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May, 2022

Working Paper No. wp2015

Automated Chat Application Surveys Using WhatsApp: Evidence from Panel Surveys and a Mode Experiment [*†]

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May 2, 2022

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Abstract

We present a method to conduct automated surveys over WhatsApp, a globally popular messaging service. WhatsApp surveys offer potential advantages since they incur relatively low costs to respondents and researchers, are easy to use for respondents who are already familiar with WhatsApp chat features, and facilitate continued engagement with mobile populations as users can retain their WhatsApp number even if they change SIM cards and phone numbers. Yet, there is limited knowledge on how well WhatsApp surveys perform empirically. We test the WhatsApp method using two original panel surveys of refugees in Colombia and the U.S. and find satisfactory response rates and retention over a nine-month follow-up period in these mobile populations. We also conduct a mode experiment in Colombia comparing WhatsApp to short message service (SMS) and interactive voice response (IVR) surveys. We find that WhatsApp had a 12 and 27 percentage points higher response rate than IVR and SMS, respectively, resulting from higher initial engagement and lower break-off. We conclude by discussing advantages and limitations of the WhatsApp method and offer documentation and a public code repository to support researchers and practitioners in applying the method in other contexts.

Keywords: survey methods, panel data, mobile populations, mode experiment

1 Introduction

Traditional survey methods present limitations for researchers and organizations alike. In-person and phone-based surveys can be time-intensive and costly to implement. It can also be difficult to retain respondents in a panel and stay in touch with them when there are changes in contact information or location. Automated and semi-automated short message service (SMS) on mobile phones have been used by researchers as cheaper alternative to both collect survey data (Tomlinson et al., 2009; Henderson and Rosenbaum, 2020) as well as conduct experimental interventions (Buntaine et al., 2018; Hainmueller et al., 2018). However, this method is limited by the potential costs of SMS messages, including those for respondents, the challenges of navigating country-specific rules and regulations for mobile networks, and the reliance on mobile phone numbers which may be unstable or too costly over time for mobile and low-income populations using pre-paid plans.

In this study, we propose a data collection method that leverages automated surveys over WhatsApp, a popular cross-platform messaging application. While this method is not without limitations, it offers some important advantages compared to traditional survey data collection. First, respondents complete the survey in a familiar messaging platform as if it were a chat conversation, rather than through an unfamiliar online survey platform (e.g., Qualtrics, SurveyMonkey). Second, using WhatsApp is cost effective and scalable compared to SMS messages due to lower messaging fees and accessibility over a cellular network or WiFi. Third, the method facilitates maintaining contact with mobile populations since WhatsApp numbers can remain stable even when SIM cards and phone numbers change. Fourth, with more than 2 billion active monthly users (Clement, 2020), WhatsApp has the potential to reach a wide range of respondents.

Given that WhatsApp surveys are a fairly recent technology, little is known about the empirical viability of this method for research (de Gruchy et al., 2021; Ndashimye et al., 2021). To provide such evidence we examine the use of the method with two case studies, including two original panel surveys of refugees in Colombia and in the U.S. and a randomized mode

experiment in Colombia where we tested WhatsApp surveys against SMS and interactive voice response (IVR) surveys, which are two prominent alternative methods for data collection (Lau et al., 2019). These case studies demonstrate that the WhatsApp method is a viable alternative for data collection in certain contexts and suggests its potential for wider applicability. We find that the WhatsApp method yields satisfactory response rates and retention in our panel surveys. Among refugees in Colombia, 60.8% completed the survey at three months, 51.4% at six months, and 47.1% at the nine month follow-ups (N=2,396). Among refugees resettled in the U.S., the response rate was 34.7% at three months, 26.8% at six month, and 19.8% at the nine month follow-ups. In the mode experiment we find that the response rate for the WhatsApp method was 27 percentage point higher than for SMS, and 12 percentage points higher than for IVR (N=2,410), a result that was driven both by a higher fraction of respondents starting the survey and a lower break-off rate. To support the implementation of this method more broadly, we offer documentation and a public repository of code as supplementary materials to support those who are looking to apply this method in other contexts.[1][2]

2 Methodology

As described in Figure 1, our survey method combines three commercial platforms - the WhatsApp Business API, Twilio, and Google. As a first step, researchers must collect WhatsApp contact numbers and obtain consent from participants to be contacted via WhatsApp. Second, researchers need to be granted permission to access to the WhatsApp Business API by verifying their organization through the Facebook Business Manager.[3] Third, researchers design the survey flow using Twilio's Studio tool. Twilio is a cloud communications platform that facilitates access to the WhatsApp Business API and provides web service APIs and

[1] In our GitHub repository we provide a comprehensive How-To Manual and all of the code required to build and execute the automated WhatsApp surveys, including those in multiple languages, at https://github.com/ImmigrationPolicyLab/IPL-Twilio-Execution-Google-Scripts.

[2] Replication data and code for all analyses presented here is posted at ADD URL.

[3] Note that WhatsApp is owned by Meta Platforms.

software to set up and send the WhatsApp chat messages that serve as an interactive survey. Fourth, researchers send the first survey message to each survey participant, who can then respond to the survey via WhatsApp messages in a predetermined sequence. We automate this process using Google Apps Scripts and the Twilio for WhatsApp API to send the survey to a contact list of respondents' WhatsApp numbers hosted in a password-protected Google Sheet. Fifth, respondents then complete the survey entirely within the WhatsApp platform in the form of a chat conversation (see Figure A.2 for an example). In the Twilio environment, the response to the final question triggers a request to run a custom code block, which writes the response data to a specified Google Sheet via the Google Sheets API. This code block is also triggered if a survey is not completed, ensuring both partial and complete survey responses are captured.

3 Case Studies

We examined the use of the WhatsApp method in two case studies. First, we conducted panel surveys with refugee populations in Colombia and in the U.S.. These surveys provide a suitable testing ground since they are focused on mobile populations that are difficult to survey. Second, we implemented a randomized mode experiment in Colombia to benchmark the WhatsApp method against two alternative methods for data collection, SMS and IVR surveys. Below we describe the main results from both studies; further details on the questionnaires, samples, and robustness checks are provided in the Supplementary Materials (SM).[4]

3.1 Panel Survey: Venezuelan Refugees in Colombia

In partnership with the humanitarian organization Mercy Corps we implemented a survey to evaluate a cash assistance program for Venezuelan refugees who had recently fled to

[4]The studies where completed under Stanford IRB Protocols 54716 and 56000.

neighbouring Colombia. Households completed a vulnerability screening to determine their eligibility for cash assistance. Each head of household that completed the screening was given the option to consent to follow-up surveys on WhatsApp. Individuals who agreed were sent follow-up surveys approximately three, six, and nine months later over WhatsApp and were notified that they would receive $1.43 in phone credit (5,000 Colombian pesos) upon survey completion. The surveys involved questions about migration, housing, nutrition, health, and access to medical care and education.

The top panel in Table 1 shows the main results from this panel survey. 2,396 numbers were invited in each survey wave. For the three month follow-up there was a 60.8% response rate, with 63.6% starting the survey and 95.5% of starters completing it.[5][6] For the six and nine month follow-ups, the response rate was at 51.4% and 47.1%, respectively, indicating that a large share of respondents were retained in the panel.

