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Abstract

Low levels of household sewerage connectivity constitute a pervasive challenge in low-income, peri-urban settings, limiting the potential benefits of sanitation systems. The situation calls for better understanding of what drives households' decisions to invest in sewerage connections. This paper tested a multi-component communication campaign that combined broadcast messaging, "edutainment" activities, and personalized outreach. The intensive 11-week campaign was randomly assigned to a subset of 31 neighborhoods in the city of El Alto, Bolivia. The effects on a sample of over 1,300 households that were not connected to the sewerage system at baseline were then measured. The intervention increased household sewerage connection rates by 11.2 percentage points over 16 months, a 26 percent improvement relative to the control group. Treated households also reported better-quality connections. These results underscore the potential effectiveness of behavioral change strategies delivered through communication and edutainment campaigns to influence sewerage connectivity.

JEL Codes: C93, O12, I15, H54, Q56

Keywords: sanitation, sewerage, connectivity, edutainment, communication campaign, behavioral change

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Declaration of Generative AI and AI-assisted Technologies in the Writing Process

During preparation of this work, the authors used the Hemingway Editor AI tool and ChatGPT to polish the final version of the manuscript. After using these tools, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

1. Introduction

Despite large-scale public investment in sanitation infrastructure across Latin America and the Caribbean, household connection rates remain low (Kennedy-Walker et al. 2020; Sturzenegger, Vidal, and Martinez 2020). In many urban sanitation projects, connecting to the sewerage system requires households to undertake additional in-home investments to link their private infrastructure to the public network on the street. This process can be especially challenging for the most vulnerable households. As a result, many dwellings remain unconnected even where networks exist, and untreated wastewater continues to flow into pits or public areas, undermining the health and environmental returns to infrastructure investments (Galiani, Gertler, and Schargrodsky 2005; Alsan and Goldin 2019; Sturzenegger, Vidal, and Martinez 2020). Recent evidence highlights that access to infrastructure alone does not ensure uptake, so the central policy challenge is how to translate network availability into effective household connections.

This paper evaluates a high-intensity, edutainment-enhanced communication campaign implemented in El Alto, Bolivia, to increase household connections to the sewerage network. In response to persistently low connection rates following a major investment in expanding the sewerage system, the Bolivian Ministry of Environment and Water and the Public Social Water and Sanitation Company (EPSAS), with support from the Inter-American Development Bank (IDB), launched the *Conéctate a la Ciudad Que Queremos* (CCQQ) ("Connect to the City We Want"[3]) campaign, an 11-week multi-level intervention designed to promote household sewerage connections and system maintenance.

The intervention combined broadcast messaging with community mobilization and personalized outreach via home visits. Campaign activities incorporated elements of art, education, and entertainment; a format commonly referred to as "edutainment" (Tufte 2005). While edutainment is not a new concept, it has only recently begun to receive attention for its potential to influence behavior and serve as a tool for development (Development Impact Group 2019).

This paper evaluates the campaign through a neighborhood-level randomized controlled trial. Treatment areas received sustained, multi-channel communications that combined edutainment activities and home visits, whereas control areas were exposed only to limited broadcast messaging. This design isolates the effect of intensive edutainment-enhanced communication relative to less-intensive messaging.

The study makes several contributions to the literature. First, it provides experimental evidence on the added value of intensive edutainment-enhanced communication relative to basic broadcast media. Second, by assessing demand-side strategies to increase adoption of sanitation infrastructure (Sturzenegger, Vidal, and Martinez 2020), it contributes to the small but growing body of evidence on household uptake of sanitation infrastructure, including evidence on supply-side expansion in Latin America (Galiani, Gertler, and Schargrodsky 2005; Bancalari 2024) and an analysis in the U.S. context (Alsan and Goldin 2019). Third, to our knowledge, it is the first randomized evaluation of an edutainment-enhanced communication campaign aimed at increasing household sewerage connections.

The analysis finds that the intensive multi-component communication campaign increased household sewerage connection rates by 11.2 percentage points 16 months after the start of campaign implementation. It also found evidence that treated households installed better-quality connections. No detectable effect was found on household knowledge of sewerage maintenance. These results highlight the potential for communication to incentivize

[3] In English, the translation of "*Queremos"* in the program's name could indicate a connection to the city we "want," "aspire to," "love," or "care for".

demand, particularly when intensive and community-embedded, in order to shift household behavior in the sanitation sector.

The remainder of the paper is structured as follows. Section 2 describes the context, intervention, and barriers to connection, while Section 3 outlines the experimental design used for the analysis. Section 4 presents the data and Section 5 explains the empirical strategy. Section 6 reports the results of the analysis and Section 7 presents the paper's conclusions.

2. Context and Intervention

2.1 El Alto

El Alto, Bolivia's second-most populated city, is located 4,100 meters above sea level on the Andean plateau adjacent to La Paz. About 80 percent of its roughly 1 million residents identify as Indigenous, and the city is the main destination for rural migrants from Bolivia's highland communities. El Alto has the highest population density in the country and has a poverty rate of 67 percent. Rapid urban growth has outpaced the expansion of basic services, resulting in a persistent gap in sanitation coverage.

In 2012, the Ministry of Environment and Water prioritized expanding access to potable water and sewerage infrastructure in peri-urban areas of El Alto and 10 other cities as part of the national Peri-urban Water and Sewerage Program (PAAP-I).[4] This paper focuses on District 8 of El Alto, where most of the city's investments under PAAP-I were concentrated. Of the 111 zones targeted in El Alto, 92 were located in District 8. A total of US$5.6 million was invested to expand the sewerage system in District 8, reaching an estimated 59,000 residents and installing nearly 10,400 chambers for household connections. The sewerage system became operational in January 2015.

2.2 Barriers to Sewerage Connection

Under Bolivian regulations, sewerage projects build the main and secondary networks and install inspection chambers along the street, at the edge of each property. The households are then responsible for the final connection, which requires installing one or more on-property inspection chambers, internal plumbing, and, in many cases, the improvement or even construction of adequate sanitary facilities. This final step remains a binding constraint on uptake—a challenge often described as the "last mile" for sanitation connections.

The baseline survey conducted for this paper in 2017, two and a half years after the infrastructure project was completed, found that 27 percent of properties in the evaluation areas remained unconnected to the sewerage system. Among unconnected households, nearly half (49 percent) cited lack of time as the reason for not making the connection, 18 percent cited costs, and 12 percent reported informational barriers — 5 percent did not know how to connect, and 7 percent lacked sufficient information (Appendix C, Table C4).

These responses highlight that unconnected households were constrained by priorities and informational frictions, rather than financial constraints alone. "Lack of time" likely reflects the opportunity costs of time and the cognitive effort of coordinating a one-time construction task with no immediate payoff. When costs are immediate and long-run benefits are unclear or undervalued, households may procrastinate connections (Kremer, Rao, and Schilbach 2019; O'Donoghue and Rabin 2001). In vulnerable settings, these behavioral frictions are reinforced by the need to prioritize among competing demands on limited time and resources, often

[4] The US$100 million that financed the program included US$80 million in non-reimbursable funding from the Spanish Cooperation Fund for Water and Sanitation in Latin America and the Caribbean, and a US$20 million IDB loan (No. 2199/BL-BO). The program was approved under Law No. 010 of May 24, 2010.

pushing sanitation lower on the list. Even the households that reported financial constraints may reflect similar behavioral dynamics. Evidence from comparable settings shows that households forgo highly subsidized connection offers, suggesting persistent non-monetary barriers at the last mile (Sturzenegger, Vidal, and Martinez 2020).

Information barriers also played a central role, with 10 percent of unconnected households explicitly citing a lack of information on how to connect. The connection process and administrative requirements can be burdensome in the absence of clear steps or support from service providers (Kennedy-Walker et al. 2020). Without guidance, households may decide to stick with existing sanitation infrastructure, primarily septic tanks or pit latrines. In addition, implicit information failures include underestimating the health risk of non-connection or the long-term maintenance savings from sewerage usage compared to individual sanitation solutions (J-PAL 2025). Information gaps may also play a role in the misperception of the value of connection (Kar and Pasteur 2005; Currie and Gahvari 2008), which would explain the salience of time and cost concerns among 70 percent of unconnected respondents.

These behavioral and informational frictions show why the presence of infrastructure does not automatically lead households to connect. A promising approach to addressing these last-mile barriers involves targeted communication strategies that enhance perceived value and awareness and clarify procedures to promote behavioral change (Sturzenegger, Vidal, and Martinez 2020).

Although cost was reported as a barrier, it was not considered feasible to respond with financial incentives in the context of El Alto, since this could have generated tensions disrupting neighborhood-level organizational dynamics. This barrier reinforced the decision to work only through communication components.

2.3 Edutainment-enhanced Communication to Address Barriers

Various policy tools have been used to expand household sewerage connections, including subsidies, regulatory mandates, and behavioral change strategies (Alam et al. 2025). In El Alto, financial incentives were not feasible, and regulations alone could not address the practical and behavioral barriers households reported. These conditions created the space for a communications-based campaign that could motivate households to make connections and support them in completing the process.

Communication campaigns delivered via radio, text message, or phone calls are widely used in multiple sectors to raise awareness. When implemented in isolation, however, these approaches often have little or no effect on changing behavior (Wallack 1981; Galiani, Gertler, and Orsola-Vidal 2012; Guiteras, Levinsohn, and Mobarek 2015; Sarrassat et al. 2018; Alam et al. 2025). Without compelling narratives, messages may be understood but rarely acted on, as habits and status quo bias delay connection decisions (Neal et al. 2016).

In contrast, interactive and personalized engagement has proven more effective in driving behavioral change. Evidence from health and sanitation programs shows that combining mass media with community activities produces larger impacts (Galiani, Gertler, and Orsola-Vidal 2012; Guiteras, Levinsohn, and Mobarek 2015; Kennedy-Walker et al. 2020). Evidence from Pakistan shows that door-to-door, targeted follow-up activities help sustain improved sanitation behavior, with the largest gains in households facing the most unfavorable conditions, suggesting that personalized engagement is most valuable precisely where barriers are the highest (Augsburg et al. 2022). In Peru, a randomized evaluation found no effect of mass media messaging alone on handwashing behavior, but substantial improvements when combined with intensive school and community activities (Galiani, Gertler, and Orsola-Vidal 2012). More intensive multi-channel campaigns also tend to be more successful at sustaining behavioral change (Menon et al. 2016; Stead et al. 2019).

Edutainment offers a promising approach to expanding both reach and impact. Delivering sanitation messages through formats such as street theaters or neighborhood fairs makes them more vivid, engaging, and memorable, while also connecting with people's lived experiences and beliefs. For instance, programs such as *Lazos de Agua*, implemented across several Latin American countries, have used art and cultural activities to encourage sanitation uptake and tariff payments.[5] By drawing on familiar cultural formats, these approaches capture attention, stir emotion, and reinforce local norms (Banerjee, La Ferrara, and Orozco-Olvera 2019; Grady, Iannantuoni, and Winters 2021; Hussam et al. 2021).

Given that completing household sewerage connections involves motivations beyond cost, these strategies can play a key role in prompting action at the household level. However, robust evidence is needed on the impact of different approaches, designs, and combinations of activities to identify what works best, ensure cost-effectiveness, and inform policies that can be embedded into sanitation investment programs.

The CCQQ campaign aimed to increase sewerage connection rates through a multi-component communication program that raised awareness of connection benefits and procedures, while also addressing proper use, maintenance, and tariff payments. The campaign blended technical guidance with civic and community appeals so that messages resonated with local values and built emotional engagement. By combining broad awareness efforts with local mobilization and personalized nudges, it aimed to create an enabling environment that provided households with both the information and the motivation to complete sewerage connections. The campaign was implemented between May and July 2018.

The intervention combined three components: (1) broadcast messaging, (2) community-based edutainment activities, and (3) personalized household visits. Treatment areas received the full package over an extended period, while control neighborhoods were exposed only to basic broadcast messaging and a limited set of activities introduced later.

The broadcast component relied on both mass media and remote outreach. Mass media included radio spots and jingles, as well as instructional videos disseminated via television and social media. Remote outreach consisted of text messages and phone calls that reinforced these messages at scale. Audiovisual materials were also used in local events, edutainment activities, home visits, and training sessions. This component extended the campaign's reach and ensured repeated exposure to key messages.

The edutainment component blended art, education, and entertainment to deliver culturally resonant messages in public spaces. Activities included street theater and school performances featuring local characters, percussion ensembles (*batucadas*), neighborhood fairs, contests and games, and loudspeaker announcements. Many of the participating groups, such as the *batucada* ensembles, were led by young people, reflecting the campaign's aim to connect with El Alto's predominantly young population. Printed materials were also distributed at these events. By drawing on familiar narratives, edutainment helped engage residents and reframe sewerage connections as both a household achievement and civic responsibility, while reinforcing El Alto's aspirations for prosperity.

The third component involved home visits from the CCQQ team to provide individualized guidance and training to households on the practical steps and estimated costs to connect to the sewerage network. These visits were also used to deepen engagement and reinforce campaign messages.

The campaign was developed and implemented in collaboration with El Alto residents through a participatory process and was preceded by a diagnostic study carried out by a specialized firm. The diagnostic generated key organizational inputs and identified the

[5] See the Lazos de Agua website at www.lazosdeagua.org/es/nuestro-modelo-y-enfoque/ (accessed 25 August 2025).

motivations and cultural elements to be emphasized in the edutainment activities. This helped ensure that campaign messages directly addressed the barriers households faced. Community leaders, teachers, artists, and local suppliers played a central role in organizing events and mobilizing participation. Appendix A provides examples of campaign materials.

