# Housing, Social Cohesion and Well-Being: Evidence from Informal Settlements*

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**Abstract**

How do housing interventions affect subjective well-being? To study this question, we conduct a randomized intervention in informal settlements in Brazil that mobilizes residents to build higher-quality prefabricated houses with community members and friends. We find that the intervention substantially improved subjective well-being. Assessing the mechanisms, we show that treated individuals have more trust in community members and a lower propensity to move out to other neighborhoods. Qualitative data from semistructured in-depth interviews reinforce our findings. The results highlight that social interactions are relevant for explaining outcomes of *in situ* improvements.

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*Keywords*: Housing, Subjective Well-Being, Informal Settlements, Social Interactions.

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# 1 Introduction

An enduring theme in the development agenda is how housing programs can reduce existing health inequalities. Quality housing protects from extreme weather, animal infestations, and many health hazards, also influencing residential stability and ties to communities. Over time, the housing debate has shifted from focusing on physical health to a more comprehensive view, including fighting existing mental well-being inequalities. This shift may be particularly relevant for the low-income population since mental-related disorders are pervasive in lower-housing quality settings (Krieger and Higgins 2002; Barari et al. 2020; Ridley et al., 2020). Moreover, pressing times—such as epidemics and natural disasters—usually exacerbate health inequalities, putting marginalized groups with precarious housing at even higher risk. Yet, the mental well-being effects of housing interventions are understudied in such pressing, high-stake contexts.

This paper investigates the effects of a housing intervention in Brazilian informal settlements on subjective well-being.[1] More than one billion people live in slum settlements (United Nations, 2020), so studying housing interventions in these communities can inform about the living conditions of a sizeable part of the world's population.[2] We partner with the non-profit organization TECHO, whose intervention mobilizes slum squatters to build higher-quality prefabricated houses. The slum settlements that TECHO assists are highly precarious, without access to basic services.

The intervention we study is notable for at least four reasons. First, TECHO provides a relatively higher-quality housing unit: wooden houses with solid foundations providing isolation against changing temperatures, adequate ventilation, and more satisfactory protection against floods. These characteristics represent an improvement as substandard houses in slums have non-durable structures, and many do not have windows. However, TECHO housing units are as small as the original ones, and beneficiaries must pay a share of the construction cost. Second, unlike many other housing interventions, TECHO does not relocate residents but rather upgrades homes for residents in their original land plots. Third, TECHO's intervention includes a collective effort to build new homes: beneficiaries must attend meetings and mobilize community members, friends, or family members to assist TECHO's volunteers in

[1] We define subjective well-being as emotional well-being according to Kahneman and Deaton (2010). Emotions include happiness, sadness, loneliness, worriedness, among others. We use mental well-being, subjective well-being, and emotional well-being interchangeably throughout the paper. See Section 2 for definitions.

[2] Although the term "slum" may invoke negative connotations in some contexts, we use it (interchangeably with informal settlements) for two reasons. First, it is commonly used in Brazil (*favela*) and by the individuals in our setting. Second, the communities we examine fit the definition of a slum according to the United Nations: inadequate access to sanitation and other infrastructure, poor housing quality, overcrowding, and lack of tenure security (United Nations, 2020).

building the houses. Therefore, we study an intervention comprising a private good (the higher-quality housing unit) and a prosocial behavior component (that aims to promote social cohesion by incentivizing social interactions to build the housing unit). Finally, the intervention is reproducible and standard in 18 countries; hence, studying its impacts may provide useful lessons for other environments.

Housing interventions may or may not improve subjective well-being, as the impacts of underlying mechanisms are theoretically ambiguous. In our intervention, the effects of both the private and prosocial components are ambivalent. For example, a higher quality basic structure protects against weather shocks and animal-related infestations, but the housing payment may burden the beneficiaries. In addition, the intervention's prosocial behavior component may positively affect well-being by increasing self-esteem and community cohesion, generating a greater sense of belonging and attachment. However, it may impose negative "positional externalities" and disrupt connections if community members dislike having an "inferior" housing unit (Undurraga, 2021). Given these theoretically ambiguous effects, evaluating the impacts of our housing intervention and other similar programs on mental well-being requires an empirical analysis to verify both the overall effects and the operating mechanisms.

To test the effects of the intervention, we conducted a pre-registered randomized control trial with 611 families in 24 slums in Brazil. The randomization took place in 2019 and early 2020 before the COVID-19 outbreak—see more details in Section 2. Professional enumerators conducted phone surveys during the early stages of the COVID-19 pandemic (between June and July 2020). Therefore, when interpreting the results, we take into account that we are analyzing a setting of dire times in which the better-quality housing unit may function as a "buffer."

We find that the intervention substantially improved subjective well-being, with an effect size estimate of about 0.2 standard deviations relative to the control group. Importantly, the results are robust to alternative empirical models and the exclusion of control variables. The magnitude of our findings is greater than the average effect size found in studies that designed experiments to assess the impacts of cash transfers and other anti-poverty programs on mental well-being (Ridley et al., 2020).

To understand how the intervention impacts subjective well-being, we study potential pathways related to housing quality and social interactions. First, in terms of housing quality, we find no significant improvements in sanitary infrastructure; the intervention does not aim to improve such infrastructure, and this result indicates that residents do not invest in sanitation themselves. However, the intervention impacts other dimensions of housing quality that are conceptually more likely to be affected: for instance, beneficiaries report a lower incidence of pests such as rats. In addition, we assess how the better housing structure is associated with sleep deprivation. Sleep

could be crucial to a person's well-being, and the intervention positively affects sleep according to a self-reported measure of sleep quality (but the coefficients are not precisely estimated). Second, as for social interactions, we find increased trust toward community leaders and selected community members, such as friends. In addition, our findings indicate suggestive evidence of an impact on reducing outmigration: the magnitude of the intervention effects on squatters' propensity to move to other neighborhoods is large, but not precisely estimated in some specifications. Together, these results suggest that some measures of housing quality and social cohesion are likely to operate to trigger changes in subjective well-being.