The median time to completion was 14 minutes for the three month wave (see Table A.1). Non-response analyses shows that the samples of responders were representative on gender, age, and household size, and slightly skewed towards households with lower vulnerability and lower income. This non-response pattern was stable across all survey waves (see Table A.2). The average cost per completed survey over WhatsApp was $0.37 in messaging fees (not including the phone credit incentive payment).

3.2 Panel Survey: Resettled Refugees in the U.S.

In partnership with Lutheran Immigration and Refugee Service (LIRS), a refugee resettlement agency in the U.S., we implemented a rapid response survey among resettled refugees who arrived in the U.S. between 2010-2020 and participated in the travel loan program.[7] Af-

[5]Using the standard definition we compute the RR1 response rate as the number of complete interviews divided by the number of eligible reporting units in the sample which in our case includes all invited numbers (American Association for Public Opinion Research, 2016).

[6]For 55.8% of invited numbers, the name of the survey respondent also matched the name of one of the registered household members from the registration. In the other cases a non-registered household member or non-household member may have completed the survey. See SM for details.

[7]Refugees admitted to the U.S. for resettlement typically have to take out a loan with the International Organization for Migration to pay for their travel.

ter conducting a baseline survey (online and phone), we deployed quarterly follow-up surveys over WhatsApp and SMS in seven languages to determine how refugees have been impacted by COVID-19.[8] Both active opt-in consent and follow-up contact information were gathered in the baseline survey. In contrast to the survey of recently arrived Venezuelan refugees in Colombia, in this survey of resettled refugees in the U.S. the sample is much more heterogeneous in terms of length of residency in the U.S. and also in terms of nationalities.

The bottom panel in Table 1 shows the main results from the panel survey. Overall, we invited 803 refugees to participate in the three month follow-up survey and obtained a 34.7% response rate. For the six and nine month follow-ups, the response rate was 26.8% and 19.8%, respectively. Despite the differences in the samples, the results share several similarities with the survey from Colombia. While the response rates in the U.S. surveys were generally lower, we see similar patterns in that many of the initial respondents were retained in the panel from the three to the nine month follow-up. In addition, we see a similarly low break-off rate among those who started the surveys. The surveys were also fairly comparable in terms of duration and cost. The median duration for the U.S. survey was 10.6 minutes with 20 questions (see Table A.1). The average cost per completed WhatsApp survey was $0.32. Non-response analyses shows that the samples of responders for the U.S. surveys were fairly representative on age, household size, income, and food security, and slightly skewed towards males, but this gender skew disappeared in the six and nine month wave (see Table A.2).

Taken together, the results from both panel surveys suggest that WhatsApp is a viable option for data collection and panel retention. These findings are consistent with a recent study by de Gruchy et al. (2021) who found satisfactory response rates and retention using WhatsApp surveys in a four-month pilot in South Africa.

[8]Note that since respondents in the baseline survey self-selected into receiving follow-up surveys via WhatsApp or SMS, the comparison between these two modes is not causally identified. Yet, for transparency we report the response rates for the SMS follow-up surveys in Table A.3. Consistent with the results of the mode experiment below, the response rates for the SMS mode was lower than for the WhatsApp mode. For example, the response rate for SMS for the three month survey was 21.8% compared to 34.7% for WhatsApp.

3.3 Mode Experiment Comparing WhatsApp, SMS, and IVR

To benchmark the WhatsApp method against alternative approaches, we conducted a randomized experiment with a sample of 2,410 Venezuelan migrants living in Colombia who had completed the vulnerability screening for the VenEsperanza program with Mercy Corps in July – October 2020. This sample was randomly assigned (with equal probability) to receive an identical survey on one of three survey platforms, WhatsApp, SMS, or IVR in July 2021. We chose to compare these three platforms as they offer a degree of automation and are low-cost alternatives to in-person phone surveys (Lau et al., 2019). Randomization checks shows that the covariate distributions are well balanced across the three experimental conditions (see Tables A.4 and A.5).

Figure 2 and Table 2 show the main results from the experiment (also see Table A.6). We find that WhatsApp yielded the highest response rate with 55%. The response rate for WhatsApp was 12 percentage points higher than for IVR (standard error of the difference was 2.5 percentage points) and 27 percentage points higher than for SMS (standard error of the difference was 2.4 percentage point). This higher response rate for WhatsApp is the result of two factors: First, WhatsApp had a higher percentage of respondents who started the survey with 60%, compared to 55% for IVR, and only 33% for SMS. Second, WhatsApp had a higher rate of starters completing the survey at 92%, compared to only 77% for IVR and 82% for SMS. Non-response analyses suggests that the samples of responders in the WhatsApp group and also the IVR group were representative of the population with respect to the baseline characteristics, including gender, household size, income, and region, while the SMS group was skewed toward females (see Table A.7).

Overall, these results indicate that WhatsApp surveys perform well in this context compared to IVR and especially SMS. Absent data on mechanisms, we can only speculate on what explains these differences across platforms. One potential reason why WhatsApp performed better could be that it was less costly for respondents.[9] Another potential reason is that

[9]Some cellular providers, such as Claro, offer prepaid plans that include the free use of WhatsApp in

respondents may be more familiar with WhatsApp and regard messages as more credible, compared to SMS and IVR which people may be more likely to ignore given the frequency of unwanted spam messages or robocalls. In addition, WhatsApp can be an important source of migration-related information for refugees, such as information about healthcare resources and government aid programs (Zambrano-Barragán et al., 2021).

Overall, our findings differ somewhat from a recent study by Ndashimye et al. (2021) who found no significant difference in response rates between WhatsApp and IVR in a survey in Guinea, but a slightly higher response rate for IVR in a survey in Senegal. Consistent with our study, Ndashimye et al. (2021) also found that WhatsApp had a lower break-off rate than IVR in both countries. Future work is needed to examine how generalizable these findings are to other contexts and probe more into the reasons for the differences in performance.

4 Advantages and Limitations

Automated WhatsApp surveys offer advantages to both survey implementers and respondents compared to traditional survey modes. One advantage is that the method facilitates collecting panel data using short, recurring surveys. If respondents move locations, they can retain their WhatsApp number which can reduce attrition over time. Data from the two case studies revealed that respondents do maintain WhatsApp numbers with country codes that differ from their country of residence. Implementing surveys over WhatsApp also increases accessibility for respondents while decreasing costs. The method engages respondents on a commonly-used messaging platform in a conversation format, rather than an unfamiliar survey platform. Users can access WhatsApp on cellular networks or over WiFi (and WhatsApp messaging may be included at no additional cost in mobile plans in some contexts), which reduces costs for participants to complete the survey. Although the average messaging fees per completed survey were low, these costs do not account for staff time needed to learn and

Colombia without using up data. Depending on the plan and provider, sending SMS messages may incur fees and similarly use airtime minutes for IVR.

set up the WhatsApp surveys. We estimate this upfront process to take approximately 10-20 hours of accessing, learning, and testing systems before implementation readiness. This general method can also be adapted for chat applications beyond WhatsApp.