3. Experimental Design

This study estimates the impact of the CCQQ campaign on household sewerage connection rates in El Alto using a neighborhood-level cluster randomized controlled trial. The experimental sample consists of 31 neighborhoods in District 8, randomly selected from the 92 neighborhoods targeted by the broader sewerage infrastructure project. To ensure balance, neighborhoods were stratified by the number of unconnected properties at baseline before random assignment of 20 neighborhoods to treatment and 11 to control.

Treatment neighborhoods received the full CCQQ campaign, which combined broadcast messaging, 58 edutainment events, and nearly two visits per household (1.97) over an 11-week period. Control neighborhoods were exposed only to broadcast messaging. At residents' request, a small number of control areas also received late additions, including household visits and one theater performance and fair in the last two weeks of the campaign. These additions, amounting to 0.79 visits per household and four edutainment events, were not part of the original design. Instead, they were introduced in the final two weeks of the campaign in a non-systematic and limited manner. Figure 1 maps the distribution of treatment and control neighborhoods. Appendix B provides additional figures illustrating the experimental design and timeline for edutainment activities.

Figure 1. Map of Treatment and Control Neighborhoods

Note: The map displays the 31 neighborhoods in District 8, randomly assigned to treatment (blue) or control (brown).

The campaign was originally designed to phase implementation over time, with treatment and control neighborhoods receiving the intervention at different stages. However, due to operational constraints, penetration of the intervention in control areas was minimal, resulting in persistent differences in both the intensity and duration of exposure to the campaign. As noted previously, the control group was not entirely untreated, and may also have been subject to informational spillovers from treated areas due to geographic proximity (Figure 1). Assuming monotonicity in the direction of direct and indirect effects, the estimated effects are likely a lower bound of the intensive campaign's potential impact, since households in control areas may have adopted recommended behaviors because of partial exposure to the intervention. Finally, because the intervention components were bundled, the contribution of each individual element cannot be separated.

Edutainment activities were coordinated through local leaders and delivered in designated public spaces within neighborhoods. Minor deviations in implementation occurred, but these were infrequent and did not compromise treatment assignment. Robustness checks are presented in Section 6.

Baseline balance was assessed across 109 pre-treatment covariates among households unconnected at baseline. Only one of the 109 covariates (0.9 percent) had a p-value below 0.01, none had p-values between 0.01 and 0.05, and two (1.8 percent) had p-values between 0.05 and 0.10. These patterns are consistent with random assignment. All main regressions control for the full set of baseline covariates, which includes those that were unbalanced at baseline; the event study controls for the unbalanced covariates only. Table 1 presents descriptive statistics for key baseline variables by treatment status, confirming comparability across groups. Additional tests are reported in Appendix C.

Table 1. Baseline Balance of Main Characteristics

	(1) Treatment	(2) Control	(3) Difference (1)-(2)	(4) p-value (1)=(2)	(5) Observations
Panel A: Property Characteristics					
Household size	4.38	4.30	0.08	0.524	1,449
	(2.13)	(2.15)	(0.12)		
Number of rooms	2.89	2.83	0.05	0.688	1,251
	(1.35)	(1.66)	(0.13)		
Number of bathrooms	0.94	0.96	-0.02	0.553	1,467
	(0.34)	(0.43)	(0.03)		
Roof is made of corrugated metal (calamina) (%)	0.97	0.97	-0.00	0.865	1,449
	(0.18)	(0.17)	(0.01)		
Floor is made of cement (%)	0.83	0.83	0.00	0.918	1,449
	(0.37)	(0.38)	(0.03)		
Bathroom is precarious (%)[a]	0.82	0.77	0.04	0.182	1,449
	(0.39)	(0.42)	(0.03)		
Panel B: Sanitation and Wastewater Practices					
Flush to septic tank (%)	0.19	0.16	0.03	0.334	1,449
	(0.40)	(0.37)	(0.03)		
Flush to pit or unknown place (%)	0.26	0.34	-0.08	0.272	1,449

	(0.44)	(0.47)	(0.08)		
Dry pit latrine with foot platform (%)	0.28	0.25	0.03	0.542	1,449
	(0.45)	(0.43)	(0.05)		
Dry pit latrine without platform or open pit (%)	0.16	0.13	0.03	0.523	1,449
	(0.37)	(0.34)	(0.04)		
Other sanitation facility (%)	0.00	0.00	-0.00	0.311	1,449
	(0.00)	(0.04)	(0.00)		
No sanitation facility (%)	0.08	0.09	-0.01	0.689	1,449
	(0.27)	(0.28)	(0.03)		
Piped water inside the dwelling (%)	0.30	0.35	-0.05	0.287	1,449
	(0.46)	(0.48)	(0.05)		
Kitchen wastewater drains to street (%)	0.58	0.55	0.03	0.482	1,429
	(0.49)	(0.50)	(0.04)		
Personal hygiene wastewater drains to street (%)	0.44	0.44	0.00	0.995	1,444
	(0.50)	(0.50)	(0.04)		
Panel C: Connection Readiness					
Signed sewerage connection authorization form (%)	0.60	0.59	0.01	0.907	1,180
	(0.49)	(0.49)	(0.09)		
Has inspection chamber for sewerage connection (%)	0.12	0.13	-0.00	0.892	1,403
	(0.33)	(0.33)	(0.03)		
Panel D: Informant Characteristics					
Informant completed secondary education (%)	0.38	0.36	0.02	0.564	1,467
	(0.49)	(0.48)	(0.03)		
Age of informant/property owner (years)	39.30	39.26	0.04	0.963	1,465
	(14.02)	(14.51)	(0.86)		
Informant/property owner is female (%)	0.62	0.57	0.04	0.055*	1,467
	(0.49)	(0.50)	(0.02)		
Property owner lives in the dwelling (%)	0.67	0.73	-0.06	0.170	1,449
	(0.47)	(0.45)	(0.04)		
Panel E: Child Health					
Any child under 5 had diarrhea **in** past four weeks (%)	0.14	0.15	-0.01	0.712	558
	(0.34)	(0.36)	(0.04)		
Panel F: Attrition and Data Availability					
Connection outcome observed at follow-up (%)	0.89	0.92	-0.03	0.073*	1,467
	(0.32)	(0.27)	(0.02)		

Note: Columns 1 and 2 report means and standard deviations (in parentheses) for the treatment and control groups. Column 3 reports the difference in means and the associated standard error (in parentheses). Column 4 reports p-values from regressions of each variable on a treatment indicator, with standard errors clustered at the neighborhood level. Column 5 shows the number of non-missing observations. *, **, and *** indicate significance at the 10, 5, and 1 percent levels, respectively.

[a] "Bathroom is precarious" is defined as having at least one of the following deficiencies: missing or precarious walls, roof, floor, door, or lack of basic fixtures.

4. Data

The data used are from two household surveys conducted in the 31 neighborhoods of District 8 selected for the evaluation. The baseline survey was administered via face-to-face interviews in July-August 2017 for all 5,430 properties identified for private housing with potential access to the sewerage system. The survey collected data on household demographics, housing and sanitation characteristics, and perceived barriers to connection. The analysis sample eligible for the study was restricted to properties that reported not being connected to the sewerage system at baseline (1,467 properties). Randomization of neighborhoods into treatment and control groups was carried out in March 2018.

The follow-up survey was conducted in September-October 2019 to measure post-intervention outcomes. Connection status, the primary outcome, is based on respondents' self-reported answers recorded during the survey. In addition, the survey collected data on exposure to the communications campaign and other secondary outcomes.[6]

The final analysis sample includes 1,317 properties that had access to the sewerage system but were unconnected at baseline and for which complete follow-up data on connection status were collected. This represents 89.8 percent of the 1,467 eligible properties. The remaining 150 cases were lost to follow-up due to inaccessibility, refusals, or failed contact attempts. As reported in panel F of Table 1, recontact rates were 3 percentage points lower in treatment than in control neighborhoods, a difference significant at the 10 percent level. Households lost to follow-up appear broadly comparable across arms on observable baseline characteristics, although two of the characteristics examined (number of rooms and corrugated-metal roofing) differ at the 5 percent level (Appendix C, Table C6). Selective attrition therefore cannot be entirely ruled out.[7] General connection status was collected for the entire property, while more specific information was collected for the household of the key informant, typically the property owner.[8]

5. Empirical Strategy

The analysis estimates the intent-to-treat effects of assignment to the intensive communication campaign on sewerage connection outcomes. The primary outcome is a binary indicator equal to one if the property reported being connected to the sewerage system at endline.

[6] This study was pre-registered in the American Economic Association registry for randomized controlled trials as RCT ID AEARCTR-0003666. The primary outcome was connection rate, and secondary outcomes included number of facilities connected (bathrooms, kitchen, and laundry). In the final analysis, we report the likelihood that individual facilities (bathroom, kitchen, and laundry) are connected.

[7] A random subsample of 50 unresolved cases was selected for revisits, but only two additional observations were recovered (one treatment and one control). These are included in the analysis sample without applying non-response weights.

[8] In both survey rounds, the key informant was preferably the property owner or spouse; if they were unavailable, another resident who lived on the property was interviewed. Household-level questions were referenced to the informant's household. Throughout the paper "property" and "household" are used interchangeably to refer to the unit of analysis.

Treatment effects are estimated using the following ordinary least squares (OLS) specification:

$$Y_{ij} = \alpha + \beta Treatment_j + X'_{ij}\gamma + \varepsilon_{ij,} \qquad (1)$$

where Y_{ij} denotes the outcome for property *i* in neighborhood *j* and $Treatment_j$ is an indicator equal to one if neighborhood *j* was randomly assigned to receive the intensive communication campaign. The vector X'_{ij} contains the full set of baseline covariates, covering (i) household composition and dwelling characteristics; (ii) water and sanitation conditions; (iii) connection readiness; and (iv) respondent characteristics. Covariates with missing values at baseline are median-imputed, and in every case, an explicit indicator for baseline missingness is also included. Standard errors are clustered at the neighborhood level, which is the unit of randomization. Because the number of clusters in the sample is moderate, statistical significance is based on wild cluster bootstrap p-values following the procedure proposed by Cameron, Gelbach, and Miller (2008), using Webb's weight distribution (Webb 2023).

In addition to the primary connectivity outcome, treatment effects are estimated for a set of secondary outcomes capturing connection quality and implementation: whether all bathrooms are connected, whether kitchens, or laundry areas are connected, time taken to connect, connection cost, whether connection was verified by EPSAS or the neighborhood board, an index of post-connection problems, and an index of sewerage maintenance knowledge. For outcomes measured using multiple binary indicators (i.e., problem index and knowledge index), additive count indices are constructed by summing the relevant binary variables.

Finally, an event study is implemented using self-reported data on the month of connection to examine dynamic treatment effects. These specifications estimate the cumulative treatment-control difference in connection rates over time.

6. Results

6.1 Exposure

The analysis first looks at how exposure to the campaign varied across treatment and control areas. Table 2 shows clear differences in exposure to the communication campaign: 45 percent of households in treatment neighborhoods reported hearing about the campaign, compared to 19 percent in control areas. Exposure was consistently higher across each communication component: 27 percent of treatment households reported attending an edutainment activity, while only 9 percent of control households did. Similarly, 25 percent of treated households heard about the campaign through other channels, compared to 12 percent in control areas. Nearly 31 percent of households in treatment neighborhoods reported receiving a home visit, compared to 12 percent in control neighborhoods. These self-reports may not fully capture the actual level of exposure, but they show clear differential exposure, and all these differences are significant at the 1 percent level.

Table 2. Post-intervention Exposure Outcomes by Treatment Status

	(1) Treatment	(2) Control	(3) Difference (1)-(2)	(4) p-value (1)=(2)	(5) Observations
Heard about the CCQQ campaign (%)	0.45	0.19	0.27	0.000***	1,232

	(0.50)	(0.39)	(0.04)		
Heard through edutainment component (%)[a]	0.27	0.09	0.18	0.000***	1,232
	(0.45)	(0.29)	(0.04)		
Heard through non-edutainment channels (%)[b]	0.25	0.12	0.12	0.000***	1,232
	(0.43)	(0.33)	(0.03)		
Received a home visit from CCQQ team (%)	0.31	0.12	0.19	0.000***	1,117
	(0.46)	(0.33)	(0.03)		

Note: Columns 1 and 2 report means and standard deviations (in parentheses) for the treatment and control groups. Column 3 reports the difference in means and the associated standard error (in parentheses). Column 4 reports p-values from regressions of each outcome on a treatment indicator, with standard errors clustered at the neighborhood level. Column 5 shows the number of observations. *, **, and *** indicate significance at the 10, 5, and 1 percent levels, respectively.

[a] Edutainment includes theater, fairs, school events, brochures, contests, or training workshops. These channels are coded only for respondents who reported hearing about the campaign.

[b] Non-edutainment channels include radio, text messages, phone calls, or information from neighbors or friends. These channels are coded only for respondents who reported hearing about the campaign.

Differences in exposure reflect both intentional variation in implementation and some degree of spillovers. Edutainment activities were held almost exclusively in treatment neighborhoods. Given the large disparity in the number of activities across groups, the fact that 9 percent of control households reported exposure is substantial and likely reflects spillovers. Differences in reported exposure to home visits align with the study design, as treatment areas received more than twice as many visits per household. Variation in non-edutainment exposure likely reflects differences in the extent to which broadcast messages were reinforced through edutainment activities and home visits. Overall, the evidence confirms that random assignment to treatment generated sizable and statistically significant differences in campaign exposure across all components. Additional post-intervention characteristics by treatment status are reported in Appendix D.