We used qualitative data from semi-structured in-depth interviews that reinforce our findings. We carry out subsequent follow-up work based on 42 interviews with (randomly selected) beneficiaries. The qualitative interviews provide additional evidence that the channels we discuss are relevant. For example, better housing quality and ties with community members are common factors discussed in the interviews. The interviews highlight that the intervention strengthened the interpersonal bonds necessary to cope with the hardships imposed by the difficult times.

An important takeaway from our findings is that the dimensions of the intervention must be considered to explain the results: both the private component of the intervention (the quality housing unit) and the prosocial behavior component are crucial drivers. Furthermore, the results of increased mental well-being are consistent with ongoing discussions regarding the need for housing interventions to target a broader range of goals, e.g., going beyond the promotion of housing affordability by also stimulating social mobility and reducing inequalities (Da Mata and Mation, 2024).

Our paper connects to the extensive literature on housing and mental well-being. From psychology to public health and economics, the literature widely agrees that housing quality interferes with mental well-being (e.g. Evans et al., 2000). This literature is too large to be detailed here but recent systematic reviews in health include Singh et al. (2019). Within this literature, few papers have assessed how housing interventions affect subjective well-being using an experimental and lottery-based designs (e.g. Kling et al., 2007; Galiani et al., 2017; Galiani et al., 2018; Franklin, 2019; Andersen et al., 2022; Bueno et al., 2022; Kumar, forthcoming).[3] We are closely related to Galiani et al. (2017), Galiani et al. (2018), and Galiani et al. (2021), which study a similar TECHO intervention in other contexts, analyzing distinct dimensions

[3]These papers focus on one aspect of subjective well-being (life evaluation), while we examine emotional well-being (Kahneman and Deaton, 2010). Emotional well-being is better suited for our context since we study how both housing quality and social interactions affect well-being (see Section 2.2). Galiani et al. (2017) and Galiani et al. (2018) focus on life evaluation. Franklin (2019) and Andersen et al. (2022) study life evaluation and emotional well-being, and Bueno et al. (2022) examines a combination of material well-being, expectations, and happiness. Kumar (forthcoming) examines a related, but different concept, of dignity.

of subjective well-being and different mechanisms.

We build on these existing experimental and lottery-based studies and fill three gaps. First, we add by showing that social interactions are also relevant for *in situ* improvements, and not only for interventions that generate relocation to live in other areas (e.g. Barnhardt et al., 2017). Second, we contribute by providing experimental evidence on how a housing intervention affects an understudied challenge of slum dwellers: sleep deprivation.[4] We find positive effects on sleep after our intervention (but not precisely estimated), consistent with with the results of Bessone et al. (2021), which find increased sleep duration after a sleep-related information and encouragement experiment. Third, we investigate the mental well-being impacts of housing during dire times, an underlying context much less studied by the literature. This is particularly relevant for lower-income families, who suffer more from mental-related issues and are disproportionally affected during crises. Since the returns to a specific intervention are subject to aggregate shocks (Rosenzweig and Udry, 2020), it is crucial to evaluate slum interventions during economic downturns to complement the existing literature.

In addition, we connect to the broad literature on how anti-poverty programs affect mental well-being (see Ridley et al., 2020 for a review). We contribute by providing experimental evidence on how a housing intervention can impact subjective well-being during a negative aggregate shock.[5] Finally, we connect to papers analyzing the effects of interventions in slums (e.g. Field, 2005; Field, 2007; Di Tella et al., 2007; Galiani and Schargrodsky, 2010; Galiani et al., 2017; Cavalcanti et al., 2019; Michaels et al., 2021; Harari and Wong, 2024) and those studying the role of policies in slums in the COVID-19 pandemic (e.g. Brotherhood et al., 2022). We add another piece of evidence by examining the role of social interactions in shaping the outcomes of *in situ* interventions.

This article proceeds as follows. Section 2 details the intervention. Section 3 presents the experimental design, while Section 4 reports the quantitative and qualitative results. Section 5 concludes.

[4] To our knowledge, the papers studying housing and sleep use observational data (e.g., Simonelli et al., 2013).

[5] We also relate to the literature on mental health and aggregate shocks, especially the growing branch documenting the detrimental impacts of the COVID-19 pandemic on mental health—examples of meta-analyses in health include Bueno-Notivol et al. (2021) and Robinson et al. (2022).

# 2 Background

## 2.1 The intervention

Substandard housing is pervasive in many parts of the world, particularly in developing countries. In response, many interventions have been devised and implemented to improve the housing quality of slum dwellers. This paper studies a housing intervention led by a non-profit organization (NGO) called TECHO ("TETO" in Brazil). To understand the underlying context, we provide a detailed description of the intervention.

TECHO's mission is to reduce poverty in informal settlements by improving housing quality and building what the organization calls "community capacities" (a concept that involves leadership and civic engagement, network expansion, among others). TECHO argues that by improving housing quality and community capacities, slum dwellers can find their way out of poverty. The NGO started in 1997, and it has offices in most Latin American countries. We partner with TECHO in Brazil—where the NGO has offices in five states (São Paulo, Rio de Janeiro, Paraná, Minas Gerais, Bahia) and operates in Pernambuco with no offices.