There are several limitations of WhatsApp surveys that are worth considering. First, WhatsApp surveys are not suitable for complex question formats or in-depth qualitative responses. Second, the method is not useful for surveying populations with limited mobile phone usage, WhatsApp familiarity, or (digital) literacy. The selection bias concerns of this limitation demand careful consideration. Third, business verification is required to access the WhatsApp Business API. Therefore, WhatsApp surveys may be most compatible for partnership-based studies, rather than those conducted by an individual researcher. Fourth, the WhatsApp Business API requires obtaining proactive consent, known as "opt-in." Regulations require senders to clearly establish their identity, such as through a business logo and website link, and to communicate a participant's rights, such as offering the ability to skip questions or stop the survey. Even though each question of the WhatsApp survey runs automatically once the survey is initiated, WhatsApp Business API policies require active monitoring and a way to transfer conversations to a human agent to provide support if needed. Lastly, WhatsApp numbers are sometimes shared amongst a group of individuals (e.g., a household using one mobile phone). Therefore, if the goal is to ensure that responses are linked to a specific individual, it is useful to include identity verification questions such as year of birth to merge with existing administrative or baseline data on the respondent. The WhatsApp Business API retains end-to-end encryption between the researcher and all respondents, but it is important to consider how the use of each platform in this method, as well as shared phones amongst multiple respondents, may affect data privacy and confidentiality. Importantly, many of these limitations are shared by other low-cost alternatives, such as SMS or IVR surveys.

5 Conclusion

This study offers preliminary evidence that chat application surveys, specifically using the WhatsApp Business API, is a viable data collection method. We also provide extensive technical documentation to guide others who are interested in the implementation of this method. Using automated WhatsApp surveys offers an alternative to traditional data collection methods that minimizes costs and enables continued engagement especially with mobile populations. To date, humanitarian organizations have not yet leveraged chat applications for client engagement, measurement, and evaluation (Quintanilla and Stoll, eds, 2017). Therefore the method introduced here has the potential to be broadly applicable across diverse areas in partnership-based social science research.

Acknowledgments

The authors would like to thank Mercy Corps, specifically Jen Daum, John Sandoval, and David Hernandez, and Lutheran Immigration and Refugee Service (LIRS), specifically Laura Wagner and Sierra Lovegrove, for their partnership and commitment to innovation to improve client engagement and research. We are grateful to Slalom, especially Nima Niakan and Samantha Ingram, Twilio Impact Corps, especially Michael Ruggiero, and David Scales for development and design guidance.

Funding

Funding for the project with Mercy Corps in Colombia was provided by the UK Foreign, Commonwealth & Development Office, awarded through Innovations for Poverty Action's Peace & Recovery Program. We also acknowledge funding from the Charles Koch Foundation and the Stanford King Center on Global Development. These funders had no role in the data collection, analysis, decision to publish, or preparation of the manuscript.

Figures and Tables

Figure 1: Survey software infrastructure and implementation flow

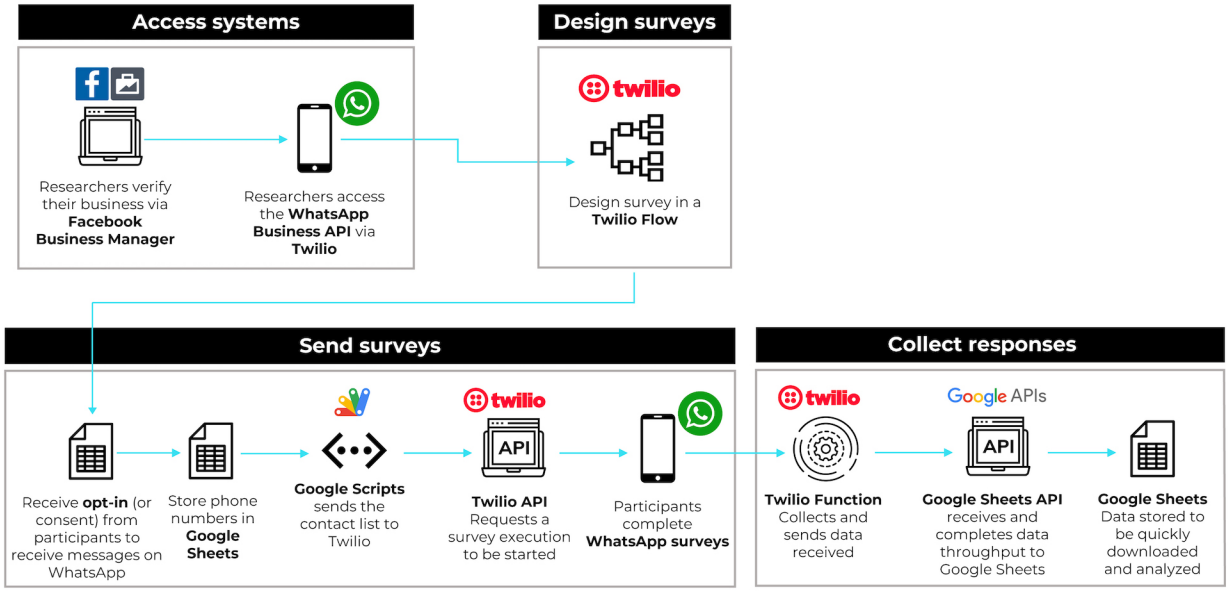
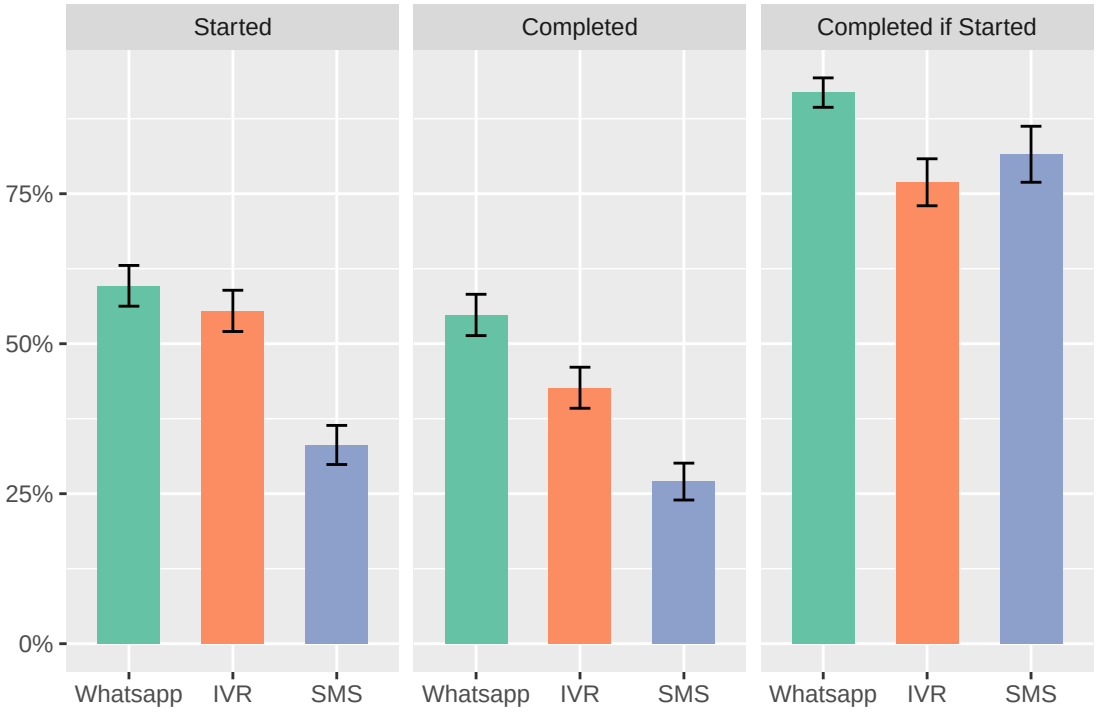


Table 1: Response Rates: Panel Surveys of Venezuelan Refugees in Colombia and Resettled Refugees in the U.S.