6.2 Regression Estimates

Table 3 reports intent-to-treat (ITT) estimates from the regressions controlling for all baseline covariates to improve precision and account for baseline imbalances. All standard errors are clustered at the neighborhood level, and significance levels are based on wild cluster bootstrap p-values clustered at the neighborhood level to account for the small number of clusters. Assignment to the high-intensity campaign increased the probability of being connected to the sewerage system by 11.2 percentage points, relative to a control group mean connection rate of 43.7 percent ($p < 0.01$).

The campaign also improved outcomes that signal the quality of connections. The probability of having all bathrooms connected rose by 10 percentage points ($p < 0.01$). Connection verification rates increased by 11.2 percentage points ($p < 0.1$), and the connection problem index declined significantly ($p < 0.05$). The average time to connect decreased by 1.8 months ($p < 0.1$), and connection costs increased by 241 bolivianos (Bs) ($p < 0.05$). The probability of having a kitchen or laundry area connected increased slightly, but the estimates were not statistically significant. No effect on sewerage maintenance knowledge is detected.

Self-reported diarrhea in children under age 5 is also examined. The intent-to-treat estimate is small and statistically indistinguishable from zero, and its sign is sensitive to the choice of controls in this restricted subsample: 0.025 with the full set of baseline covariates

(Table 3) and -0.024 without controls (Table E2). Statistical power for this outcome is limited, with 456 observations (households with children under 5). A separate analysis in Table E1 in Appendix E estimates a 12 percentage point lower prevalence of diarrhea among connected households ($p < 0.1$). These results are suggestive of positive effects of the intervention on child health but should be interpreted with caution given the reliance on self-reports and limited statistical power. Table E2 in Appendix E presents the same estimates without controls as a robustness check.

Table 3. Impact of the Connect to the City We Want Campaign on Sewerage Connection, Infrastructure, and Knowledge

	(1)	(2)	(3)
	Coefficient	**Mean (Control Group)**	**Observations**
Panel A: Sewerage Connection Outcomes			
Property connected to sewerage system (%)	0.112***	0.437	1,317
	(0.032)	(0.497)	
All bathrooms connected to sewerage system (%)	0.100***	0.383	1,281
	(0.031)	(0.487)	
Any kitchen connected to sewerage system (%)	0.020	0.217	1,281
	(0.022)	(0.413)	
Any laundry area connected to sewerage system (%)	0.024	0.148	1,281
	(0.018)	(0.355)	
Panel B: Connection Characteristics and Quality			
Connection speed[a]	-1.794*	-0.005	632
	(0.860)	(9.488)	
Connection cost (Bs)[b]	241.106**	1044.174	631
	(79.007)	(547.089)	
Connection had technical verification (%)	0.112*	0.235	631
	(0.049)	(0.425)	
Connection problem index[c]	-0.149**	0.455	630
	(0.065)	(0.770)	
Panel C: Sewerage Maintenance Knowledge			
Sewerage maintenance knowledge index score[d]	-0.026	0.648	1,235
	(0.070)	(0.930)	
Panel D: Child Health			
Any child under 5 had diarrhea in the past four weeks (%)	0.025	0.209	456
	(0.036)	(0.408)	

Note: Each column reports intent-to-treat estimates from separate unweighted ordinary least squares regressions of post-treatment outcomes on a treatment indicator. All specifications control for all baseline covariates covering (i) household composition and dwelling characteristics (household size, rooms, bathrooms, housing materials, renovations); (ii) water and sanitation conditions (water access and service frequency, sanitation type, wastewater drainage, bathroom quality, reported drainage problems); (iii) connection readiness (authorization form, inspection chamber, plumbing readiness, payment indicator); and (iv) respondent characteristics (age, sex, education, and whether the respondent and owner live in the dwelling). Missing-value imputations are applied to baseline controls: continuous and binary controls are imputed with the neighborhood median and categorical controls include a separate missing category; indicators for baseline missingness are included throughout. Standard errors are clustered at the neighborhood level and reported in parentheses. Significance stars are based on wild cluster bootstrap p-values clustered at the neighborhood level. Column (2) reports the control-group mean and standard deviation. Column (3) reports the number of observations. *** p < 0.01, ** p < 0.05, * p < 0.10.

[a] Connection speed is the difference (in months) between the date of connection and the average month when the campaign began in the respondent's neighborhood.

[b] In cases where the connection cost was not reported, the survey recorded a placeholder value of Bs 99,999. These values were treated as missing and imputed using the mean connection cost of other households in the same neighborhood.

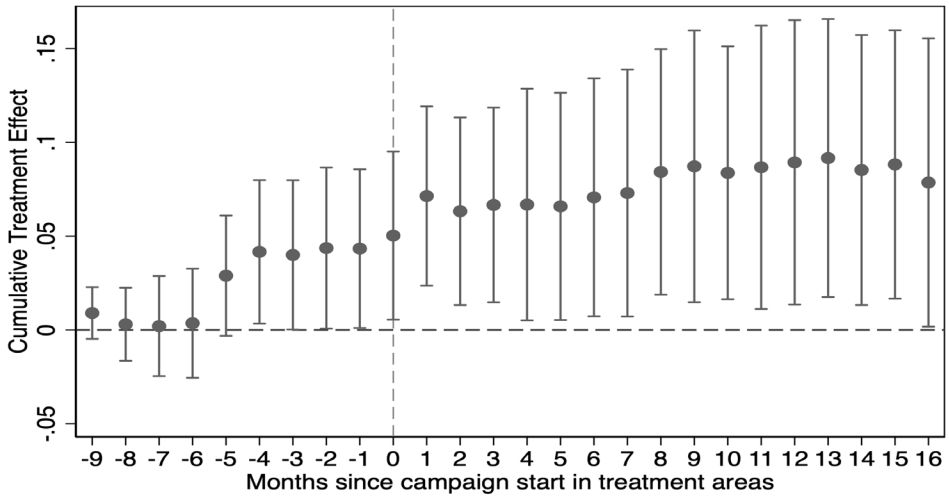
[c] The connection problem index is the unweighted sum of four binary indicators: reports of bad odor, blocked pipes, water overflow, or other connection-related issues.

[d] The sewerage maintenance knowledge index is the unweighted sum of three binary indicators: knowledge that the chamber must be cleaned, the chamber must be kept sealed, and drains should be covered.

6.3 Event Study

Figure 2 plots monthly treatment effects based on self-reported connection dates. Pre-treatment estimates are mostly small and not statistically different from zero, consistent with parallel trends. A modest increase begins five months before the onset of the campaign, with statistically significant effects in month -4 and marginally significant effects in months -3 to -1. Possible explanations for this pre-campaign pattern, including recall bias in self-reported connection dates, are discussed in Section 7.2. Effects become significant at the start of the campaign in treated neighborhoods (month 0). The largest increase occurs in month 1, when treatment areas had full exposure and control areas had not yet been reached by the later campaign activities in month 2. From month 2 onward, when both groups were exposed at different intensities, the cumulative effect rises gradually to about 9 percentage points by month 9 and remains at roughly that level through month 16, the end of the observation window. The timing of these effects aligns closely with the campaign's implementation.

Figure 2. Cumulative Treatment Effect on Self-Reported Connection Rate



Note: This figure plots the cumulative treatment effect on the self-reported connection rate over a window running from nine months before the start of the campaign to sixteen months after. This sample includes properties unconnected at baseline. Month -9 corresponds to the baseline survey. Month 0 marks the start of the communication campaign in treatment neighborhoods. Each point reflects the difference in cumulative connection between treatment and control groups, controlling for unbalanced baseline covariates. The vertical dashed line indicates the start of the campaign in treatment areas (month 0). Confidence intervals (95 percent) are based on standard errors clustered at the neighborhood level.

6.4 Secondary Analysis

Local average treatment effects (LATE) using two-stage least squares are estimated in order to complement the intent-to-treat estimates and account for the fact that random assignment imperfectly determined exposure due to both incomplete reach within treated neighborhoods and spillover exposure in control neighborhoods. An aggregate index of campaign exposure with random assignment is used. The index is the average of three binary indicators capturing whether the household heard about the campaign, was exposed to any edutainment activity, or received a home visit from the CCQQ team. Estimates are reported in Appendix Table F1. The first stage is strong, and random assignment raises the aggregate index by 0.21 points relative to a control mean of 0.13 (F=61.3). Among compliers, a one-unit increase in the index, moving from no exposure to full exposure among all three components, raises the probability of sewerage connection by 55.4 percentage points ($p<0.01$). Similarly, all other LATE estimates are roughly proportional, rescaling the intent-to-treat coefficients by a factor of 1/0.21. The results showed a significant gain on having all bathrooms connected, connection technical verification, the connection problem index, and connection cost. No detectable effects were found on kitchen or laundry connection, sewerage maintenance knowledge, or connection speed. Local average treatment effect estimates that use each individual exposure measure as the endogenous regressor deliver consistent results in sign, significance, and magnitude (Table F1, panels C-E). These results suggest that the overall intent-to-treat is a conservative estimate reflecting the partial reach of the campaign across the assigned population, rather than weak responsiveness among the households that actually engaged.

Exploratory heterogeneity analysis was also conducted across five baseline subgroups: reported connection barriers, bathroom conditions, signing of the EPSAS authorization form, completed secondary education, and wealth. Results are reported in Appendix Table F2, where the intent-to-treat column reports subgroup-specific intent-to-treat estimates, and the Δ vs. ref column reports the treatment × subgroup interaction.

Panel A of Appendix Table F2 shows that the interaction for households reporting information barriers is small and statistically indistinguishable from zero, indicating effects not meaningfully different from the reference group reporting time, cost, or priority barriers. By contrast, households in the “Other barriers” category exhibit a treatment effect that is essentially zero and substantially smaller than the reference group, with an interaction of −0.191 ($p < 0.01$). This residual category pools responses that are plausibly outside the campaign’s margin—being told not to connect, missing physical prerequisites such as a connection point, or reporting that connection was not feasible—alongside low-information or low-engagement answers (“does not know,” “other reason”) that may proxy for households less able or willing to act even when prompted.

Panels B–E of Appendix Table F2 show little evidence of differential effects by baseline bathroom conditions, baseline connection readiness, completed secondary education, or wealth. The wealth split is based on an endline asset index, as baseline asset data are unavailable. While durable assets are unlikely to respond to a communication campaign over the study horizon, potential endogeneity cannot be fully ruled out. These analyses should therefore be treated as exploratory and descriptive.

7. Conclusions

7.1 Results

Households assigned to the intensive CCQQ campaign comprised of broadcast messaging, edutainment activities, and household visits were 11.2 percentage points more likely to connect to the sewerage system. Relative to a 43.7 percent connection rate in the control group, which received only broadcast messaging, this represents a substantial behavioral response to the demand-side intervention. The results highlight the potential of edutainment-enhanced communication and personalized outreach to spur high-effort, one-time actions.

Beyond increasing take-up, the campaign also affected how households connected. Treated households were more likely to have all bathrooms connected. This outcome is important, as full connection of sanitary facilities to the sewerage system is necessary to eliminate exposure to untreated wastewater and yield the expected health benefits. Treated households were also more likely to have verified connections and to report fewer post-connection problems. Yet, no significant effect of the campaign was detected on connecting kitchen or laundry areas, likely reflecting that bathrooms are the most essential infrastructure to connect, whereas extending connections to other areas may entail additional costs without immediate benefits. These findings are consistent with the higher connection costs observed among treatment households, plausibly reflecting higher-quality infrastructure investments, such as improved materials or a greater number of bathrooms connected. General equilibrium price effects are unlikely, as these would operate market-wide and affect both groups. Together, these results suggest that the campaign improved both the quantity of connections and certain dimensions of connection quality.

Despite these behavioral changes, the campaign had no detectable effect on sewerage maintenance knowledge. Average knowledge scores remained low in both groups. This disconnect between the campaign's effect on household action versus knowledge suggests that the campaign operated primarily through motivational channels rather than through technical learning. Edutainment and home visits embedded messages within emotionally resonant narratives that were well suited to shifting behavior and prompting action in one-time, high-effort decisions, even without measurable gains in knowledge.

Suggestive evidence was also found of reduced diarrhea incidence among children under age 5, though estimates are imprecise and not statistically significant. The evaluation was not powered to detect health effects, and the sample of households with young children was limited. Nonetheless, the direction of the effect is consistent with existing evidence linking improved sanitation to enteric health outcomes (Norman, Pedley and Takkouche 2010; Wolf et al. 2022).

Temporal patterns in the data further support a behavioral interpretation of the effect of the campaign. The event study shows a sharp rise in treatment effects in month 1, when only the treatment neighborhoods received full exposure. The gap then widens gradually before leveling off. This trajectory suggests that the campaign not only triggered households to connect but also helped them overcome barriers that might otherwise have delayed or prevented connection.

Taken together, the evidence is consistent with reductions in both behavioral and informational barriers, suggesting that the campaign made it easier for households to complete a costly, one-time investment by combining messaging, assistance, and narratives that resonated with El Alto residents.

7.2 Challenges and Imprecisions

A small number of households in control neighborhoods reported exposure to the campaign through edutainment activities or household visits, either from light-touch outreach in the final weeks or spillovers. This contamination likely reduced estimated treatment effects, so the results should be interpreted as lower bounds of the program's potential impact.