One of TECHO's most significant assets is its close relationship with local community leaders in informal settlements that are hard to access. TECHO's volunteers have an essential role in establishing most of these relationships. Typically, outsiders cannot get involved in many of these slum settlements without permission, and TECHO succeeds in places where no other NGO reaches—in some cases, even government officials do not have equal access to communities. The slum settlements that TECHO assists are highly precarious, with limited access to water, no sanitation, improper quality housing, and a lack of garbage disposal networks.[6] Slums such as these are also characterized by a lack of property rights, insecurity, and lack of government presence (Cavalcanti et al., 2019).

TECHO's intervention consists of mobilizing slum squatters to build higher-quality prefabricated houses with community members and friends. TECHO's houses have relatively higher quality compared to substandard housing units in slums, which are mostly made of cardboard, inadequate pieces of wood or plastic, and some do not have floors or windows. For instance, TECHO's wooden houses have a solid foundation and adequate construction materials. Walls and roofs are starkly more resistant and provide protection from frequent rains and storms. TECHO's wooden houses also

[6]For instance, according to Brazilian Census data, the median per capita income of slum dwellers in the country is 865.40 (in 2020 Brazilian Reais), while the median per capita in our sample of informal settlements is only 210 Brazilian Reais. The slum settlements in our experiment are also significantly worse than the average Brazilian slum household in other dimensions (see Appendix Table A.1).

**Figure 1:** Phases of the Intervention

**(a)** Removal of old unit

**(b)** Meeting: mobilization of community members

**(c)** Construction of new unit

**(d)** TECHO unit before painting

Notes. The pictures show the phases of the intervention. Panel (a) shows the team removing the old housing unit. Panel (b) depicts the meeting with TECHO volunteers, friends, and other community members to start the construction of the new housing unit. Panel (c) shows the construction of the TECHO housing units. Panel (d) depicts the TECHO unit before being painted. The pictures are of a housing unit built after the beginning of the COVID-19 Pandemic, and that is not in the sample of this study. Source: Authors and TECHO.

provide isolation against changing temperatures, have windows for ventilation, and are elevated, protecting against animals and floods. Anecdotal evidence indicates that pest infestations and floods are common in slums (Folha de São Paulo, 2021; G1, 2018). However, TECHO's housing units are as small as the original ones (18 square meters), have just one room (families improvise a wall to create a living room and a bedroom), and are regularly overcrowded.

Beyond the housing unit (the private good), the intervention comprises a prosocial behavior component. More specifically, TECHO's intervention includes a collective effort to build new homes: A one-month program that ends with two construction days. During the program, beneficiaries must attend meetings whose main objective is the construction planning. In addition, selected slum residents are directly responsible for the viability of the construction: They must access their networks to engage comunity members, friends, or family members to assist TECHO's volunteers in planning the logistics for the housing construction, as well as helping to build the houses.

Figure 1 depicts the phases of the intervention, from the removal of the old housing unit to the meetings and construction of the new house. TECHO does not relocate residents but rather upgrades homes in their original land plots. Importantly, the intervention we study with both private and prosocial components is standard in the countries where TECHO operates. In addition, Appendix Figure A.1a shows a typical housing unit that the NGO targets to be a beneficiary, while Appendix Figure A.1b depicts a typical TECHO housing unit.

More than 95% of the house cost is subsidized, and beneficiaries must pay around R$200,00 (which represent approximately 55% of the monthly per capita income of a typical household in our sample). In summary, the multidimensional intervention comprises a bundle of private and social interaction components.

### 2.2 Subjective well-being

We are interested in assessing the impact of TECHO's intervention on subjective well-being. Subjective well-being is a broad category of phenomena that includes people's emotional responses and life satisfaction judgments. In this paper, we define subjective well-being as *emotional well-being*. Emotional well-being includes people's everyday emotional experiences—the quality and frequency of joy, sadness, happiness, stress, anxiety, and other feelings (Kahneman and Deaton, 2010).[7] The use of emotional well-being is relevant for our investigation because it is positively affected (i) when there is the fulfillment of basic needs (Kahneman and Deaton, 2010; Diener et al., 2010) and most importantly (ii) by social interactions (Sandstrom and Dunn, 2014).

Housing can affect emotional well-being through multiple channels. Given the characteristics of our intervention, the housing quality and prosocial components may help explain how housing affects subjective well-being.

**Housing quality.** Low housing quality is a gateway to mental-related illness (Krieger and Higgins 2002; Barari et al. 2020). Lower-quality units are more vulnerable to the impacts of environmental exposures. The threat of physical hazards like storms and floods are major stressors and can engender anxiety, worry, and stress (Wells and Evans, 1996, 2003). Other environmental stresses, such as exposure to extreme temperatures, also affect emotions (Berry et al., 2010; Patel et al., 2018; Liu et al., 2021). Since the intervention improves the quality of housing structure, one could

[7]Apart from emotional well-being (an affective measure of well-being), studies on subjective well-being also use two evaluative measures of well-being: life satisfaction—referring to the thoughts that people have when they think about their life —and domain satisfaction—the extent to which beneficiaries are satisfied with the quality of their houses (floor, roof, walls, and other features of their residency)—see Diener et al. (2018a). According to Kahneman and Deaton (2010), emotional well-being and life satisfaction have different correlates. The authors show that while income and education are more strongly linked to how people evaluate their lives overall, factors like health, caregiving, and loneliness have a greater impact on daily emotional experiences.

expect a reduction of concerns of insecurity towards basic needs and an improvement in emotional well-being.