	Panel A: Survey Venezuelan Refugees in Colombia					
	3 Months		6 Months		9 Months	
	Count	Rate	Count	Rate	Count	Rate
Total Invitations	2,396	–	2,396	–	2,396	–
Survey Started	1,525	63.6%	1,295	54.0%	1,192	49.7%
Survey Completed	1,457	60.8%	1,232	51.4%	1,128	47.1%
Completed and Matched	1,336	55.8%	1,146	47.8%	1,032	43.1%
Completed If Started	–	95.5%	–	95.0%	–	94.5%
	Panel B: Survey Resettled Refugees in the U.S.					
	3 Months		6 Months		9 Months	
	Count	Rate	Count	Rate	Count	Rate
Total Invitations	806	–	806	–	806	–
Survey Started	344	42.7%	236	29.3%	168	20.8%
Survey Completed	279	34.6%	209	25.9%	153	19.0%
Completed and Matched	259	32.1%	198	24.6%	146	18.1%
Completed If Started	–	81.1%	–	88.6%	–	91.1%

Notes: Response rates for panel surveys conducted three, six, and nine months after registration.

Figure 2: Experiment Results: Response and Completion Rates by Platform



Notes: Left panel shows fraction of respondents who started the survey in each experimental condition: WhatsApp, IVR, and SMS (total N=2410). Middle panel shows fraction of respondents who completed the survey in each experimental condition (total N=2410). Right panel shows fraction of respondents who completed the survey conditional upon starting in each experimental condition (total N=1191). Whiskers show 95% confidence intervals for the means.

Table 2: Experiment Results: Estimates of Differences in Response and Completion Rates

	Started	Completed	Completed if Started
WhatsApp	0.265	0.278	0.103
	(0.024)	(0.024)	(0.027)
IVR	0.223	0.156	-0.047
	(0.024)	(0.023)	(0.031)
N	2410	2410	1191
$\bar{Y}$	0.494	0.415	0.840
R^2	0.054	0.053	0.033

Notes: Regression coefficients from linear probability models shown with robust standard errors in parenthesis. Dependent variables are dummies for whether the respondent started the survey (column 1), completed the survey (column 2), or completed conditional on starting (column 3). Independent variables are dummies for the WhatsApp and IVR group, respectively. The reference category is the SMS group.

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A Appendix

Supplementary Materials

Technical Documentation and How-To Manual

To enable implementation of the WhatsApp survey method, we created a comprehensive How-To Manual, which is available in our GitHub repository at https://github.com/ImmigrationPolicyLab/IPL-Twilio-Execution-Google. As shown in Figure A.1, the How-To Manual provides a step-by-step guide to implementing the method. We include screenshots, code snippets, and video tutorials to guide users. Additionally, our repository provides all of the code required to build and execute surveys, including those in multiple languages.

A.1 Details about Panel Surveys

A.1.1 Colombia

In 2020, Mercy Corps Colombia began enrolling Venezuelan households in Colombia to assess their eligibility for a cash assistance program. From March - November 2020, all households that were assessed for eligibility were asked if they consented to join a study with follow up surveys, regardless of their eligibility status. Individuals who registered and agreed to participate during March - May 2020 were included in the panel surveys. Surveys were successively sent out on WhatsApp at 3, 6, and 9 month intervals after a participants' enrollment month. For example, the 3-month survey was sent in June - August 2020 for individuals registered in March - May 2020.

The full questionnaire is in the section below. We define a started interview as an interview where the respondent answered a valid response to either the intro or first survey question. We define a completed interview as a an interview where the respondents answered

the last question about their names. To match the respondents back to the registration data we examined whether the first name of the respondent matches the first name of any of the household members registered with the head of household.

For the analyses we only consider unique WhatsApp numbers and therefore remove from the sample all cases where two or more households registered using the same WhatsApp number (across March, April, and May registrations).

A.1.2 U.S.

In July 2020, we partnered with Lutheran Immigration and Refugee Service (LIRS) to conduct a baseline survey of 9,693 refugees and special immigrant visa holders (SIVs) who arrived between 2010-2010 and participated in the LIRS loans program. Respondents to the baseline survey had the option of opting into follow-up surveys via WhatsApp or SMS and were asked to provide mobile numbers for this purpose. We first conducted these follow-up surveys on a monthly basis starting in September 2020. After conducting follow-up surveys in September, October, and November 2020, we decided to decrease the frequency of these surveys from monthly to quarterly[10], and conducted follow-up surveys in February, May, and August 2021. For comparability with the survey in Colombia, we examine response rates at 3, 6, and 9 months after the baseline survey.

The full questionnaire is in the section below. We define a started interview as an interview where the respondent answered a valid response to the introductory message that invites participants to begin the survey. We define a completed interview as an interview where the respondent answered the last question about their year of arrival in the United states (question 18). To match the respondent back to the baseline data, we merged follow-up survey data from WhatsApp and SMS with the baseline survey data using phone number and study ID, and then confirmed respondents' identity matching based on year of arrival responses in both the baseline and follow-up survey data. In case of duplicated responses

[10]Based on the feedback from our partner, the surveys felt a bit too frequent.

based on either duplicated phone numbers or on duplicated study IDs assigned to each respondent, we kept only the most recent response from a given respondent within a given panel wave. We had to manually construct panel responses from 3 respondents on account of message delivery delays.

Since respondents in the baseline survey self-selected into receiving follow-up surveys via WhatsApp or SMS, the comparison between these two modes is not causally identified. Yet, for transparency we report the response rates for the SMS follow-up surveys in Table A.3. The response rates were lower for the SMS mode compared to the WhatsApp mode, a result that is consistent with the mode experiment.

A.2 Details about the Mode Experiment

Building on the same enrollment sample from Mercy Corps Colombia's eligibility assessment of Venezuelan households in Colombia, individuals who registered and agreed to participate during June - November 2020 were included in the mode experiment surveys.