The primary outcome, connection status (connected or not connected), is self-reported and was not verified through visual inspection by enumerators. Several other outcomes are also self-reported, which is a limitation because they are more susceptible to recall error and reporting bias. Connection dates used in the event study analysis relied on self-reports. A modest and not statistically significant increase was observed in reported connections in the months immediately preceding the campaign. One possible explanation for this pattern is recall bias: households in the treatment group, having greater exposure to campaign messaging about the value of connecting, may have backdated their reported connection dates to align with perceived expectations. Similar reporting patterns have been observed in other behavioral change interventions. For example, in Kenya's WASH Benefits study, treated mothers revised their reported breastfeeding durations after the intervention to conform to the practices recommended by the campaign (Stewart et al. 2024). In Bangladesh, households in a latrine promotion program over-reported use relative to verified behavior (Islam et al. 2025).

Finally, with respect to the mechanisms underlying behavioral change, the results suggest that the campaign operated primarily through motivational channels rather than the transmission of technical knowledge. A limitation of the study, however, is that the survey did not collect intermediate outcomes related to motivation, such as social norms, perceptions, or expectations, which prevents a more direct test of these mechanisms.

7.3 Cost-Effectiveness

The total campaign cost in treatment neighborhoods was estimated at US$60,472, of which 27 percent was allocated to broadcast messaging and 73 percent to edutainment activities and household visits. Among the 855 households that were unconnected at baseline and included in the follow-up analysis, the average campaign cost was US$71 per household, or US$52 when considering only edutainment activities and visits.

The cost-effectiveness of the intervention was assessed using the estimated effect of the campaign (11.2 percentage points) and the incremental cost of campaign components implemented in treatment areas. The campaign induced an additional sewerage connection at a cost of US$631. Restricting the calculation to edutainment and home visit variable costs, the cost per additional property connection is US$461. Details and procedures used to derive these estimates are provided in Appendix G.

These program costs appear high relative to the physical cost of installing a connection. Indeed, the average connection cost reported by residents of El Alto in the survey was US$170 (a full-sample average of Bs 1,181, converted at the official exchange rate at the time of Bs 6.96 per U.S. dollar). Other studies in Bolivia place the figure at US$204 (Sturzenegger, Vidal, and Martinez 2020). These amounts exclude important costs such as breaking and replacing floors to install connections or the value of the time spent on the work. Even accounting for these omissions, the total remains below the estimated cost of the CCQQ program. Still, directly subsidizing connections at a similar or lower cost is an approach that has been shown to create perverse incentives. Studies of water and sanitation programs illustrate that when households receive free connections, they are more likely to fall behind on tariff payments or neglect upkeep, in part due to lacking a sense of ownership (Lauria, Hopkins, and Debomy 2005; Kullmann 2012; Mallapaty 2013; Al Djono and Daniel 2022). In contrast, the CCQQ campaign emphasized this sense of ownership and civic duty to create a shift in behavior to promote the

maintenance and long-term benefits of connection. Even without measurable gains in maintenance knowledge, this intervention avoids incentive problems associated with subsidies and addresses the behavioral barriers that underlie low connection rates.

This mobilization is essential for the households targeted by the campaign that represent the “last mile” for connection and for which barriers to connection often extend beyond financial considerations (Sturzenegger, Vidal, and Martinez 2020). By closing these final gaps, the intervention may generate broader benefits—such as potential reductions in child diarrhea—that make such an intervention more economical than subsidizing connections, although the scope of these secondary benefits remains an open question. Indeed, the timing of the study may not fully capture the benefits of the campaign and of connections that are likely to materialize over a longer period. Finally, a significant share of the campaign cost represents fixed expenses in creating edutainment materials. Therefore, this intervention is scalable, and subsequent replications should lower the cost per induced connection.

7.4 Open Questions

Several open questions emerge from this analysis and could orient future research. First, the bundled nature of the campaign means that the impact of individual components could not be isolated and remains unknown. Second, it is unclear which features of El Alto, such as its strong community organizations and the diagnostic groundwork that shaped the campaign’s design, were essential to its success, and whether similar approaches would work in less-organized settings. Third, it remains unclear whether pairing communication campaigns like CCQQ with targeted financial incentives would enhance impact. Finally, additional longitudinal follow-up studies are needed to assess whether the observed behavioral changes persist and whether health benefits materialize over time.

Appendix A: Campaign Materials

Figure A1. Campaign Poster

Note: This poster was part of the campaign materials. The QR code links to a video about the campaign.

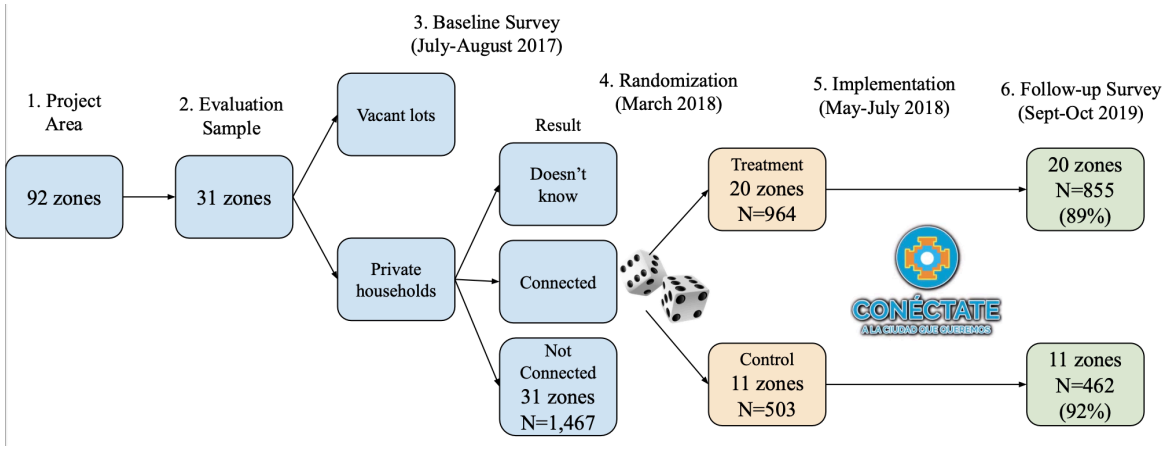
Videos

The campaign videos are available in a public YouTube playlist: *Conéctate con la ciudad que queremos.* Available at: https://www.youtube.com/playlist?list=PL-O0Sln8Kcz2OMohnrdm_0nHvrPonV8XH

The playlist contains multiple campaign videos used as part of the intervention and to document the intervention.

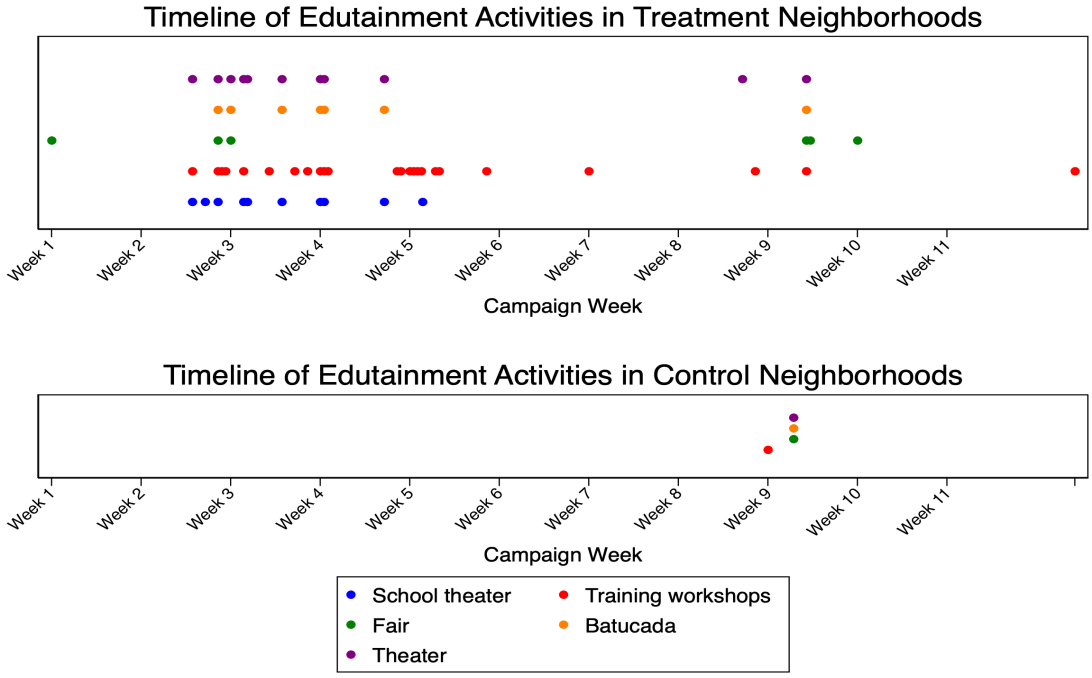
Appendix B: Visualizations of the Experimental Design

Figure B1. Experimental Design



Note: This figure illustrates the evaluation design.

Figure B2. Timeline of Edutainment Activities across Treatment and Control Groups



Note: Each dot represents an activity occurrence, classified into school theater, training workshops, fairs, batucadas (street performances), and theater events. Weeks are defined relative to the campaign launch, with Week 1 beginning on May 3, 2018. When multiple activities of the same type occurred on the same day, a slight horizontal offset (up to 0.6 days) was applied for visual clarity. No jitter was applied across activity types.

Appendix C: Additional Baseline Balance Tables

Table C1. Baseline Balance of Property and Respondent Characteristics

	(1) Treatment	(2) Control	(3) Difference	(4) p-value	(5) Observations
Panel A: Property Characteristics					
Private dwelling (not commercial/public)	1.00	1.00	0.00	.	1,467
	(0.00)	(0.00)	(0.00)		
Number of bathrooms	0.94	0.96	-0.02	0.553	1,467
	(0.34)	(0.43)	(0.03)		
Number of housing units on property	1.08	1.08	0.00	0.859	1,467
	(0.44)	(0.32)	(0.03)		
Property has at least one occupied unit	1.00	0.99	0.00	0.791	1,456
	(0.06)	(0.08)	(0.01)		
Interview date (Century Month Code)	1411.21	1411.27	-0.06	0.724	1,467
	(0.45)	(0.47)	(0.17)		
Panel B: Respondent Characteristics					
Respondent is owner	0.52	0.57	-0.05	0.102	1,467
	(0.50)	(0.50)	(0.03)		
Respondent is spouse of owner	0.05	0.04	0.01	0.571	1,467
	(0.21)	(0.20)	(0.01)		
Respondent is other adult relative of owner	0.27	0.25	0.02	0.488	1,467
	(0.44)	(0.44)	(0.02)		
Respondent is another adult in household	0.16	0.13	0.03	0.230	1,467
	(0.37)	(0.34)	(0.02)		
Age of respondent/owner (years)	39.30	39.26	0.04	0.963	1,465
	(14.02)	(14.51)	(0.86)		
Respondent/owner is female	0.62	0.57	0.04	0.055*	1,467
	(0.49)	(0.50)	(0.02)		
Owner lives in dwelling	0.67	0.73	-0.06	0.170	1,449
	(0.47)	(0.45)	(0.04)		
Respondent lives in dwelling	0.99	0.98	0.01	0.295	1,449
	(0.11)	(0.13)	(0.01)		
Panel C: Educational Attainment					
No formal education	0.03	0.02	0.01	0.333	1,467
	(0.16)	(0.14)	(0.01)		
Some primary education	0.20	0.20	-0.01	0.871	1,467
	(0.40)	(0.40)	(0.03)		
Completed primary education	0.15	0.12	0.03	0.240	1,467

	(0.36)	(0.33)	(0.03)		
Some secondary education	0.16	0.23	-0.08	0.003***	1,467
	(0.37)	(0.42)	(0.02)		
Completed secondary education	0.38	0.36	0.02	0.564	1,467
	(0.49)	(0.48)	(0.03)		
Higher education	0.08	0.06	0.03	0.125	1,467
	(0.27)	(0.23)	(0.02)		
Other education	0.00	0.00	0.00	0.318	1,467
	(0.03)	(0.00)	(0.00)		

Note: Estimates follow the specifications described in notes of Table 1 in the main text.

Table C2. Baseline Balance of Demographic Composition (Main Household)

	(1) Treatment	(2) Control	(3) Difference	(4) p-value	(5) Observations
Panel A: Demographic Composition					
Household size (number of residents)	4.38	4.30	0.08	0.524	1,449
	(2.13)	(2.15)	(0.12)		
Share of boys under 5	0.06	0.05	0.00	0.665	1,449
	(0.11)	(0.10)	(0.01)		
Share of girls under 5	0.05	0.04	0.01	0.282	1,449
	(0.10)	(0.10)	(0.01)		
Share of males aged 6–17	0.13	0.14	-0.01	0.230	1,449
	(0.17)	(0.18)	(0.01)		
Share of females aged 6–17	0.10	0.10	-0.01	0.355	1,449
	(0.14)	(0.14)	(0.01)		
Share of males aged 18–49	0.24	0.24	-0.00	0.953	1,449
	(0.21)	(0.23)	(0.01)		
Share of females aged 18–49	0.23	0.22	0.01	0.303	1,449
	(0.18)	(0.18)	(0.01)		
Share of males aged 50+	0.09	0.09	0.00	0.922	1,449
	(0.20)	(0.21)	(0.01)		
Share of females aged 50+	0.09	0.09	-0.00	0.851	1,449
	(0.20)	(0.19)	(0.01)		
Panel B: Child Health					
Any child < 5 had diarrhea in past four weeks (%)	0.14	0.15	-0.01	0.712	558
	(0.34)	(0.36)	(0.04)		

Note: Estimates follow the specifications described in notes of Table 1 in the main text.