The higher-quality housing unit can also affect subjective well-being because it reduces the likelihood of animal-related contamination—as physical health interferes with mental well-being (Diener et al., 2018b)—and it may matter for sleep. These factors would also be associated with positive impacts on emotional well-being (Vandekerckhove and Cluydts, 2010; Gee et al., 2019).

Moreover, the higher-quality housing unit can act as a positional good (Frank, 2005; Foye et al., 2018), positively impacting self-esteem and well-being.[8] Better-quality housing can strengthen social ties by increasing the satisfaction of community members who value more attractive and well-maintained surroundings. However, it may impose negative positional externalities: community members may dislike having an "inferior" housing unit, which might disrupt connections. Another negative impact of the higher-quality housing unit on emotions could come from the fact that the cost of construction can compromise one's financial situation, leading to emotional deterioration. Although the unit is highly subsidized, several other costs may affect subjective well-being—for instance, time costs and paying for utilities' re-connection.[9] The intervention could have been considered of "higher dosage" if the intervention had improved household sanitation or provided land titling (thus, households still fear evictions, a driver of emotional deterioration). The lack of property rights and sanitation could then generate no effects of the intervention.

In addition, individuals in slum communities migrate regularly, and people constantly seek better living conditions (Evans et al., 2003). By receiving a better-quality house, there might be a reduction in migration mobility. Reduced mobility would incentivize one's willingness to invest in the community and strengthen interpersonal bonds—the happiest individuals usually have supportive social relations (e.g., Diener and Seligman, 2002).

**Prosocial component.** The intervention also affects social relations through a prosocial component. Since the intervention promotes *in situ* improvements (at the current land plot), disruption of social ties and networks is not a plausible mechanism in our setting. On the contrary, the intervention requires the community members to collaborate in the construction phase of the housing unit, so we expect an increased connection with the community. The collaboration may work as a social learning experience because beneficiaries must use their social assets and skills (trust, reciprocity, networks) to interact with other community members and volunteers if they want the

[8]Positional goods are those whose value is determined relative to other goods, and therefore, concerns about local ranks matter for valuation.

[9]TECHO has waived households from paying for housing construction in some communities.

intervention to be successful. Hence, participants may learn from practical, meaningful experiences that their collective effort can help their development. People who cultivate strong ties with friends, family, and even weak ties with community members could become relatively happier than less connected individuals (Baumeister and Leary, 1995; Helliwell and Putnam, 2004; Sandstrom and Dunn, 2014).

**Other channels.** Given our intervention's characteristics, other potential mechanisms in the literature are less likely to operate. For instance, the labor market channel seems less prominent: housing interventions may affect labor market outcomes by changing job search efforts. However, this is more likely to operate where families are relocated or when there is a more significant wealth shock (van Dijk, 2019; Da Mata and Mation, 2024).

### 2.3 Timeline of the intervention and the COVID-19 pandemic

The selection of beneficiaries and construction of housing units started in 2019. During the selection of beneficiaries, we applied the baseline surveys. Because of the COVID-19 outbreak, the construction of additional housing units was interrupted in February 2020. For the families exposed to the program before that interruption, we decided to conduct the post-treatment surveys between June and July 2020. Professional enumerators worked remotely from home and conducted phone surveys; enumerators were unaware of the treatment assignment and our hypotheses. In addition, we perform 42 semistructured phone interviews between July and August 2021.

As a result, the interpretation of our results must consider that the beneficiaries faced the COVID-19 pandemic during the data collection. Historically, low-income people are disproportionately affected by pandemics. The COVID-19 pandemic has hit Brazilian slums in an unprecedented way. For instance, slum areas engage in less social distancing and present higher fatality rates than non-slum neighborhoods (Brotherhood et al., 2022). Proper housing may be critical during a pandemic, as higher quality housing units may potentially reduce mental-related burden: TECHO's housing unit may make the period of COVID-19 exposure more "bearable." Although we study a period of pressing times, we consider that the channels discussed in Section 2.2 are still plausible to operate.

## 3 Empirical Strategy

### 3.1 Sample and Treatment Assignment

To test the intervention's effects, we conducted a pre-registered experiment with 611 families in 24 slums in Brazil—217 families were randomly assigned to the treatment

group. Appendix Figure A.2 shows the location of the 24 slums across the Brazilian territory.[10]

The randomization is at the individual level, and the assignment into treatment worked as follows. In each slum, TECHO volunteers select the families eligible to participate in the program according to a vulnerability index. The vulnerability index comprises information such as physical health (e.g., chronic conditions and incurable diseases), income level, and risks (e.g., risk of eviction, vulnerability to natural disasters, and location adjacent to a landfill area). Some families live in such extreme conditions (i.e., with a very high vulnerability index) that TECHO prioritizes giving them the house—these beneficiaries are not part of the intervention. Other families voluntarily participated in a draw organized by TECHO to select beneficiaries if there was excess demand for housing units in a given community. In 24 slums, the demand lists for housing units were oversubscribed. In these cases, applicants are ordered randomly on a waitlist, and slot offers are made following that order until all housing units available are filled (all the program's construction capacity is reached). Conceptually, applicants can be partitioned into two groups: "initial offer" winners (those who were randomly ranked up to the number of housing units—our treatment group) and "nonwinner" group (randomly ranked at lower positions—our control group).