On June 7th, 2021, we initiated the survey on WhatsApp and SMS. The WhatsApp survey and SMS survey both remained open for 24 hours, with a reminder message sent to non-respondents after 24 hours. The IVR survey was programmed to start calling respondents on June 8th, with up to three attempts made for participants who did not pick up initial call attempts. We define a started interview as an interview where the respondent answered a valid response to the first question. We define a completed interview as an interview where the respondent answered question 13 (see below).

Two issues emerged during the implementation of the mode experiment. First, for the WhatsApp group there was an error that resulted in 30 of the 803 total numbers to be contacted twice, once during the pilot and once during the main experiment. For the main analyses we include these 30 numbers, but only use the replies to the second contact attempt that occurred during the main experiment. We also conducted a robustness check where we replicated the results while removing the 30 WhatsApp numbers that were contacted twice.

The results, displayed in Table A.8, remain almost identical to the results with those numbers included.

Second, for the SMS group we encountered a systematic delivery issue potentially based on cell network disruptions. After respondents reached question 13, a portion of each successive question that was automatically sent to respondents was undeliverable. As some respondents never received the next question due to this issue, they were mechanically unable to continue with the survey. This mechanically reduced response rates to the SMS survey past question 13. To address this problem we simply defined the end of the survey as question 13 to allow for a fair comparison between the three experimental groups. As a robustness check, we also replicated the results defining a completed interview based on the last question 25. The results are show in Table A.9. As shown in the third column, the response rates for the WhatsApp group remains similar compared to using question 13 as the end of the survey (55% vs 54%). In other words, due to the low break-off rate in the WhatsApp arm, it does not matter whether question 13 or question 25 is used to define a complete interview. For the IVR arm the response rate drops lower when question 25 instead of question 13 is used to define a complete interview (43% vs 39%) since this arm has a higher break-off rate. And for SMS the response rate drops down to only 8% if question 25 is used. As explained above, this is an artefact of the technical problem that a large share of SMS were not delivered beyond question 13 so this is a misleading comparison that is only displayed here for transparency.

Panel Survey Questionnaire: Venezuelan Refugees in Colombia

Note: this survey was sent to participants in Spanish. The English translation is provided here.

Intro: Hello! Thank you for completing the interview for VenEsperanza with Mercy Corps in [month]. It is time to complete the three month survey that you gave us permission to complete. The survey will be open to complete for the next 24 hours. To begin, please respond YES.

1. Thank you for agreeing to complete the three month survey. It will only take a few minutes to answer. You will receive 5000 pesos in phone credit on the provider of your choice after completing the survey. If you wish to skip any question, respond with "skip". This survey should be completed by the person who was previously interviewed by Mercy Corps. Were you interviewed by Mercy Corps in [month]?
    1. Yes
    2. No
2. Do you still live in Colombia?
    1. Yes
    2. No
3. What country are you living in?
4. What city do you currently live in?
5. Who moved?
    1. Only me
    2. My family and I
    3. Only my family

6. Have you or your family moved to another town/city in the past three months?

    1. Yes
    2. No

7. Have you or your family moved to a new house in the same city in the past three months?

    1. Yes
    2. No

8. What type of employment, if any, did you have in the past month?

    1. Employee (private business or government)
    2. Self-employed (taxi, carpenter, electrician, etc.)
    3. Informal employment (irregular daily work, casual worker)
    4. I was not employed

9. How much income did your household earn in the past month?

    0. 0 (no income)
    1. 1 to 25,000 pesos
    2. 25,001 to 50,000
    3. 50,001 to 100,000
    4. 100,001 to 150,000
    5. 150,001 to 200,000
    6. 200,001 to 250,000
    7. 250,001 to 400,000
    8. 400,000 or more

10. Did your household receive cash assistance in the last month as a part of the VenEsperanza program or another assistance program?

    0. 0 (no income)
    1. 1 to 25,000 pesos
    2. 25,001 to 50,000
    3. 50,001 to 100,000
    4. 100,001 to 150,000
    5. 150,001 to 200,000
    6. 200,001 to 250,000
    7. 250,001 to 400,000
    8. 400,000 or more

11. What is the type of housing you have lived in for the past month? Please respond with the number (1-5).

    1. House or apartment
    2. Room or hotel
    3. Shared roof/tenancy
    4. Improvised room or shelter for more than five days
    5. Living on the street

12. The housing you live in is:

    1. Owned by you
    2. Rented
    3. Passenger accommodation or on the street

4. Squatting / in care / accommodation in exchange for work
5. Doesn't apply

13. On average during the last week, how many meals were consumed in your house per day?

    1. Less than 2 meals per day
    2. 2 meals per day
    3. 3 meals or more

14. On average during the last week, how many days did your household have to reduce the size of meal portions?

    0. None
    1. 1 day
    2. 2 days
    3. 3 days
    4. 4 days
    5. 5 days
    6. 6 days
    7. 7 days

15. Which sources of information do you trust the most when it comes to advice about prevention of coronavirus?

    1. Friends/family
    2. Posts I see on social media or WhatsApp
    3. Information I receive from government

4. Information I receive from NGOs

5. None

16. In general, how would you rate your physical health?

    1. Excellent

    2. Very good

    3. Good

    4. Fair

    5. Poor

17. In the past month, have you or another adult in your household accessed medical care?

    1. No, I did not seek medical care

    2. I wanted to seek medical care, but could not afford it

    3. I wanted to seek medical care, but didn't know where to go

    4. Yes, I received medical care

18. In the past 7 days, how many days have you stayed at home all day without going out at all and without receiving any visits?

    0. None

    1. Only one day

    2. Some days

    3. Almost all days

    4. All days

19. How many children under the age of 18 are in your household?

20. How many of these children are enrolled in school?

21. What share of school days have these children been in school, online or in person, over the last month?

    1. All school days
    2. Most school days
    3. Some school days
    4. No school days

22. Thank you for taking the time to answer these questions. We would like to send you COP 5000 in airtime to thank you for your participation. The recharge will arrive in two days. Should I send the airtime to this number?

    1. Yes
    2. No, but send it to another number If you don't want the recharge,respond with number 3.
    3. All days

23. To what phone number should I send the airtime?

24. What network do you use with that number, so that we can send the correct airtime?

25. To confirm that you have finished the survey, can you send the year you were born? (e.g. 1980)

26. What is your gender?

    1. Female
    2. Male
    3. Prefer not to answer

27. If you were to change your number or lose your phone, and we wanted to get in touch with you to follow up, is there someone else we could contact? Would you like to provide a second contact number?

    1. Yes
    2. No

28. What is the second contact number?

29. Please retype the second contact number to confirm.

30. What is the name of the person who owns this second contact number? Thank you for your participation in our survey and we will contact you again in three months. Have a good day!

Survey Questionnaire: Resettled Refugees in the U.S.

Note: this survey was sent to participants in seven languages (English, Spanish, French, Russian, Arabic, Farsi, and Swahili). The English version is provided below.

Intro: Hello, thanks for agreeing to participate in the LIRS/Stanford follow-up survey. We are reaching back out to ask you a few questions about how things are going this month. To begin this short survey, respond YES.