Table C3. Baseline Balance of Main Dwelling Characteristics

	(1) Treatment	(2) Control	(3) Difference	(4) p-value	(5) Observations
Panel A: Type of Dwelling					
House	0.41	0.37	0.04	0.364	1,449
	(0.49)	(0.48)	(0.04)		
Detached rooms or units	0.56	0.61	-0.05	0.266	1,449
	(0.50)	(0.49)	(0.04)		
Other	0.03	0.02	0.01	0.381	1,449
	(0.16)	(0.13)	(0.01)		
Panel B: Wall Material					
Brick, cement block, or concrete	0.70	0.75	-0.05	0.236	1,449
	(0.46)	(0.43)	(0.04)		
Adobe or rammed earth	0.30	0.25	0.05	0.236	1,449
	(0.46)	(0.43)	(0.04)		
Panel C: Roof Material					
Corrugated metal (calamina)	0.97	0.97	-0.00	0.865	1,449
	(0.18)	(0.17)	(0.01)		
Tile or concrete slab	0.03	0.03	0.00	0.953	1,449
	(0.17)	(0.17)	(0.01)		
Other	0.00	0.00	0.00	0.341	1,449
	(0.03)	(0.00)	(0.00)		
Panel D: Floor Material					
Dirt floor	0.10	0.12	-0.02	0.536	1,449
	(0.30)	(0.32)	(0.03)		
Parquet, carpet, or tile	0.06	0.05	0.01	0.571	1,449
	(0.23)	(0.21)	(0.02)		
Cement	0.83	0.83	0.00	0.918	1,449
	(0.37)	(0.38)	(0.03)		
Other	0.01	0.01	0.00	0.360	1,449
	(0.10)	(0.08)	(0.00)		
Panel E: Other Housing Characteristics					
Number of rooms in dwelling	2.89	2.83	0.05	0.688	1,251
	(1.35)	(1.66)	(0.13)		
Dwelling renovated in past year	0.08	0.07	0.01	0.617	1,440
	(0.28)	(0.26)	(0.02)		
Panel F: Drinking Water Source					
Piped water inside dwelling	0.30	0.35	-0.05	0.287	1,449
	(0.46)	(0.48)	(0.05)		

Piped water on property (outside dwelling)	0.66	0.62	0.05	0.345	1,449
	(0.47)	(0.49)	(0.05)		
Other	0.04	0.04	0.00	0.835	1,449
	(0.19)	(0.19)	(0.01)		
Panel G: Water Service Frequency					
24 hours per day	0.73	0.80	-0.08	0.369	1,394
	(0.45)	(0.40)	(0.09)		
Certain hours per day	0.23	0.14	0.08	0.264	1,394
	(0.42)	(0.35)	(0.07)		
Less frequent	0.05	0.05	-0.01	0.733	1,394
	(0.21)	(0.23)	(0.02)		
Hours of water access per day	11.00	11.24	-0.23	0.857	378
	(6.16)	(6.38)	(1.28)		

Note: Estimates follow the specifications described in notes of Table 1 in the main text.

Table C4. Baseline Balance of Sewerage Connection Characteristics

	(1) Treatment	(2) Control	(3) Difference	(4) p-value	(5) Observations
Panel A: Sewerage Connection Status					
Dwelling is connected to the sewerage system	0.00	0.00	0.00	.	1,467
	(0.00)	(0.00)	(0.00)		
Signed EPSAS connection authorization form	0.60	0.59	0.01	0.907	1,180
	(0.49)	(0.49)	(0.09)		
Household chamber for connection is present	0.12	0.13	-0.00	0.892	1,403
	(0.33)	(0.33)	(0.03)		
Bathroom plumbing to chamber completed	0.17	0.21	-0.04	0.569	173
	(0.38)	(0.41)	(0.08)		
Connection fee paid in full (not in installments)	0.44	0.50	-0.06	0.319	625
	(0.50)	(0.50)	(0.06)		
Panel B: Reported Barriers to Connection					
Lacked time to complete connection	0.50	0.47	0.03	0.726	1,467
	(0.50)	(0.50)	(0.09)		
Could not afford connection	0.17	0.18	-0.01	0.887	1,467
	(0.38)	(0.38)	(0.04)		
Did not know how to connect	0.05	0.04	0.01	0.742	1,467
	(0.22)	(0.20)	(0.02)		
Lacked sufficient information	0.07	0.08	-0.01	0.738	1,467
	(0.26)	(0.27)	(0.03)		
Sewerage network not built on their street	0.01	0.00	0.00	0.606	1,467

	(0.08)	(0.06)	(0.00)		
Did not need a sewerage connection	0.00	0.00	0.00	0.419	1,467
	(0.06)	(0.04)	(0.00)		
Did not know any plumbers	0.00	0.01	-0.00	0.166	1,467
	(0.05)	(0.08)	(0.00)		
Other household priorities	0.02	0.02	-0.00	0.764	1,467
	(0.13)	(0.14)	(0.01)		
Missing connection point	0.00	0.01	-0.00	0.716	1,467
	(0.06)	(0.08)	(0.00)		
Told not to connect	0.01	0.02	-0.00	0.734	1,467
	(0.11)	(0.13)	(0.01)		
Other reason	0.09	0.10	-0.01	0.730	1,467
	(0.28)	(0.30)	(0.03)		
Does not know	0.07	0.08	-0.01	0.717	1,467
	(0.26)	(0.27)	(0.02)		
Panel C: Type of Assistance Needed					
Needs more time	0.27	0.29	-0.02	0.769	1,467
	(0.45)	(0.45)	(0.06)		
Needs list of available plumbers	0.07	0.04	0.02	0.093*	1,467
	(0.25)	(0.20)	(0.01)		
Needs financial support	0.26	0.24	0.02	0.626	1,467
	(0.44)	(0.43)	(0.04)		
Needs explanation on how to connect	0.12	0.13	-0.00	0.890	1,467
	(0.33)	(0.33)	(0.03)		
Needs connection materials	0.04	0.04	0.01	0.635	1,467
	(0.20)	(0.19)	(0.02)		
Needs bathroom improvements	0.01	0.02	-0.01	0.297	1,467
	(0.10)	(0.14)	(0.01)		
Needs owner’s authorization	0.04	0.03	0.01	0.151	1,467
	(0.19)	(0.16)	(0.01)		
Needs EPSAS to complete the connection	0.07	0.08	-0.01	0.748	1,467
	(0.25)	(0.26)	(0.03)		
Other assistance needed	0.07	0.08	-0.01	0.703	1,467
	(0.26)	(0.28)	(0.03)		
Does not know	0.04	0.06	-0.01	0.445	1,467
	(0.21)	(0.23)	(0.01)		

Notes: Estimates follow the specifications described in notes of Table 1 in the main text. EPSAS: Public Social Water and Sanitation Company.

Table C5. Baseline Balance of Sanitation Characteristics

	(1) Treatment	(2) Control	(3) Difference	(4) p-value	(5) Observations
Panel A: Type of Sanitation Facility					
Connected to sewerage system	0.03	0.03	0.01	0.551	1,449
	(0.18)	(0.17)	(0.01)		
Flushes to septic tank	0.19	0.16	0.03	0.334	1,449
	(0.40)	(0.37)	(0.03)		
Flushes to pit or does not know	0.26	0.34	-0.08	0.272	1,449
	(0.44)	(0.47)	(0.08)		
Dry pit latrine with foot platform	0.28	0.25	0.03	0.542	1,449
	(0.45)	(0.43)	(0.05)		
Dry pit latrine without platform or open pit	0.16	0.13	0.03	0.523	1,449
	(0.37)	(0.34)	(0.04)		
Other sanitation facility	0.00	0.00	-0.00	0.311	1,449
	(0.00)	(0.04)	(0.00)		
No toilet facility	0.08	0.09	-0.01	0.689	1,449
	(0.27)	(0.28)	(0.03)		
Reports drainage problems	0.06	0.08	-0.02	0.440	725
	(0.24)	(0.28)	(0.03)		
Toilet used exclusively by household	0.96	0.95	0.01	0.625	1,332
	(0.20)	(0.22)	(0.02)		
Toilet shared with other households	0.04	0.05	-0.01	0.533	1,332
	(0.20)	(0.22)	(0.02)		
Toilet is for public use	0.00	0.00	0.00	0.144	1,332
	(0.05)	(0.00)	(0.00)		
Overall condition of bathroom	2.35	2.27	0.08	0.109	1,326
	(0.53)	(0.50)	(0.05)		
Panel B: Bathroom Characteristics					
Bathroom has a toilet	0.77	0.84	-0.07	0.147	1,368
	(0.42)	(0.37)	(0.05)		
Bathroom has a sink	0.25	0.30	-0.05	0.316	1,368
	(0.43)	(0.46)	(0.05)		
Bathroom has a shower	0.31	0.34	-0.03	0.298	1,368
	(0.46)	(0.47)	(0.03)		
Walls are missing or made of precarious material	0.35	0.29	0.06	0.143	1,445
	(0.48)	(0.46)	(0.04)		
Floor is dirt or missing	0.26	0.26	-0.00	0.986	1,445

	(0.44)	(0.44)	(0.05)		
Roof is precarious or missing	0.20	0.21	-0.01	0.800	1,445
	(0.40)	(0.41)	(0.04)		
Door is precarious or missing	0.40	0.40	-0.00	0.949	1,445
	(0.49)	(0.49)	(0.05)		
Bathroom is precarious (any condition above)	0.82	0.77	0.04	0.182	1,449
	(0.39)	(0.42)	(0.03)		
Panel C: Kitchen Wastewater Drainage					
Drains to septic tank	0.05	0.05	-0.00	0.880	1,429
	(0.21)	(0.22)	(0.02)		
Drains to pit	0.11	0.12	-0.01	0.667	1,429
	(0.31)	(0.33)	(0.03)		
Drains to yard	0.24	0.25	-0.01	0.746	1,429
	(0.43)	(0.44)	(0.04)		
Drains to street	0.58	0.55	0.03	0.482	1,429
	(0.49)	(0.50)	(0.04)		
Other drainage destination	0.02	0.02	-0.00	0.917	1,429
	(0.14)	(0.15)	(0.01)		
Panel D: Personal Hygiene Wastewater Drainage					
Drains to septic tank	0.04	0.04	0.00	0.875	1,444
	(0.19)	(0.19)	(0.01)		
Drains to pit	0.03	0.05	-0.02	0.304	1,444
	(0.18)	(0.22)	(0.02)		
Drains to yard	0.24	0.24	-0.01	0.887	1,444
	(0.43)	(0.43)	(0.04)		
Drains to street	0.44	0.44	0.00	0.995	1,444
	(0.50)	(0.50)	(0.04)		
Reused in bathroom	0.24	0.21	0.03	0.433	1,444
	(0.43)	(0.41)	(0.04)		
Other drainage destination	0.01	0.02	-0.01	0.146	1,444
	(0.12)	(0.15)	(0.01)		

Note: Estimates follow the specifications described in notes of Table 1 in the main text.

Table C6. Baseline Balance of Household and Sanitation Characteristics of Attrited Population

	(1) Treatment	(2) Control	(3) Difference	(4) p-value	(5) Observations
Panel A. Property Characteristics					
Household size	4.15	3.85	0.30	0.334	146
	(2.24)	(2.10)	(0.30)		
Number of rooms	2.47	2.11	0.35	0.020**	127
	(1.17)	(0.99)	(0.14)		
Number of bathrooms	0.82	0.93	-0.11	0.151	150
	(0.39)	(0.35)	(0.07)		
Roof is made of corrugated metal (calamina) (%)	0.94	1.00	-0.06	0.047**	146
	(0.23)	(0.00)	(0.03)		
Bathroom is precarious (%)[a]	0.79	0.78	0.01	0.923	146
	(0.41)	(0.42)	(0.10)		
Panel B. Sanitation and Wastewater Practices					
Flushed to septic tank (%)	0.22	0.12	0.10	0.159	146
	(0.42)	(0.33)	(0.07)		
Flushes to pit or unknown (%)	0.20	0.37	-0.17	0.188	146
	(0.40)	(0.49)	(0.12)		
Dry pit latrine with foot platform (%)	0.24	0.32	-0.08	0.584	146
	(0.43)	(0.47)	(0.14)		
Dry pit latrine without platform or open pit (%)	0.16	0.10	0.06	0.414	146
	(0.37)	(0.30)	(0.08)		
Other sanitation facility (%)	0.00	0.00	0.00	.	146
	(0.00)	(0.00)	(0.00)		
No sanitation facility (%)	0.16	0.10	0.06	0.335	146
	(0.37)	(0.30)	(0.07)		
Household has piped water inside the dwelling (%)	0.28	0.29	-0.02	0.840	146
	(0.45)	(0.46)	(0.08)		
Kitchen wastewater drains to street (%)	0.50	0.51	-0.01	0.845	143
	(0.50)	(0.51)	(0.07)		
Personal hygiene wastewater drains to street (%)	0.35	0.34	0.01	0.895	144
	(0.48)	(0.48)	(0.06)		
Panel C. Connection Readiness					
Signed connection authorization form (%)	0.48	0.54	-0.06	0.573	110

	(0.50)	(0.51)	(0.11)		
Has inspection chamber connection (%)	0.07	0.16	-0.09	0.170	137
	(0.26)	(0.37)	(0.06)		
Panel D. Informant Characteristics					
Informant completed secondary education (%)	0.38	0.34	0.03	0.644	150
	(0.49)	(0.48)	(0.07)		
Age of informant/property owner (years)	39.19	36.76	2.44	0.296	149
	(15.72)	(12.59)	(2.28)		
Informant/property owner is female (%)	0.62	0.51	0.11	0.138	150
	(0.49)	(0.51)	(0.07)		
Property owner lives in the dwelling (%)	0.49	0.56	-0.08	0.500	146
	(0.50)	(0.50)	(0.11)		
Panel E. Child Health					
Any child < 5 had diarrhea in past four weeks (%)	0.11	0.11	0.00	0.976	53
	(0.32)	(0.33)	(0.08)		
Panel F. Attrition and Data Availability					
Connection outcome observed at follow-up (%)	0.00	0.00	0.00	.	150
	(0.00)	(0.00)	(0.00)		

Note: Columns 1-2 report group means (standard deviations in parentheses) for baseline observations for which the connection status at endline was not obtained. Column 3 shows mean differences (standard errors in parentheses). Column 4 reports p-values from regressions on a treatment indicator (standard errors clustered at neighborhood level). Column 5 gives non-missing observations. *, **, *** denote significance at the 10, 5, and 1 percent levels.