A timeline of the housing unit construction and our surveys is presented in Figure 2. In each of the 24 slums, we applied a baseline survey before implementing the randomized waitlist. The post-treatment survey was conducted between 6 and 14 months after the intervention. In two slums, we created two waitlists a few months apart. Therefore, the number of strata is given by the number of slum-waitlists. For ease of exposition, we refer to the number of blocks as the number of slum settlements. We did not perform any stratification within a given informal settlement. More details on the sample and randomization are in Appendix B.[11]

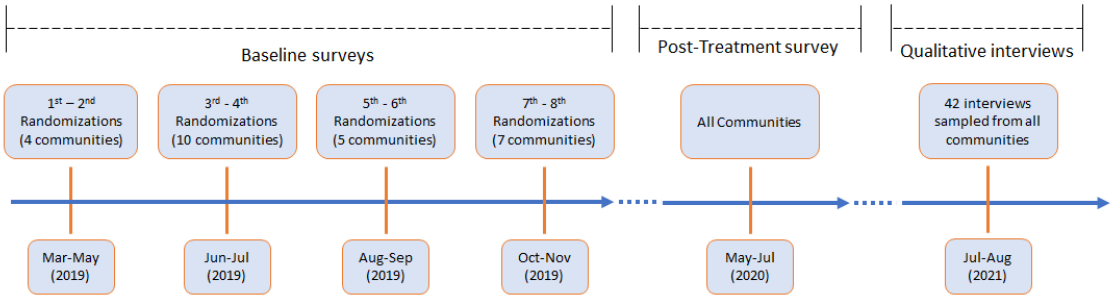
### 3.2 Empirical Specification

We estimate an intention-to-treat effect by using the following empirical specification:

[10] During our meeting with TECHO regarding the research design, we asked the implementers for details about the beneficiaries' selection. TECHO stated that selecting beneficiaries uniformly among its Brazilian offices would be an improvement. Besides, TECHO stated that most communities had excess demand for housing units. We suggested selecting the beneficiaries randomly to provide a uniform selection method in communities with excess demand, and TECHO said that this would work for their settings. Furthermore, leaders and volunteers could decide on priority cases that would not enter the random selection. We excluded households that were given priority from the analysis—for instance, pregnant women and people with disabilities. Using leaders' and volunteers' contextual knowledge improves priority decisions and addresses ethical concerns.

[11] In Appendix B, we also discuss a few minor deviations from the pre-analysis plan.

**Figure 2:** Timeline of the Intervention




Notes. This figure shows the timeline of the TECHO intervention.

$$y_{ij} = \alpha + \rho Treat_{ij} + \beta X_{ij} + \gamma_j + \varepsilon_{ij} \quad , \tag{1}$$

where $y_{ij}$ is the outcome variable for individual $i$ in slum settlement $j$, and $Treat_{ij}$ is the randomization assignment dummy: the initial-offer winner dummy equals one for applicant $i$ getting an initial offer at the draw in slum settlement $j$ and zero otherwise. The parameter of interest is $\rho$, the impact of the assignment to the intervention; if the program has positive impacts, this coefficient should be positive and statistically significant. $\gamma_j$ is a strata (informal settlement) fixed effect and $\varepsilon$ is the idiosyncratic error term.

In Equation (1), we include three variables in the vector of baseline characteristics $X_{ij}$ to improve the precision of the estimates: a health index, an indicator variable that equals one if the household has received a visit from a community leader and zero otherwise ("leader visit"), and a roof quality index. We pre-registered the inclusion of pre-treatment covariates, but we did not specify which variables would be included. In the interest of full disclosure, we also report the results without these control variables.

In addition, we perform a regression adjustment with demeaned interactions, estimating a specification based on Lin (2013):

$$y_{ij} = \alpha + \rho Treat_{ij} + \phi Treat_{ij} \times \bar{\gamma_j} + \delta Treat_{ij} \times (X_{ij} - \bar{X}) + \beta X_{ij} + \gamma_j + \varepsilon_{ij} \quad , \tag{2}$$

where $\bar{\gamma_j}$ is a set of centered strata fixed effects and $\bar{X}$ is mean covariate value for the entire sample, and the interaction terms allow for different treatment effects across strata.

In all model specifications, standard errors are robust and clustered at the individual level (the level in which randomization occurred).

### 3.3 Outcomes

Appendix Table A.2 shows the outcomes used in this paper. Our primary outcome is a (pre-registered) index of subjective well-being. The measure of subjective well-being is based on Kahneman and Deaton (2010), which use the Gallup-Healthways Well-Being Index. More specifically, we use the emotional well-being questionnaire that asks about the frequency of positive and negative emotions (e.g., happiness, worry, loneliness, stress). We adapt the phrasing of the questions to match our setting's cultural and socioeconomic context. The original language is: "Did you experience the following feelings during a lot of the day yesterday?" In our survey, we changed the wording to: "Thinking back to yesterday, would you say you felt [feeling] for most of the day?" The feelings are the following: happy, worried, sad, and lonely. We then include two additional measures of stress and depression: if the person uses any medicine for depression and the extent to which the person "felt more stressed yesterday than usual." We also include a question about sleep quality using a five-point Likert scale.

All questions were standardized to take part in an *index of subjective well-being* with equal weights for each component (Kling et al., 2007). Variables that address negative feelings had the signal inverted (reverse-scored) to match positive emotions. Therefore, our approach to dealing with multiple hypothesis testing is to examine a single overall index variable that combines all outcomes belonging to a family.