1. Which of these descriptions best applies to what you have been doing for the last four weeks?
    1. In paid work
    2. In school
    3. Unemployed and actively looking for a job
    4. Unemployed and not actively looking for a job
    5. Other
2. In the past four weeks, how many hours did you usually work each week?
    1. 0
    2. 1-10
    3. 11-20
    4. 21-35
    5. 36 or more
3. In the past four weeks, have you received any money from unemployment benefits?
    1. Yes
    2. No

4. What was the total amount of unemployment compensation you received over the last four weeks?

    1. $0-$500
    2. $501-$1000
    3. $1001-$1500
    4. $1500-$2000
    5. $2001

5. In the last four weeks, which of the below best describes your living situation?

    1. House
    2. Apartment
    3. Mobile home
    4. Other type of housing
    5. No housing (homeless)

6. Is your current house, apartment, or mobile home. . . ?

    1. Owned free and clear
    2. Owned with a mortgage or loan (including home equity loans)
    3. Rented
    4. Occupied without payment of rent

7. Did you pay your last month's rent or mortgage on time?

    1. Yes
    2. No
    3. Payment was deferred

8. In the last four weeks, which of these statements best describes the food eaten in your household?

    1. Enough of the kinds of food (I/we) wanted to eat
    2. Enough, but not always the kinds of food (I/we) wanted to eat
    3. Sometimes not enough to eat
    4. Often not enough to eat

9. In the last four weeks, did you or anyone in your household get free groceries or a free meal?

    1. Yes
    2. No

10. How confident are you that your household will be able to afford the kinds of food you need for the next four weeks?

    1. Not at all confident
    2. Somewhat confident
    3. Moderately confident
    4. Very confident

11. Would you say your health in general has been excellent, very good, good, fair, or poor?

    1. Excellent
    2. Very good
    3. Good
    4. Fair

5. Poor

12. During the last four weeks, about how often did you feel nervous?

    1. All of the time
    2. Most of the time
    3. Some of the time
    4. A little of the time
    5. None of the time

13. At any time in the last four weeks, did you delay getting medical care?

    1. Yes
    2. No

14. In the past four weeks, how have children in this household received education from their school?

    1. In-person instruction at school
    2. Distance learning only (online or using paper materials)
    3. Both in-person instruction and distance learning
    4. Neither in-person instruction nor distance learning
    5. School closed due to scheduled vacation or break
    6. Not applicable

15. Which type of distance learning education have your children received?

    1. Online only (self-paced or real-time)
    2. Paper materials only
    3. Both online and paper materials

16. How often is the Internet available to children for educational purposes?

    1. Always available
    2. Usually available
    3. Sometimes available
    4. Rarely available
    5. Never available

17. What year were you born? (for example, 1980)

18. What year did you arrive in the United States? (for example, 2000)

Mode Experiment Questionnaire: Venezuelan Refugees in Colombia

Note: this survey was sent to participants in Spanish on WhatsApp and SMS. The questions were pre-recorded by a native Spanish speaker for the IVR surveys. The English translation is provided here.

Intro: Hello! Thank you for completing the interview for VenEsperanza with Mercy Corps in [month]. It is time to complete the three month survey that you gave us permission to complete. The survey will be open to complete for the next 24 hours. To begin, please respond YES.

What was your work status one year before coming to Colombia?

1. Employed
2. Self-employed
3. Informal employment
4. I was not working

1. What sector did you work in the year prior to coming to Colombia?
    1. Retail and auto repair
    2. Construction
    3. Agriculture
    4. Hospitality (lodging, restaurants, recreation and sporting)
    5. Public institutions (health, education, and local government)
    6. Manufacturing and other light to heavy industries
    7. Professional activities (banking, scientific, administrative, financial, real estate and communications)

8. Other

2. What sector are you working in now?

    1. Retail and auto repair
    2. Construction
    3. Agriculture
    4. Hospitality (lodging, restaurants, recreation and sporting)
    5. Public institutions (health, education, and local government)
    6. Manufacturing and other light to heavy industries
    7. Professional activities (banking, scientific, administrative, financial, real estate and communications)
    8. Other
    9. Not working

3. Are you satisfied with your current employment, or are you hoping to change?

    1. Satisfied
    2. Hope to change

4. (If hoping to change:) What sector do you hope to move into?

    1. Retail and auto repair
    2. Construction
    3. Agriculture
    4. Hospitality (lodging, restaurants, recreation and sporting)
    5. Public institutions (health, education, and local government)
    6. Manufacturing and other light to heavy industries

7. Professional activities (banking, scientific, administrative, financial, real estate and communications)
8. Other

5. What types of skills do you think will be most useful to you in finding work or income through a livelihood?
    1. Technical skills such as construction or tailoring
    2. Self-employment skills such as managing finances and assessing market demand
    3. Employability skills, such as writing a CV or how to apply for work
    4. Life skills, such as communication, negotiation and work ethics
    5. Digital skills such as how to use digital tools (phones, computers) and internet job searching
6. Is childcare a barrier to your gaining employment or a livelihood?
    1. Yes
    2. No
7. Is discrimination a barrier to your gaining employment or a livelihood?
    1. Yes
    2. No
8. Are safety risks a barrier to your gaining employment or a livelihood?
    1. Yes
    2. No
9. Do you agree or disagree with the following statement: Lack of access to finance (e.g. loan) is a barrier to earning a higher income or gaining a livelihood.

1. Agree
2. Disagree

10. Do you agree or disagree with the following statement: Sending and receiving money is affordable and convenient.
    1. Agree
    2. Disagree
11. Do you agree or disagree with the following statement: I am able to save money in accounts or other places that are convenient and reliable.
    1. Agree
    2. Disagree
12. Have you send money to your family, relatives or friends in Venezuela in the past year?
    1. Yes
    2. No

If yes How often have you send money?

1. At least once a week
2. At least once a month
3. At least once every 3 months
4. Once a year or less

13. Do you have a bank account in Colombia?
    1. Yes
    2. No

14. Do you have a bank account in Venezuela?

    1. Yes
    2. No

15. When the COVID-19 vaccine is available, will you plan to take it?

    1. Yes
    2. No
    3. Unsure
    4. I already have the COVID-19 vaccine

If no Why would you not get a vaccine?

    1. Cost
    2. I do not think I am eligible
    3. I don't think it will protect me
    4. I am worried the vaccine will make me sick
    5. Other

16. Thank you for your participation. We would like to offer you 5000 in phone credit for your participation. The credit will arrive in two days. Is it good to send the credit to this number?