[a] "Bathroom is precarious" is defined as having at least one of the following deficiencies: missing or precarious walls, roof, floor, door, or lack of basic fixtures.

Appendix D: Additional Post-intervention characteristics by Treatment Status

Table D1. Post-intervention Outcomes

	(1) Treatment	(2) Control	(3) Difference (1)-(2)	(4) p-value (1)=(2)	(5) Observations
Panel A. Exposure to the Communication Campaign					
Heard about the CCQQ campaign (%)	0.45	0.19	0.27	0.000***	1,232
	(0.50)	(0.39)	(0.04)		
Heard through edutainment component (%)[a]	0.27	0.09	0.18	0.000***	1,232
	(0.45)	(0.29)	(0.04)		
Heard through non-edutainment channels (%)[b]	0.25	0.12	0.12	0.000***	1,232
	(0.43)	(0.33)	(0.03)		
Received a home visit from CCQQ team (%)	0.31	0.12	0.19	0.000***	1,117
	(0.46)	(0.33)	(0.03)		
Panel B. Sewerage Connection Outcomes					
Property is connected to sewerage system (%)	0.54	0.44	0.10	0.009***	1,317
	(0.50)	(0.50)	(0.04)		
All bathrooms connected to sewerage system (%)	0.48	0.38	0.10	0.016**	1,281
	(0.50)	(0.49)	(0.04)		
Any kitchen connected to sewerage system (%)	0.23	0.22	0.01	0.643	1,281
	(0.42)	(0.41)	(0.03)		
Any laundry area connected to sewerage system (%)	0.17	0.15	0.02	0.349	1,281
	(0.38)	(0.36)	(0.02)		
Panel C. Sewerage System Connection Characteristics					
Connection speed (months)[c]	-1.45	-0.01	-1.45	0.038**	632
	(8.85)	(9.49)	(0.67)		
Connection cost (Bs)[d]	1225.54	1044.17	181.37	0.014**	631
	(810.89)	(547.09)	(69.87)		
Connection was verified (%)	0.34	0.24	0.11	0.071*	631
	(0.48)	(0.43)	(0.06)		
Reported any connection problem	0.22	0.30	-0.07	0.075*	665
	(0.42)	(0.46)	(0.04)		
Connection problem index[e]	0.32	0.45	-0.14	0.048**	630

	(0.66)	(0.77)	(0.07)		
Panel D. Knowledge of Sewerage Maintenance					
Sewerage maintenance knowledge index[f]	0.60	0.65	-0.05	0.545	1,235
	(0.93)	(0.93)	(0.08)		
Panel E. Child Health					
Any child < 5 had diarrhea in past four weeks (%)	0.18	0.21	-0.02	0.538	456
	(0.39)	(0.41)	(0.04)		

Note: Columns 1 and 2 report means and standard deviations (in parentheses) for the treatment and control groups. Column 3 reports the difference in means and the associated standard error (in parentheses). Column 4 reports p-values from regressions of each outcome on a treatment indicator, with standard errors clustered at the neighborhood level. Column 5 shows the number of observations. *, **, and *** indicate significance at the 10, 5, and 1 percent levels, respectively.

[a] Edutainment includes theater, fairs, school events, brochures, contests, or training workshops. These channels are coded only for respondents who reported hearing about the campaign.

[b] Non-edutainment channels include radio, text messages, phone calls, or information from neighbors or friends. These channels are coded only for respondents who reported hearing about the campaign.

[c] Connection speed is calculated as the difference (in months) between the date of connection and the average start month of the campaign in the respondent's neighborhood.

[d] In cases where the connection cost was not reported, these values were treated as missing and imputed using the mean connection cost in the neighborhood.

[e] The connection problem index is the unweighted sum of four binary indicators: reports of bad odor, blocked pipes, water overflow, or other issues.

[f] The sewerage maintenance knowledge index is the unweighted sum of three binary indicators: knowledge that the chamber must be cleaned, that it must be kept sealed, and that drains should be covered.

Table D2. Post-Intervention Household Characteristics

	(1) Treatment	(2) Control	(3) Difference	(4) p-value	(5) Observations
Contains a private dwelling	0.99	0.99	0.00	0.937	1,317
	(0.09)	(0.09)	(0.01)		
Number of dwellings on property	1.39	1.54	-0.16	0.251	1,238
	(0.89)	(1.03)	(0.13)		
Includes rental housing	0.11	0.16	-0.05	0.078*	1,238
	(0.32)	(0.37)	(0.02)		
Number of residents on property	5.20	5.23	-0.04	0.812	1,238
	(2.65)	(2.59)	(0.15)		
Number of tenants on property	0.44	0.69	-0.26	0.028**	1,238
	(1.49)	(1.81)	(0.11)		
Children under 5 present in household	0.40	0.40	-0.00	0.940	1,136
	(0.49)	(0.49)	(0.03)		
Number of children under 5	1.44	1.52	-0.08	0.308	456
	(0.79)	(0.96)	(0.08)		

Interview date (Century Month Code)	1437.20	1437.21	-0.01	0.690	1,313
	(0.40)	(0.41)	(0.03)		
Sewerage chamber observed on sidewalk	1.87	1.85	0.01	0.718	1,317
	(0.34)	(0.35)	(0.04)		

Note: Estimates follow the specifications described in notes of Table 2 in the main text. *, **, *** denote significance at the 10, 5, and 1 percent levels.

Table D3. Post-Intervention Owner/Respondent Characteristics

	(1) Treatment	(2) Control	(3) Difference	(4) p-value	(5) Observations
Panel A: Respondent Identity					
Respondent is the property owner	0.64	0.68	-0.04	0.182	1,243
	(0.48)	(0.47)	(0.03)		
Owner resides on the property	0.71	0.72	-0.02	0.585	1,243
	(0.46)	(0.45)	(0.03)		
Respondent resides on the property	0.92	0.91	0.01	0.629	1,242
	(0.27)	(0.28)	(0.02)		
Panel B: Reason Owner Did Not Respond					
Owner is traveling	0.25	0.23	0.03	0.605	486
	(0.44)	(0.42)	(0.05)		
Owner lives far away/could not come	0.47	0.46	0.01	0.889	486
	(0.50)	(0.50)	(0.05)		
Owner is working/too busy	0.19	0.25	-0.06	0.225	486
	(0.39)	(0.44)	(0.05)		
Owner is elderly	0.02	0.01	0.02	0.127	486
	(0.15)	(0.08)	(0.01)		
Other reason	0.03	0.04	-0.00	0.843	486
	(0.18)	(0.19)	(0.01)		
Owner is deceased	0.03	0.02	0.01	0.410	486
	(0.17)	(0.13)	(0.02)		
Panel C: Respondent's Relationship to Owner					
Spouse	0.10	0.16	-0.06	0.043**	485
	(0.30)	(0.37)	(0.03)		
Son or daughter	0.38	0.30	0.08	0.094*	485
	(0.49)	(0.46)	(0.05)		
Father or mother	0.02	0.02	0.01	0.597	485
	(0.16)	(0.13)	(0.01)		
Other relative of owner	0.29	0.30	-0.01	0.665	485

	(0.45)	(0.46)	(0.03)		
Non-relative	0.21	0.22	-0.01	0.861	485
	(0.41)	(0.42)	(0.05)		
Panel D: Educational Attainment					
Some primary education	0.26	0.29	-0.04	0.169	1,240
	(0.44)	(0.46)	(0.03)		
Completed primary education	0.10	0.12	-0.02	0.503	1,240
	(0.30)	(0.32)	(0.03)		
Some secondary education	0.18	0.19	-0.01	0.597	1,240
	(0.38)	(0.39)	(0.02)		
Completed secondary education	0.26	0.25	0.01	0.606	1,240
	(0.44)	(0.43)	(0.02)		
Technical education	0.05	0.04	0.01	0.529	1,240
	(0.21)	(0.19)	(0.01)		
Higher education	0.11	0.07	0.04	0.074*	1,240
	(0.31)	(0.25)	(0.02)		
No formal education	0.05	0.03	0.01	0.455	1,240
	(0.21)	(0.18)	(0.01)		
Panel E: Other Respondent Characteristics					
Respondent is female	0.59	0.64	-0.05	0.048**	1,242
	(0.49)	(0.48)	(0.03)		
Respondent's age (years)	42.47	42.47	-0.00	0.997	1,240
	(13.28)	(12.98)	(0.88)		
Years living on property	11.89	10.06	1.83	0.029**	1,140
	(7.82)	(7.20)	(0.80)		
Owner since June 2017	0.95	0.96	-0.00	0.898	1,222
	(0.21)	(0.21)	(0.01)		

Note: Estimates follow the specifications described in notes of Table 2 in the main text. *, **, *** denote significance at the 10, 5, and 1 percent levels.

Table D4. Post-Intervention Dwelling Characteristics

	(1) Treatment	(2) Control	(3) Difference	(4) p-value	(5) Observations
Panel A: Type of Dwelling					
House	0.64	0.73	-0.09	0.267	1,231
	(0.48)	(0.45)	(0.08)		
Detached rooms or units	0.36	0.27	0.08	0.280	1,231
	(0.48)	(0.45)	(0.08)		
Other dwelling type	0.00	0.00	0.00	0.624	1,231

	(0.06)	(0.05)	(0.00)		
Panel B: Wall Material					
Brick, cement block, or concrete	0.70	0.75	-0.06	0.323	1,231
	(0.46)	(0.43)	(0.06)		
Adobe or rammed earth	0.30	0.24	0.06	0.302	1,231
	(0.46)	(0.43)	(0.06)		
Other wall material	0.00	0.01	-0.00	0.478	1,231
	(0.06)	(0.08)	(0.00)		
Interior walls have plaster coating	0.87	0.81	0.06	0.106	1,230
	(0.34)	(0.39)	(0.03)		
Panel C: Roof Material					
Corrugated metal	0.95	0.91	0.04	0.017**	1,229
	(0.22)	(0.29)	(0.02)		
Tile or concrete slab	0.05	0.09	-0.04	0.016**	1,229
	(0.21)	(0.28)	(0.02)		
Other roofing material	0.00	0.01	-0.00	0.335	1,229
	(0.05)	(0.08)	(0.00)		
Panel D: Floor Material					
Dirt floor	0.07	0.07	-0.01	0.641	1,229
	(0.25)	(0.26)	(0.01)		
Wood, carpet, or tile	0.10	0.11	-0.01	0.466	1,229
	(0.29)	(0.31)	(0.02)		
Cement	0.82	0.80	0.02	0.320	1,229
	(0.38)	(0.40)	(0.02)		
Other flooring material	0.01	0.02	-0.00	0.639	1,229
	(0.12)	(0.13)	(0.01)		
Panel E: Other Dwelling Characteristics					
Dwelling has electricity	1.00	0.98	0.01	0.005***	1,229
	(0.07)	(0.14)	(0.00)		
Number of rooms in dwelling	3.35	3.12	0.22	0.023**	1,225
	(1.50)	(1.56)	(0.09)		
Panel F: Wealth Index					
Factor score	0.01	-0.02	0.02	0.718	1,223
	(1.00)	(0.99)	(0.06)		
Wealth quintile 1 (lowest)	0.20	0.20	0.01	0.814	1,223
	(0.40)	(0.40)	(0.03)		
Wealth quintile 2	0.20	0.21	-0.01	0.755	1,223
	(0.40)	(0.41)	(0.03)		
Wealth quintile 3	0.21	0.18	0.02	0.370	1,223

	(0.41)	(0.39)	(0.03)		
Wealth quintile 4	0.18	0.23	-0.04	0.143	1,223
	(0.39)	(0.42)	(0.03)		
Wealth quintile 5 (highest)	0.21	0.19	0.02	0.463	1,223
	(0.41)	(0.39)	(0.03)		

Note: Estimates follow the specifications described in notes of Table 2 in the main text. *, **, *** denote significance at the 10, 5, and 1 percent levels.