We use several measures to understand (exploratory) mechanisms. First, a housing quality index, which is a standardized measure related to the presence of sanitation (presence of sinks, toilets, and showers), durable goods, pests, and a question of relative housing quality ("Do you think your house is better than the ones from your neighbors?"). Second, a trust index: a z-score of trust in government, community leaders, family, friends, community neighbors, and church members. In addition, we examine labor market outcomes and the likelihood of staying in the community. Finally, we use a few individual questions that belong to indices to shed light on the interpretation of the results—with the caution that they are not corrected for multiple testing.

### 3.4 Assessing the research design

In this subsection, we perform different exercises to assess our research design.

**Balancing**. Table 1 presents the summary statistics of households in the assigned-to-treatment and control groups at baseline. Columns (I) and (II) display the mean and the standard deviation of several characteristics for the assigned to treatment households (initial-offer winners), respectively. Columns (III) and (IV) show the mean and

standard deviation of the same attributes for the control group (nonwinner group). Column (V) reports coefficients from regressions (estimated by OLS) of baseline variables on the treatment assignment indicator, controlling for strata fixed effects—a specification similar to Equation (1) but using each baseline characteristic as the dependent variable. Column (VI) reports standard errors. Results show that our sample is balanced on a wide set of variables, but a few of the coefficients are individually statistically significant. Besides, the F-statistics cannot reject the joint hypothesis that all coefficients are zero.

**Compliance**. Of the 217 households randomly allocated to the treatment group, 87 declined or could not receive the housing unit, representing a 60% take-up rate. Part of the households assigned to treatment never gets to receive the house, either because they refuse to agree to TECHO's conditions to build a new home or because the land plot would not be adequate for TECHO's units.[12] Additionally, 13 units initially assigned to be in the control group ended up receiving treatment even though they were not eligible according to their position on the waitlist. The reason reported by the NGO's volunteers was to accommodate community leaders' will.

The fact that we are estimating an intention-to-treat effect with initial-offer winners and the non-compliance of units in the treated and control groups indicate that our estimates may be interpreted as lower bounds of the true effects.

**Attrition**. We surveyed 369 households during the post-treatment survey. We tried to contact all households of our original sample, and the main reason for not obtaining more surveys was changing phone numbers between surveys; only a few households refused to answer the survey by phone. We minimized typo errors in phone numbers by checking the survey's phone numbers with phone numbers from three suppliers. To check for differential attrition across groups, we create the variable $Interview_{ij}$, an indicator variable that equals 1 if a household $i$ in community $j$ is interviewed in the post-treatment survey and 0 otherwise. We then estimate a specification similar to Equation (1) using $Interview_{ij}$ as the dependent variable. Results are in Table 2. Importantly, our attrition rate is similar across treatment arms. There is no statistically significant difference in the likelihood that we conduct a follow-up survey by phone with households in the assigned-to-treatment and control groups. The difference in the re-survey rate is close to zero.

**Spillovers and general equilibrium effects**. For the communities in which we have data for all members, households in our sample represent 3–4% percent of all households in the slum communities—winners are 1–1.5%. Therefore, general equilibrium

[12]Conditions vary from steep terrain, small plot size, and land composition (either too muddy or too rocky).

**Table 1:** Pre-treatment Covariates: Balancing

| | Assigned to Treatment Group | | Control Group | | Δ (Treated - Control) | |
|---|---|---|---|---|---|---|
| Variable | Mean | Std. Dev. | Mean | Std. Dev. | Δ | Std. Error |
| Household size | 2.716 | (1.842) | 2.587 | (1.512) | 0.108 | (0.149) |
| Gender (Female) | 0.560 | (0.497) | 0.646 | (0.479) | -0.079* | (0.043) |
| Age | 38.022 | (15.332) | 37.420 | (15.009) | 0.296 | (1.250) |
| Race (Non-white) | 0.884 | (0.320) | 0.825 | (0.380) | 0.057** | (0.029) |
| Income (respondent) | 511.876 | (535.832) | 470.617 | (542.360) | 19.351 | (45.838) |
| Per capita income (household) | 374.111 | (376.672) | 360.784 | (423.154) | -1.512 | (32.762) |
| Indicator: Employment | 0.449 | (0.498) | 0.398 | (0.490) | 0.051 | (0.043) |
| Indicator: Pregnant | 0.053 | (0.225) | 0.061 | (0.239) | -0.009 | (0.018) |
| Indicator: Health Problem | 0.551 | (0.828) | 0.471 | (0.784) | 0.075 | (0.069) |
| Indicator: Chronic diseases | 0.373 | (0.485) | 0.333 | (0.472) | 0.046 | (0.041) |
| Indicator: Sanitary diseases | 0.276 | (0.448) | 0.303 | (0.460) | -0.014 | (0.037) |
| Indicator: Respiratory diseases | 0.280 | (0.450) | 0.284 | (0.451) | 0.006 | (0.040) |
| Indicator: No disability | 0.916 | (0.279) | 0.908 | (0.290) | 0.007 | (0.024) |
| Hospital visits | 0.591 | (0.493) | 0.624 | (0.485) | -0.032 | (0.043) |
| Financial Expectation | 0.773 | (0.460) | 0.750 | (0.525) | 0.031 | (0.043) |
| Dream housing | 1.800 | (0.443) | 1.835 | (0.443) | -0.008 | (0.037) |
| Institutional affiliation | 0.729 | (0.446) | 0.677 | (0.468) | -0.012 | (0.027) |
| Leader visit household | 0.356 | (0.480) | 0.306 | (0.461) | 0.064* | (0.038) |
| Made public goods claims | 0.187 | (0.391) | 0.172 | (0.378) | 0.016 | (0.033) |
| Made private goods claims | 0.253 | (0.436) | 0.180 | (0.384) | 0.061* | (0.036) |
| Engagement Elections 2018 | 0.129 | (0.336) | 0.109 | (0.312) | 0.013 | (0.027) |
| Engagement Elections 2016 | 0.138 | (0.345) | 0.090 | (0.286) | 0.041 | (0.026) |
| Education level | 2.338 | (1.327) | 2.371 | (1.288) | 0.030 | (0.095) |
| Year arrived community | 2014.424 | (6.221) | 2015.000 | (4.994) | 0.178 | (0.357) |
| Location previous home | 1.699 | (0.482) | 1.781 | (0.436) | -0.060* | (0.034) |
| Ever evicted | 0.116 | (0.320) | 0.133 | (0.341) | 0.005 | (0.028) |
| Any Infrastructure problems | 0.978 | (0.148) | 0.954 | (0.210) | 0.027* | (0.016) |
| Any household accident | 0.382 | (0.487) | 0.427 | (0.495) | -0.032 | (0.041) |
| Adequate roof material | 0.600 | (0.491) | 0.612 | (0.488) | -0.008 | (0.042) |
| House quality index (roof) | 2.809 | (0.781) | 2.937 | (0.739) | -0.096 | (0.064) |
| Adequate wall material | 0.022 | (0.148) | 0.017 | (0.129) | 0.005 | (0.011) |
| House quality index (wall) | 2.720 | (0.783) | 2.799 | (0.695) | -0.071 | (0.063) |
| Adequate floor material | 0.409 | (0.493) | 0.451 | (0.498) | -0.004 | (0.038) |
| House quality index (floor) | 3.062 | (0.777) | 3.036 | (0.805) | 0.055 | (0.065) |
| F-test (H0: All coefficients = 0) | F-stat: | 1.13 | P-value: | 0.28 | | |