    1. Yes
    2. No, but send it to another number
    3. If you do not want the credit, respond with the number 3.

17. To what phone number should I send the airtime?

18. What network do you use with that number, so that we can send the correct airtime?

19. To confirm that you have finished the survey, how many years old are you?

20. What is your sex?

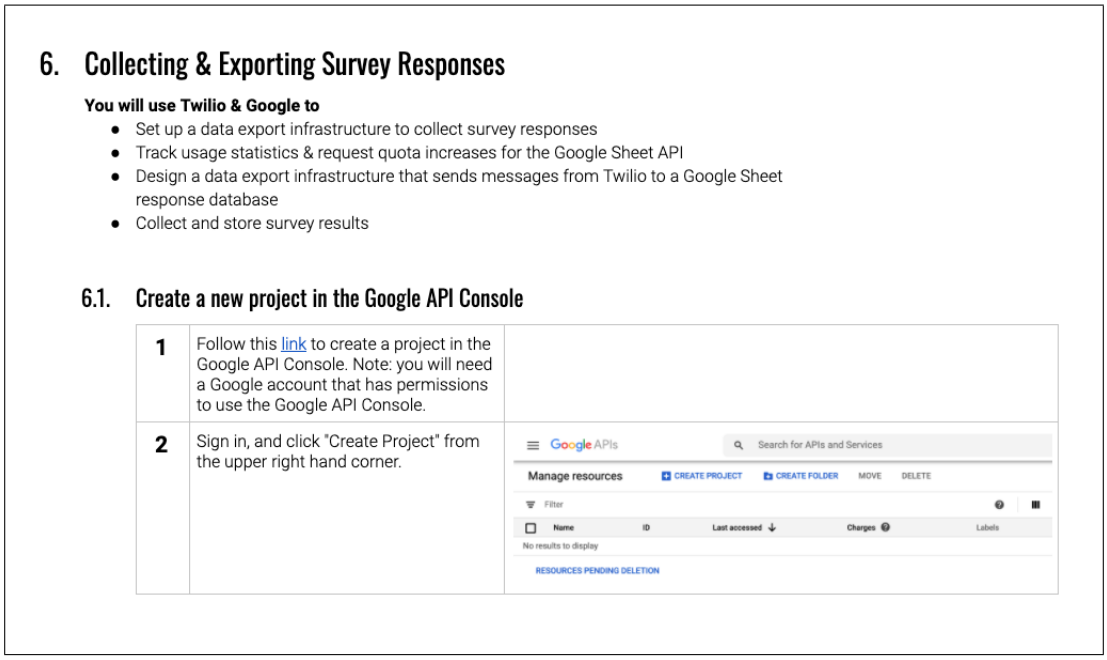
    1. Female

    2. Male

    3. Prefer not to answer

21. Thank you for your participation in our survey. Have a great day!

Figures and Tables



6. Collecting & Exporting Survey Responses

You will use Twilio & Google to

- Set up a data export infrastructure to collect survey responses
- Track usage statistics & request quota increases for the Google Sheet API
- Design a data export infrastructure that sends messages from Twilio to a Google Sheet response database
- Collect and store survey results

6.1. Create a new project in the Google API Console

1	Follow this link to create a project in the Google API Console. Note: you will need a Google account that has permissions to use the Google API Console.	
2	Sign in, and click "Create Project" from the upper right hand corner.	

Figure A.1: **Example of How-To Manual's step-by-step instructions**

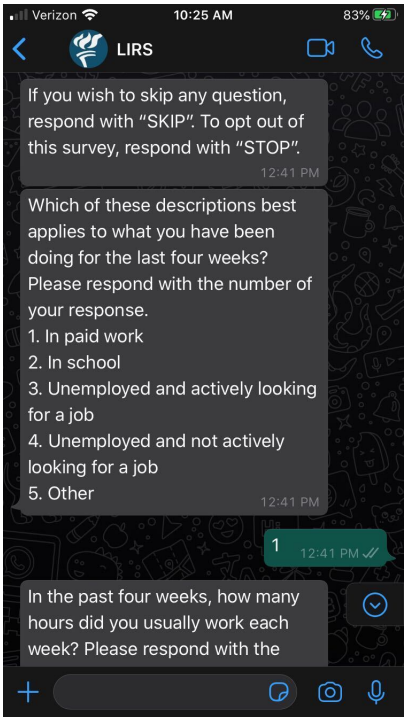


Figure A.2: **Multiple choice questions and numeric entry validation on WhatsApp**

Table A.1: Panel Surveys: Distributions of Number of Messages and Response Times

Panel A: Survey Venezuelan Refugees in Colombia

	P10	Median	Mean	P90
Messages to completion	26	29	29.5	33
Minutes to completion	8	14	22.4	40

Panel B: Survey Resettled Refugees in the U.S.

	P10	Median	Mean	P90
Messages to completion	18	20	20.8	24
Minutes to completion	4.1	10.6	20.7	51.1

Notes: Distribution of number of messages and completion times for panel survey conducted 3 months after registration in Colombia (Panel A) and 1 month after registration in the U.S. (Panel B).

Table A.2: Panel Surveys: Non-response Bias across Waves

	Panel A: Survey Venezuelan Refugees in Colombia								
	3 Months			6 Months			9 Months		
	Responded:			Responded:			Responded:		
	Yes	No	Delta	Yes	No	Delta	Yes	No	Delta
Female	0.72	0.73	-0.01	0.72	0.73	-0.01	0.72	0.73	-0.01
	(0.45)	(0.44)	(0.02)	(0.45)	(0.44)	(0.02)	(0.45)	(0.44)	(0.02)
Year of Birth	1985.81	1984.65	1.16	1985.36	1985.24	0.12	1985.26	1985.32	-0.06
	(9.95)	(12.21)	(0.46)	(9.92)	(11.95)	(0.45)	(9.70)	(11.93)	(0.44)
Household Size	3.20	3.20	-0.00	3.22	3.18	0.03	3.25	3.16	0.08
	(1.26)	(1.26)	(0.05)	(1.28)	(1.25)	(0.05)	(1.27)	(1.25)	(0.05)
Any Income	0.41	0.50	-0.08	0.42	0.47	-0.05	0.44	0.46	-0.02
	(0.49)	(0.50)	(0.02)	(0.49)	(0.50)	(0.02)	(0.50)	(0.50)	(0.02)
Vulnerability Index	117.65	120.33	-2.67	117.37	120.19	-2.82	117.28	120.01	-2.73
	(27.01)	(28.09)	(1.14)	(26.69)	(28.20)	(1.12)	(26.90)	(27.93)	(1.13)
N	1,336	1,060	2,396	1,146	1,250	2,396	1,032	1,364	2,396
	Panel B: Survey Resettled Refugees in the U.S.								
	3 Months			6 Months			9 Months		
	Responded:			Responded:			Responded:		
	Yes	No	Delta	Yes	No	Delta	Yes	No	Delta
Female	0.25	0.35	-0.10	0.30	0.32	-0.02	0.29	0.32	-0.03
	(0.43)	(0.48)	(0.03)	(0.46)	(0.47)	(0.04)	(0.46)	(0.47)	(0.04)
Year of Birth	1982.31	1981.97	0.34	1981.69	1982.15	-0.46	1981.15	1982.14	-0.99
	(9.93)	(10.90)	(0.78)	(10.50)	(10.60)	(0.87)	(10.70)	(10.50)	(0.98)
Household Size	4.81	4.93	-0.12	4.87	4.90	-0.03	5.00	4.89	0.11
	(2.20)	(2.44)	(0.17)	(2.29)	(2.37)	(0.19)	(2.32)	(2.36)	(0.21)
Any Income	0.75	0.77	-0.02	0.76	0.76	0.00	0.79	0.76	0.03
	(0.43)	(0.42)	(0.03)	(0.43)	(0.42)	(0.04)	(0.41)	(0.43)	(0.04)
Food Insecurity	0.18	0.21	-0.03	0.21	0.19	0.02	0.18	0.20	-0.02
	(0.38)	(0.41)	(0.03)	(0.41)	(0.39)	(0.03)	(0.38)	(0.40)	(0.04)
N	258	543	801	197	580	777	146	624	770

Notes: Table reports mean covariate values for responders (i.e. Yes) and non-responders (i.e. No), with standard deviations in parentheses. Responders are defined as respondents who completed the survey and were matched back to the registration data. The columns labeled delta report differences in means with standard errors in parentheses.