Table D5. Post-Intervention Sewerage Connection Characteristics

	(1) Treatment	(2) Control	(3) Difference	(4) p-value	(5) Observations
Panel A: Sewerage Connection Status					
Property connected to sewerage network	0.54	0.44	0.10	0.009***	1,317
	(0.50)	(0.50)	(0.04)		
Month of sewerage connection (Century Month Code)	1419.55	1420.99	-1.45	0.038**	632
	(8.85)	(9.49)	(0.67)		
Received pipes or materials as donation	0.14	0.08	0.05	0.108	303
	(0.34)	(0.28)	(0.03)		
Panel B: Who Carried Out the Connection					
Hired workers (sewerage specialists or diggers)	0.54	0.53	0.01	0.775	632
	(0.50)	(0.50)	(0.04)		
Owner completed the work alone	0.18	0.17	0.02	0.633	632
	(0.39)	(0.37)	(0.04)		
Owner completed the work with help	0.25	0.27	-0.02	0.568	632
	(0.43)	(0.44)	(0.03)		
Another person completed the work	0.01	0.01	0.00	0.937	632
	(0.11)	(0.10)	(0.01)		
Does not know	0.02	0.03	-0.01	0.293	632
	(0.12)	(0.16)	(0.01)		
Panel C: Cost and Financing					
Total cost of sewerage connection	1228.96	1059.54	169.41	0.024**	445
	(945.11)	(657.16)	(71.31)		
Paid using own resources	0.90	0.89	0.02	0.606	631
	(0.30)	(0.32)	(0.03)		
Paid using loan from financial institution	0.05	0.06	-0.01	0.633	631

	(0.22)	(0.24)	(0.02)		
Paid using loan from family or friends	0.01	0.04	-0.02	0.235	631
	(0.12)	(0.19)	(0.02)		
Connection payment was completed	0.83	0.78	0.05	0.131	629
	(0.38)	(0.41)	(0.03)		
Panel D: Connection Verification					
Connection had technical verification	0.34	0.24	0.11	0.071*	631
	(0.48)	(0.43)	(0.06)		
Verified by neighborhood association	0.18	0.07	0.12	0.029**	196
	(0.39)	(0.25)	(0.05)		
Verified by EPSAS	0.69	0.68	0.01	0.896	196
	(0.46)	(0.47)	(0.07)		
Verified by both	0.12	0.25	-0.12	0.061*	196
	(0.33)	(0.44)	(0.06)		
Month of verification (Century Month Code)	1421.20	1422.14	-0.93	0.507	196
	(8.48)	(8.54)	(1.39)		
Panel E: Issues with the Connection					
Problem: bad odor	0.18	0.26	-0.08	0.060*	630
	(0.38)	(0.44)	(0.04)		
Problem: blocked pipes	0.07	0.10	-0.03	0.293	630
	(0.25)	(0.30)	(0.03)		
Problem: water overflow	0.06	0.10	-0.04	0.181	630
	(0.24)	(0.30)	(0.03)		
Problem: other	0.01	0.01	0.01	0.287	630
	(0.11)	(0.07)	(0.01)		

Notes: Estimates follow the specifications described in notes of Table 2 in the main text. EPSAS: Public Social Water and Sanitation Company. *, **, *** denote significance at the 10, 5, and 1 percent levels.

Table D6. Post-Intervention Knowledge about Sewerage Maintenance

	(1) Treatment	(2) Control	(3) Difference	(4) p-value	(5) Observations
Knows that inspection chambers should be cleaned	0.23	0.26	-0.03	0.388	1,235
	(0.42)	(0.44)	(0.03)		
Knows that chambers should be kept sealed or covered	0.15	0.14	0.01	0.654	1,235
	(0.36)	(0.34)	(0.03)		
Knows that drains should have protective grates or covers	0.23	0.26	-0.03	0.388	1,235
	(0.42)	(0.44)	(0.03)		

Mentions other sewerage maintenance practice	0.08	0.11	-0.03	0.130	1,235
	(0.27)	(0.31)	(0.02)		
Does not know any sewerage maintenance practices	0.36	0.37	-0.01	0.798	1,235
	(0.48)	(0.48)	(0.03)		
Sewerage maintenance knowledge index	0.60	0.65	-0.05	0.545	1,235
	(0.93)	(0.93)	(0.08)		

Note: Estimates follow the specifications described in notes of Table 2 of main text.

Table D7. Post-Intervention Reasons for Not Connecting and Connection Intention

	(1) Treatment	(2) Control	(3) Difference	(4) p-value	(5) Observations
Panel A: Reported Barriers to Sewerage Connection					
Could not afford the connection	0.24	0.28	-0.04	0.272	605
	(0.43)	(0.45)	(0.04)		
Could not find anyone to do the work	0.03	0.04	-0.01	0.520	605
	(0.17)	(0.19)	(0.01)		
No external access point on property	0.01	0.04	-0.03	0.212	605
	(0.09)	(0.19)	(0.02)		
No sewerage outlet available	0.04	0.01	0.03	0.020**	605
	(0.19)	(0.09)	(0.01)		
Did not know how or lacked information	0.03	0.03	0.00	0.929	605
	(0.17)	(0.17)	(0.02)		
Did not have time	0.21	0.19	0.02	0.505	605
	(0.41)	(0.39)	(0.03)		
Plans to carry out other constructions on property	0.07	0.10	-0.02	0.486	605
	(0.26)	(0.29)	(0.03)		
Does not know the reason	0.02	0.02	-0.00	0.817	605
	(0.15)	(0.16)	(0.01)		
No authorization from neighborhood leaders	0.04	0.03	0.01	0.650	605
	(0.20)	(0.18)	(0.02)		
Problems with paperwork or administrative process	0.10	0.09	0.01	0.588	605
	(0.30)	(0.28)	(0.02)		
Problems with the property owner	0.02	0.01	0.01	0.190	605
	(0.15)	(0.09)	(0.01)		
Property owner was absent or does not live on site	0.07	0.02	0.05	0.002***	605
	(0.26)	(0.16)	(0.01)		

Other reason	0.12	0.15	-0.03	0.251	605
	(0.32)	(0.36)	(0.03)		
Panel B: Intent to Connect					
Has taken at least one action to connect	0.17	0.17	0.01	0.730	604
	(0.38)	(0.37)	(0.02)		
Purchased materials for the connection	0.17	0.17	0.01	0.730	604
	(0.38)	(0.37)	(0.02)		
Completed trenching, excavation, or pipe laying	0.11	0.12	-0.01	0.656	604
	(0.31)	(0.33)	(0.02)		
Installed an inspection chamber	0.07	0.10	-0.03	0.118	604
	(0.25)	(0.29)	(0.02)		
Tested drainage and refilled trenches	0.05	0.04	0.01	0.659	604
	(0.22)	(0.20)	(0.02)		
Intends to connect or continue process	0.85	0.82	0.03	0.359	604
	(0.36)	(0.38)	(0.03)		
Months until expected connection	4.00	4.73	-0.73	0.108	507
	(3.60)	(4.87)	(0.44)		
Maximum amount willing to pay	954.49	852.79	101.70	0.409	355
	(970.96)	(944.69)	(121.41)		
Could obtain a loan to finance connection	0.47	0.49	-0.02	0.552	507
	(0.50)	(0.50)	(0.04)		

Note: Estimates follow the specifications described in notes of Table 2 in the main text. *, **, *** denote significance at the 10, 5, and 1 percent levels.

Table D8. Post-Intervention Exposure to the Communication Campaign

	(1) Treatment	(2) Control	(3) Difference	(4) p-value	(5) Observations
Heard of the CCQQ campaign	0.45	0.19	0.27	0.000***	1,232
	(0.50)	(0.39)	(0.04)		
Heard about campaign through street theater	0.02	0.00	0.02	0.000***	444
	(0.13)	(0.00)	(0.00)		
Heard about campaign through radio	0.08	0.15	-0.07	0.095*	444
	(0.28)	(0.36)	(0.04)		
Heard about campaign at market or fair	0.08	0.04	0.04	0.118	444
	(0.27)	(0.19)	(0.02)		
Received text message	0.00	0.01	-0.01	0.482	444
	(0.05)	(0.11)	(0.01)		
Received phone call	0.02	0.03	-0.00	0.903	444

	(0.15)	(0.16)	(0.03)		
Received information pamphlet	0.12	0.05	0.07	0.116	444
	(0.32)	(0.22)	(0.04)		
Received trifold brochure	0.17	0.15	0.02	0.870	444
	(0.37)	(0.36)	(0.09)		
Heard about campaign at neighborhood council meeting	0.35	0.33	0.02	0.734	444
	(0.48)	(0.47)	(0.07)		
Participated in contest activity	0.02	0.04	-0.02	0.547	444
	(0.15)	(0.19)	(0.03)		
Attended training session	0.34	0.16	0.17	0.012**	444
	(0.47)	(0.37)	(0.06)		
Heard about campaign at school	0.04	0.06	-0.03	0.530	444
	(0.19)	(0.25)	(0.04)		
Heard about campaign from neighbors or friends	0.11	0.16	-0.05	0.475	444
	(0.31)	(0.37)	(0.08)		
Household received home visit from CCQQ team	0.31	0.12	0.19	0.000***	1,117
	(0.46)	(0.33)	(0.03)		

Note: Estimates follow the specifications described in notes of Table 2 in the main text. *, **, *** denote significance at the 10, 5, and 1 percent levels.

Table D9. Post-Intervention Sanitation Characteristics

	(1) Treatment	(2) Control	(3) Difference	(4) p-value	(5) Observations
Panel A: Type of Sanitation Facility					
Connected to sewerage network	0.51	0.41	0.10	0.025**	1,231
	(0.50)	(0.49)	(0.04)		
Connected to septic tank	0.07	0.07	0.00	0.984	1,231
	(0.25)	(0.25)	(0.02)		
Uses a pit latrine	0.33	0.42	-0.09	0.051*	1,231
	(0.47)	(0.49)	(0.04)		
Uses a dry pit latrine without footrests or open pit	0.05	0.04	0.01	0.848	1,231
	(0.21)	(0.20)	(0.03)		
Other sanitation facility	0.01	0.02	-0.01	0.353	1,231
	(0.11)	(0.15)	(0.01)		
No toilet or latrine	0.04	0.04	-0.00	0.821	1,231
	(0.19)	(0.20)	(0.02)		

Facility used exclusively by household	0.97	0.97	0.00	0.821	1,182
	(0.17)	(0.18)	(0.01)		
Facility shared with other households	0.02	0.03	-0.00	0.613	1,182
	(0.15)	(0.17)	(0.01)		
Facility used by the public	0.01	0.00	0.00	0.401	1,182
	(0.07)	(0.05)	(0.00)		
Panel B: Cleaning Frequency of Septic Tank or Pit					
Cleaned every six months	0.16	0.17	-0.00	0.934	570
	(0.37)	(0.37)	(0.04)		
Cleaned once a year	0.28	0.21	0.08	0.071*	570
	(0.45)	(0.41)	(0.04)		
Cleaned every two to three years	0.11	0.08	0.02	0.340	570
	(0.31)	(0.28)	(0.02)		
Cleaned more than three years ago	0.05	0.05	0.01	0.647	570
	(0.23)	(0.21)	(0.02)		
Never cleaned	0.39	0.50	-0.11	0.017**	570
	(0.49)	(0.50)	(0.04)		
Months since last cleaning	-11.24	-11.64	0.40	0.711	322
	(10.75)	(13.70)	(1.08)		
Amount paid during last cleaning	178.58	167.45	11.12	0.286	272
	(92.65)	(89.62)	(10.23)		

Note: Estimates follow the specifications described in notes of Table 2 in the main text. *, **, *** denote significance at the 10, 5, and 1 percent levels.

Table D10. Post-Intervention Alternative Outcomes

	(1) Treatment	(2) Control	(3) Difference	(4) p-value	(5) Observations
Panel A: Sewerage Connectivity Indicators					
Property is connected to the sewerage system	0.54	0.44	0.10	0.009***	1,317
	(0.50)	(0.50)	(0.04)		
All bathrooms connected to the sewerage system	0.48	0.38	0.10	0.016**	1,281
	(0.50)	(0.49)	(0.04)		
Some bathrooms connected to the sewerage system	0.01	0.02	-0.00	0.742	1,281
	(0.11)	(0.12)	(0.01)		
No bathrooms connected to the sewerage system	0.51	0.60	-0.09	0.017**	1,281
	(0.50)	(0.49)	(0.04)		

All kitchens connected to the sewerage system	0.23	0.21	0.01	0.698	1,281
	(0.42)	(0.41)	(0.03)		
Some kitchens connected to the sewerage system	0.01	0.00	0.00	0.631	1,281
	(0.08)	(0.07)	(0.01)		
No kitchens connected to the sewerage system	0.77	0.78	-0.01	0.643	1,281
	(0.42)	(0.41)	(0.03)		
All laundry areas connected to the sewerage system	0.17	0.14	0.02	0.318	1,281
	(0.37)	(0.35)	(0.02)		
Some laundry areas connected to the sewerage system	0.00	0.01	-0.00	0.575	1,281
	(0.07)	(0.08)	(0.00)		
No laundry areas connected to the sewerage system	0.83	0.85	-0.02	0.349	1,281
	(0.38)	(0.36)	(0.02)		
Panel B: Health Indicator					
Any child < 5 had diarrhea in the past four weeks	0.18	0.21	-0.02	0.538	456
	(0.39)	(0.41)	(0.04)		

Note: Estimates follow the specifications described in notes of Table 2 in the main text. *, **, *** denote significance at the 10, 5, and 1 percent levels.