Notes. This table shows the balancing test between the group assigned to treatment and the comparison group. Columns (I) and (II): mean and the standard deviation of characteristics of the treated households (initial-offer winners). Columns (III) and (IV): mean and standard deviation of the characteristics of the control group. Column (V): coefficients from regressions estimating Equation (1) with each characteristic as the dependent variable. Column (VI): standard errors. ***p<0.01, **p<0.05, *p<0.1.

effects are less likely to occur. In addition, since our sample is small relative to the number of dwellers of these settlements, there is a lower probability that individuals who were assigned to control are living close to those units that were treated—the units that would be more likely to be influenced by treated units (Galiani et al., 2021).

**Table 2:** Attrition Analysis

| *Dependent Variable:* | *Interview (1=Yes)* | |
|---|---|---|
| Variables | (I) | (II) |
| Treat | -0.000 | 0.001 |
| | (0.042) | (0.043) |
| Resp. Health Index | | 0.021 |
| | | (0.062) |
| Leader visit | | -0.021 |
| | | (0.046) |
| Roof qual. index | | 0.001 |
| | | (0.028) |
| Strata fixed effect | Yes | Yes |
| Pre-treatment Controls | No | Yes |
| Number of Obs. | 632 | 632 |

Notes. This table shows the results of the baseline empirical model – see Equation (1). The dependent variable is an indicator variable that equals 1 if a household $i$ in community $j$ is interviewed in the post-treatment survey and 0 otherwise. $Treat$ is the randomization assignment dummy, which equals one for applicants getting an initial offer at the draw in a slum settlement and zero otherwise. Control variables are community leader visits, quality of the house roof, and an index for respiratory diseases. ***p<0.01, **p<0.05, *p<0.1.

Qualitative evidence from our fieldwork suggests that the possibility of spillovers in our settings is unlikely.[13]

# 4 Results

We divide the results into four parts. First, we show the effects on the primary outcome: subjective well-being. Then, we discuss the channels. After, we perform exploratory analysis (that were not pre-specified). Finally, we close the section by detailing the key results from the qualitative analysis. Our tables have a common format: we present the results from estimating Equation (1) with and without controls and then present the results from estimating Equation (2) with and without controls.

## 4.1 Main Results

We start by examining the consequences of a housing intervention in Brazilian slums on mental well-being. The results are shown in Table 3. Column (I) indicates a large and statistically significant effect on well-being: exposure to the intervention triggers

[13] We do not have precise geolocation of the individuals of our sample.

a rise in subjective well-being of about 0.2 standard deviations. The point estimates on emotional well-being are uniformly large and positive after performing pre-specified analyses. For instance, Column (II) indicates that the results are robust to including control variables. In addition, Columns (III) and (IV) point out that the magnitude of the results increases when estimating the regressions with interactions (see Equation (2)). Those in the treatment group, relative to the control group, report having a greater subjective well-being index by 0.26 standard deviations.

The results show then that the group assigned to treatment presents improved subjective well-being. Next, we investigate which index components are associated with the positive effects—bearing in mind that this analysis is primarily suggestive because the index was meant to be a holistic measurement instrument for subjective well-being (Kahneman and Deaton, 2010). Results in Table 3 suggest that decreases in worry and the use of depression medication are large in magnitude and are likely to explain the positive impacts we observe on mental well-being.

To put the magnitude of our results into perspective, we compare them with those from the literature analyzing anti-poverty programs. Ridley et al. (2020) provides a meta-analysis of the effects of anti-poverty programs on mental well-being. Our estimates lie in the upper range of the positive results, highlighting that the large effects of our intervention are likely related to the fact that the survey data collection was conducted during pressing times. Aggregate crises such as the COVID-19 pandemic disproportionally affect the people living in poverty, with detrimental effects on mental health outcomes (Adams-Prassl et al., 2020). Our findings suggest that even in a highly vulnerable sample—overall more prone to the negative impacts of external shocks—the program helps alleviate adverse effects among the targeted group.

