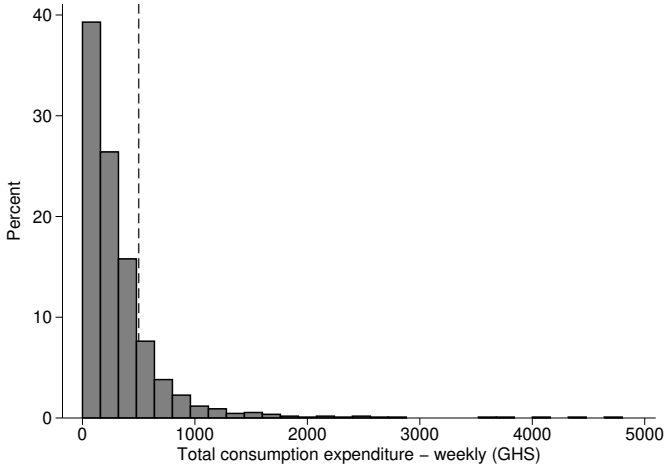
Note: Observations are at the subject level. Table reports the summary statistics of relevant variables from our baseline survey waves. This include information about demographics, poverty indicators, communication and well-being outcomes, respectively. The exchange rate during the baseline period is US$ 1.0 = GHS 5.80.

Figure A.4: **K 10 SCORE AT BASELINE (WAVE 1)**



Note: Observations are at the subject level. Low (scores of 10-15, indicating little or no psychological distress). Moderate (scores of 16-21). High (scores of 22-29). Very high or severe distress (scores of 30-50). 11.5% rate of severe distress (indicated by the vertical dashed line).

Figure A.5: **TOTAL CONSUMPTION EXPENDITURE AT BASELINE (WAVE 1)**



Note: Observations are at the subject level. Total consumption expenditure sums all expenses: food (inside and outside home), utilities, personal care, education, health, and durables. 81.7% rate of poor consumption ($\leq$ 500GHS per week and indicated by the dashed vertical line).