Table A.3: SMS Response Rates: Resettled Refugees in the U.S.

	SMS Survey Resettled Refugees in the U.S.					
	3 Months		6 Months		9 Months	
	Count	Rate	Count	Rate	Count	Rate
Total Invitations	251	–	251	–	251	–
Survey Started	59	23.5%	44	17.5%	33	13.1%
Survey Completed	52	20.7%	37	14.7%	33	13.1%
Completed and Matched	50	19.9%	37	14.7%	31	12.4%
Completed If Started	–	88.1%	–	84.1%	–	100.0%

Table A.4: Experiment Balance Check: Baseline Characteristics by Treatment Group

	WhatsApp	IVR	SMS	All
Male	0.27	0.27	0.24	0.26
	(0.44)	(0.44)	(0.43)	(0.44)
Birthyear	1986.27	1986.61	1986.50	1986.46
	(10.01)	(10.47)	(10.13)	(10.20)
HH Size	3.66	3.48	3.55	3.56
	(1.47)	(1.52)	(1.47)	(1.49)
Days with lower cost food	5.68	5.68	5.58	5.65
	(1.89)	(1.85)	(1.94)	(1.90)
Any Income: Day Laborer	0.42	0.40	0.44	0.42
	(0.49)	(0.49)	(0.50)	(0.49)
Any Income: Street Vendor	0.25	0.24	0.22	0.24
	(0.44)	(0.43)	(0.41)	(0.43)
City: Cartagena	0.34	0.35	0.37	0.35
	(0.48)	(0.48)	(0.48)	(0.48)
City: Medellin	0.26	0.26	0.22	0.25
	(0.44)	(0.44)	(0.42)	(0.43)
City: Valledupar	0.14	0.14	0.14	0.14
	(0.35)	(0.35)	(0.35)	(0.35)
City: Bello	0.03	0.03	0.04	0.04
	(0.17)	(0.18)	(0.21)	(0.19)
City: Other	0.22	0.22	0.22	0.22
	(0.42)	(0.42)	(0.41)	(0.42)
Obs	803	804	803	2410

Notes: Means with standard deviations in parentheses.

Table A.5: Experiment Balance Check: Multinomial Regression of Treatment Group on Baseline Characteristics

	IVR	WhatsApp
Male	0.017	0.014
	(0.023)	(0.023)
Birthyear	0.001	-0.001
	(0.001)	(0.001)
HH Size	-0.012	0.014
	(0.007)	(0.006)
Days with lower cost food	0.003	0.002
	(0.006)	(0.005)
Any Income: Day Laborer	-0.033	0.014
	(0.023)	(0.023)
Any Income: Street Vendor	-0.010	0.039
	(0.026)	(0.026)
City: Cartagena	-0.008	-0.002
	(0.028)	(0.027)
City: Medellin	0.005	0.019
	(0.028)	(0.028)
City: Valledupar	-0.005	-0.004
	(0.033)	(0.033)
City: Bello	-0.027	-0.049
	(0.056)	(0.056)
Obs: 2410		
Joint test chi2: 13.78		
Joint test p-value: 0.32		

Notes: Average Marginal Effects computed from multinomial logistic regressions shown, with standard errors in parentheses. Baseline category is SMS.

Table A.6: Experiment Results: Response and Completion Rates by Platform

	Started	Completed	Completed if Started
WhatsApp	0.60	0.55	0.92
	(0.02)	(0.02)	(0.01)
N	803	803	479
IVR	0.55	0.43	0.77
	(0.02)	(0.02)	(0.02)
N	804	804	446
SMS	0.33	0.27	0.82
	(0.02)	(0.02)	(0.02)
N	803	803	266

Notes: Means with standard errors in parentheses.

Table A.7: Experiment Check for Representativeness: Baseline Characteristics by Treatment Group for Respondents who Finished the Survey

	WhatsApp	IVR	SMS	All
Male	0.25	0.26	0.18	0.26
	(0.43)	(0.44)	(0.39)	(0.44)
Birthyear	1985.61	1987.00	1986.62	1986.46
	(9.86)	(9.30)	(9.32)	(10.20)
HH Size	3.67	3.56	3.82	3.56
	(1.46)	(1.48)	(1.49)	(1.49)
Days with lower cost food	5.62	5.57	5.63	5.65
	(1.93)	(1.96)	(1.96)	(1.90)
Any Income: Day Laborer	0.42	0.43	0.41	0.42
	(0.49)	(0.50)	(0.49)	(0.49)
Any Income: Street Vendor	0.25	0.22	0.24	0.24
	(0.44)	(0.41)	(0.42)	(0.43)
City: Cartagena	0.37	0.39	0.40	0.35
	(0.48)	(0.49)	(0.49)	(0.48)
City: Medellin	0.24	0.25	0.21	0.25
	(0.43)	(0.43)	(0.41)	(0.43)
City: Valledupar	0.15	0.13	0.16	0.14
	(0.36)	(0.33)	(0.37)	(0.35)
City: Bello	0.04	0.03	0.05	0.04
	(0.19)	(0.18)	(0.22)	(0.19)
City: Other	0.20	0.20	0.18	0.22
	(0.40)	(0.40)	(0.38)	(0.42)
Obs	440	343	217	2410

Notes: Means with standard deviations in parentheses.

Table A.8: RCT Robustness Check: Response and Completion Rates by Platform (After Removing WhatsApp numbers that were contacted twice)

	Started	Completed	Completed if Started
WhatsApp	0.60	0.55	0.92
	(0.02)	(0.02)	(0.01)
N	773	773	463
IVR	0.55	0.43	0.77
	(0.02)	(0.02)	(0.02)
N	804	804	446
SMS	0.33	0.27	0.82
	(0.02)	(0.02)	(0.02)
N	803	803	266

Notes: Means with standard errors in parentheses.

Table A.9: RCT Robustness Check: Response and Completion Rates by Platform (Including Q25)

	Started	Completed Q13	Completed Q25	Completed Q13 if Started
WhatsApp	0.60	0.55	0.54	0.92
	(0.02)	(0.02)	(0.02)	(0.01)
N	773	773	773	463
IVR	0.55	0.43	0.39	0.77
	(0.02)	(0.02)	(0.02)	(0.02)
N	804	804	804	446
SMS	0.33	0.27	0.08	0.82
	(0.02)	(0.02)	(0.01)	(0.02)
N	803	803	803	266

Notes: Means with standard errors in parentheses.