Appendix E: Additional Analysis Tables

Table E1. Effects on Diarrhea in Children under Age 5

	(1)	(2)
	Child Diarrhea (OLS)	Child Diarrhea (2SLS)
Connected (=1)	-0.120*	0.725
	(0.057)	(1.964)
Mean (control group)	0.209	0.209
	(0.408)	(0.408)
Observations	456	456

Note: This table reports estimates of the impact of the CCQQ campaign on self-reported diarrhea in children under age 5. Column (1) shows ordinary least squares (OLS) estimates of the association between sewerage connection and diarrhea. Column (2) presents two-stage least squares (2SLS) estimates instrumenting connection with treatment assignment. All specifications control for all baseline covariates covering (i) household composition and dwelling characteristics (household size, rooms, bathrooms, housing materials, renovations); (ii) water and sanitation conditions (water access and service frequency, sanitation type, wastewater drainage, bathroom quality, reported drainage problems); (iii) connection readiness (authorization form, inspection chamber, plumbing readiness, payment indicator); and (iv) respondent characteristics (age, sex, education, and whether the respondent and owner live in the dwelling). Missing-value imputations are applied to baseline controls: continuous and binary controls are imputed with the neighborhood median, and categorical controls include a separate missing category; indicators for baseline missingness are included throughout. Standard errors clustered at the neighborhood level are reported in parentheses. Significance stars are based on wild cluster bootstrap p-values clustered at the neighborhood level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table E2. Impact of the Connect to the City We Want Campaign on Sewerage Connection, Infrastructure, and Knowledge (No Controls)

	(1)	(2)	(3)
	Coefficient	Mean (Control Group)	Observations
Panel A: Sewerage Connection Outcomes			
Property is connected to sewerage system (%)	0.104**	0.437	1,317
	(0.037)	(0.497)	
All bathrooms connected to sewerage system (%)	0.097*	0.383	1,281
	(0.038)	(0.487)	
Any kitchen connected to sewerage system (%)	0.015	0.217	1,281
	(0.032)	(0.413)	
Any laundry area connected to sewerage system (%)	0.022	0.148	1,281
	(0.023)	(0.355)	
Panel B: Connection Characteristics and quality			
Connection speed[a]	-1.449**	-0.005	632
	(0.666)	(9.488)	
Connection cost (Bs)[b]	181.366**	1044.174	631
	(69.866)	(547.089)	
Connection was verified (%)	0.107*	0.235	631

	(0.057)	(0.425)	
Connection problem index[c]	-0.139**	0.455	630
	(0.067)	(0.770)	
Panel C: Sewerage Maintenance Knowledge			
Sewerage maintenance knowledge index[d]	-0.048	0.648	1,235
	(0.078)	(0.930)	
Panel D: Child Health			
Any child under 5 had diarrhea in past four weeks (%)	-0.024	0.209	456
	(0.039)	(0.408)	

Note: Each column reports intent-to-treat estimates from separate unweighted ordinary least squares regressions of post-treatment outcomes on a treatment indicator. No controls. Standard errors are clustered at the neighborhood level and reported in parentheses. Significance stars are based on wild cluster bootstrap p-values clustered at the neighborhood level. Column (2) reports the control-group mean and standard deviation. Column (3) reports the number of observations. *** p < 0.01, ** p < 0.05, * p < 0.10.

[a] Connection speed is the difference (in months) between the date of connection and the average month when the campaign began in the respondent's neighborhood.

[b] In cases where the connection cost was not reported, the survey recorded a placeholder value of Bs 99,999. These values were treated as missing and imputed using the mean connection cost of other households in the same neighborhood.

[c] The connection problem index is the unweighted sum of four binary indicators: reports of bad odor, blocked pipes, water overflow, or other connection-related issues.

[d] The sewerage maintenance knowledge index is the unweighted sum of three binary indicators: knowledge that the chamber must be cleaned, that the chamber must be kept sealed, and that drains should be covered.

Appendix F. Exploratory Results and Analysis

Table F1. Local Average Treatment Effects: Impact of Connect to the City We Want Campaign on Sewerage Connection, Infrastructure, and Knowledge

	(1) Coefficient	(2) Mean (Control Group)	(3) Observations	(4) First-stage F-statistic
Panel A: First Stage: Treatment Assignment on Exposure				
Aggregate exposure index (heard + edutainment + visit)	0.213***	0.130	1,232	61.29
	(0.027)	(0.277)		
Heard about CCQQ campaign (=1)	0.270***	0.185	1,232	53.76
	(0.037)	(0.389)		
Exposed to any edutainment activity (=1)	0.193***	0.089	1,232	34.21
	(0.033)	(0.285)		
Received home visit from CCQQ team (=1)	0.183***	0.120	1,117	64.59
	(0.023)	(0.325)		
Panel B: Local Average Treatment Effect: Aggregate Exposure Index				
Property is connected to sewerage system (%)	0.554***	0.436	1,232	
	(0.169)	(0.496)		
All bathrooms connected to sewerage system (%)	0.439**	0.400	1,232	
	(0.165)	(0.491)		
Any kitchen connected to sewerage system (%)	0.076	0.227	1,232	
	(0.109)	(0.419)		
Any laundry area connected to sewerage system (%)	0.106	0.155	1,232	
	(0.093)	(0.362)		
Connection speed	-8.101	-0.032	628	
	(4.245)	(9.507)		
Connection cost (Bs)	1118.131*	1044.949	628	
	(433.125)	(548.462)		
Connection was verified (%)	0.516**	0.237	628	
	(0.173)	(0.426)		
Connection problem index	-0.702**	0.457	628	
	(0.251)	(0.772)		
Sewerage maintenance knowledge index	-0.107	0.646	1,232	
	(0.309)	(0.929)		
Panel C: Local Average Treatment Effect: Heard about CCQQ Campaign				
Property is connected to sewer system (%)	0.437***	0.436	1,232	

	(0.136)	(0.496)	
All bathrooms connected to sewerage system (%)	0.346**	0.400	1,232
	(0.132)	(0.491)	
Any kitchen connected to sewerage system (%)	0.060	0.227	1,232
	(0.086)	(0.419)	
Any laundry area connected to sewerage system (%)	0.083	0.155	1,232
	(0.074)	(0.362)	
Connection speed	-6.247	-0.032	628
	(3.217)	(9.507)	
Connection cost (Bs)	862.207**	1044.949	628
	(310.488)	(548.462)	
Connection was verified (%)	0.398**	0.237	628
	(0.135)	(0.426)	
Connection problem index	-0.541**	0.457	628
	(0.197)	(0.772)	
Sewerage maintenance knowledge index	-0.084	0.646	1,232
	(0.244)	(0.929)	
Panel D: Local Average Treatment Effect: Exposure to any Edutainment Activity			
Property is connected to sewerage system (%)	0.611***	0.436	1,232
	(0.203)	(0.496)	
All bathrooms connected to sewerage system (%)	0.485**	0.400	1,232
	(0.194)	(0.491)	
Any kitchen connected to sewerage system (%)	0.084	0.227	1,232
	(0.122)	(0.419)	
Any laundry area connected to sewerage system (%)	0.116	0.155	1,232
	(0.103)	(0.362)	
Connection speed	-9.338	-0.032	628
	(4.894)	(9.507)	
Connection cost (Bs)	1288.833*	1044.949	628
	(504.449)	(548.462)	
Connection was verified (%)	0.595**	0.237	628
	(0.222)	(0.426)	
Connection problem index	-0.809**	0.457	628
	(0.298)	(0.772)	
Sewerage maintenance knowledge index	-0.118	0.646	1,232
	(0.339)	(0.929)	

Panel E: Local Average Treatment Effect: Received Home Visit from CCQQ Team			
Property is connected to sewerage system (%)	0.665**	0.424	1,117
	(0.205)	(0.495)	
All bathrooms connected to sewerage system (%)	0.547**	0.391	1,117
	(0.197)	(0.489)	
Any kitchen connected to sewerage system (%)	0.035	0.227	1,117
	(0.139)	(0.419)	
Any laundry area connected to sewerage system (%)	0.106	0.148	1,117
	(0.105)	(0.356)	
Connection speed	-10.441	0.393	562
	(6.527)	(9.360)	
Connection cost (Bs)	1095.505	1057.333	562
	(577.874)	(566.274)	
Connection was verified (%)	0.352*	0.233	562
	(0.178)	(0.424)	
Connection problem index	-0.937**	0.491	562
	(0.316)	(0.804)	
Sewerage maintenance knowledge index	-0.227	0.648	1,117
	(0.380)	(0.928)	

Note: Each row reports two-stage least squares (2SLS) estimates from separate regressions of the listed outcome on the panel's exposure measure, instrumenting that exposure measure with random assignment to the intensive communication campaign. Panel A reports the corresponding first-stage relationship between assignment and each exposure measure. The aggregate exposure index in Panel B is the average of three binary indicators: having heard about the campaign, having been exposed to any edutainment activity, and having received a home visit from the CCQQ team. Panels C–E report local average treatment effect estimates using each individual exposure measure as the endogenous regressor. All specifications control for all baseline covariates and missing-value imputations are applied to baseline controls. Standard errors are clustered at the neighborhood level and reported in parentheses. Significance stars are based on wild cluster bootstrap p-values clustered at the neighborhood level. Column (2) reports the control-group mean and standard deviation. Column (3) reports the number of observations. Column (4) reports the F-statistic on the treatment indicator from the first-stage regression and is shown only for Panel A. *** p < 0.01, ** p < 0.05, * p < 0.10.

Table F2. Heterogeneity in Connection

Reported Barrier	Intent-to-treat	Δ vs. ref	Number
Panel A: Baseline Reported Barrier			
Time/cost/priorities	0.157***	—	910
	(0.044)		
Information barriers	0.107	-0.050	163
	(0.092)	(0.116)	
Other reasons	-0.033	-0.191***	244
	(0.050)	(0.062)	
Panel B: Baseline Precarious Bathroom			

Precarious	0.136***	—	1,047
	(0.038)		
Not precarious	0.043	-0.093	256
	(0.059)	(0.073)	
Panel C: Baseline EPSAS Authorization Form			
Signed at baseline	0.119*	—	653
	(0.051)		
Did not sign at baseline	0.073*	-0.046	417
	(0.041)	(0.073)	
Panel D: Completed Secondary Education			
Less than secondary education	0.079*	—	728
	(0.040)		
Completed secondary education	0.156***	0.077	589
	(0.042)	(0.050)	
Panel E: Over Wealth Index Median			
High wealth	0.096**	—	733
	(0.043)		
Low wealth	0.113**	0.016	584
	(0.037)	(0.050)	

Note: Each panel reports intent-to-treat estimates from a single ordinary least squares regression of connection status on treatment, the subgroup indicator, and their interaction, controlling for the full set of baseline covariates with imputed missing. Coefficients on the treatment effect for the reference group are reported in the first row of each panel; subsequent rows report the intent-to-treat for the non-reference group(s) along with Δ vs. ref, the treatment × subgroup interaction. Standard errors clustered at the neighborhood level are reported in parentheses. Significance stars are based on wild cluster bootstrap p-values clustered at the neighborhood level (9,999 replications, Webb weights). Panel E uses an endline wealth index that may be affected by treatment and is therefore presented as descriptive. Index constructed from ownership of durable assets and housing-quality indicators observed at follow-up: the index is the first principal component of these indicators, standardized, and split at the median to define below-median vs. above-median wealth. *** p<0.01, ** p<0.05, * p<0.10. EPSAS: Public Social Water and Sanitation Company.

Appendix G. Cost Per Additional Property Connection

Table G1. Cost per Additional Connection Attributable to the Campaign

	Properties Not Connected in Treatment Neighborhoods	Impact of the Campaign (p.p.)	Properties Connected by Campaign	Total Cost (U.S. dollars)	Cost per Connection (U.S. dollars)
Total campaign	855	11.2	95.76	60,472	631
Edutainment and visits	855	11.2	95.76	44,181	461

Note: This table reports the estimated cost per additional property connection induced by the campaign.

The program's cost-effectiveness is estimated as the average cost of inducing one additional property connection attributable to the campaign. The numerator is the incremental cost of campaign components implemented in treatment neighborhoods but not equally in control areas (excluding broadcast messaging). The denominator is the number of additional connections estimated from the experimental results.

The financial data available reflect budgeted amounts rather than realized expenditures, and these amounts were not recorded in a way that allows disaggregation by treatment area. The budget includes personnel (coordinators, specialists, accountants, and door-to-door staff), evaluation activities, production of edutainment events, radio spots and jingles, printed and audiovisual materials, theater performances, fairs, and other materials. The cost of broadcast messaging (radio, jingles, TV spots) is excluded because these were delivered at equal intensity in treatment and control, and our effect is measured relative to that baseline. All amounts are in U.S. dollars.

To allocate costs to treatment neighborhoods, two rules were applied. First, for cost components implemented across all of District 8 (e.g., coordinators, specialists, diagnostic work), the cost was weighted by the share of properties in treatment neighborhoods relative to the total properties reached, including those outside the experimental sample. Second, for activities confined to experimental neighborhoods (e.g., edutainment events and household visits), costs were weighted by the share of those activities implemented in treatment neighborhoods relative to the total across arms. For district-wide cost components such as coordinators and specialists, we applied an additional adjustment: because these costs supported both broadcast and non-broadcast components, they were weighted by the share of non-broadcast costs in the total budget. This adjustment ensures that only the portion of district-wide expenditures attributable to treatment-differential activities is included. Summing these weighted costs gives an estimated expenditure in treatment neighborhoods of US$60,472.

The number of additional connections attributable to the campaign comes from the experimental estimate: assignment to treatment increased the connection rate by 11.2 percentage points among the 855 unconnected properties in treatment areas with follow-up data. This corresponds to around 96 additional connections attributable to the campaign.

Dividing the estimated campaign cost in treatment neighborhoods by this number yields an average cost of US$631 per induced connection. Restricting the calculation to the cost of edutainment activities alone produces an estimated cost of US$461 per induced connection. These estimates are subject to limitations: they are based on budgeted rather than actual expenditures, and shared costs were allocated proportionally using available property and activity data.

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