We perform three additional exercises to check the robustness of our results. First, Appendix Table A.3 shows that our findings are robust to controlling for the unbalanced variables (recall the balancing analysis in Table 1). Second, Appendix Table A.4 shows that our findings are robust after applying other models: Gibbons et al. (2018)'s interaction-weighted estimator and regression-weighted estimator. In addition, there were two informal settlements in which few individuals had a greater chance of winning the lottery—see Appendix B. Appendix Table A.5 indicates that the results are robust to excluding all individuals of these two informal settlements—but notice that the results are less precisely estimated as the number of observations decrease in these regressions.

### 4.2 Channels

To better understand our findings, we examine potential mechanisms through which the intervention may affect subjective well-being. Our goal is to assess the role of

**Table 3:** Intention to Treat Estimates (Initial Offer) - Emotional Well-being

| | Baseline Model | | Lin Model | |
|---|---|---|---|---|
| Dependent Variable | (1) | (2) | (3) | (4) |
| Well-being Index | 0.197* | 0.180* | 0.258** | 0.226** |
| | (0.103) | (0.105) | (0.103) | (0.104) |
| **Index Components** | | | | |
| More Happiness | 0.137 | 0.121 | 0.155 | 0.140 |
| | (0.106) | (0.109) | (0.112) | (0.110) |
| Less Worry | 0.229** | 0.208* | 0.289** | 0.247** |
| | (0.114) | (0.115) | (0.117) | (0.118) |
| Less Sadness | -0.017 | -0.022 | 0.005 | 0.006 |
| | (0.106) | (0.109) | (0.103) | (0.105) |
| Less Loneliness | 0.110 | 0.109 | 0.169 | 0.166 |
| | (0.110) | (0.111) | (0.107) | (0.109) |
| More Sleep Quality | 0.072 | 0.040 | 0.113 | 0.075 |
| | (0.108) | (0.108) | (0.118) | (0.119) |
| Less Depression Medication | 0.194** | 0.190** | 0.209** | 0.183** |
| | (0.089) | (0.091) | (0.082) | (0.085) |
| Less Stress | 0.144 | 0.148 | 0.198** | 0.182* |
| | (0.105) | (0.109) | (0.094) | (0.100) |
| Fixed Effects | Yes | Yes | Yes | Yes |
| Pre-treatment Controls | No | Yes | No | Yes |
| Number of Obs. | 369 | 369 | 369 | 369 |
| Number of Blocks | 25 | 25 | 25 | 25 |

Notes. Reported results: estimated coefficients and robust standard errors (in parentheses). Specifications (2) and (4) include pre-treatment control variables for community leader visit, quality of the house roof, and household index for respiratory diseases. Pre-registered models (1) and (2) are based on Equation (1). Pre-registered models (3) and (4) include interactions and are based on Equation (2). The pre-registered well-being index is an average of z-scores of Happiness, Worry, Sadness, and Loneliness, Depression Medication, Sleep Quality, and Stress. ***p<0.01, **p<0.05, *p<0.1.

channels related to the multifaceted intervention's attributes (private and prosocial behavior). In this analysis, we work with pre-specified indexes and questions as well as specific components of those indexes—and, again, the interpretation of individual components should be done with caution since individual components are not corrected for multiple testing.

First, we analyze the role of housing quality in Table 4. The intervention increased the housing quality index by 0.1 standard deviations relative to the control group, but the estimates are not precisely estimated. Analyzing the index's components, we find improvements in small magnitudes in housing structures (such as the presence of bathrooms and sinks). Although the intervention does not aim to improve such dimensions, the effect could have been positive had residents decided to invest in sanitation themselves. By contrast, the intervention seems to impact other dimensions of

**Table 4:** Intention to Treat Estimates (Initial Offer) - Channel housing

| | Baseline Model | | Lin Model | |
|---|---|---|---|---|
| Dependent Variable | (I) | (II) | (III) | (IV) |
| Housing Index | 0.102 | 0.113 | 0.133 | 0.140 |
| | (0.098) | (0.099) | (0.094) | (0.097) |
| **Index Components** | | | | |
| Less pests | 0.178* | 0.168* | 0.177** | 0.155* |
| | (0.099) | (0.099) | (0.088) | (0.088) |
| Home has sink | 0.028 | 0.028 | 0.044 | 0.053 |
| | (0.108) | (0.110) | (0.105) | (0.110) |
| Home has bathroom | -0.093 | -0.079 | -0.073 | -0.050 |
| | (0.109) | (0.109) | (0.098) | (0.098) |
| Shared bathroom | 0.013 | 0.043 | 0.038 | 0.056 |
| | (0.110) | (0.113) | (0.099) | (0.101) |
| Relative house quality | 0.181* | 0.161 | 0.212* | 0.206* |
| | (0.108) | (0.111) | (0.117) | (0.118) |
| Home has TV/Fridge | 0.005 | 0.024 | 0.008 | 0.008 |
| | (0.101) | (0.100) | (0.098) | (0.098) |
| Strata Fixed Effects | Yes | Yes | Yes | Yes |
| Pre-treatment Controls | No | Yes | No | Yes |
| Number of Obs. | 369 | 369 | 369 | 369 |
| Number of Blocks | 25 | 25 | 25 | 25 |

Notes. Reported results: estimated coefficients and robust standard errors (in parentheses). Specifications (2) and (4) include pre-treatment control variables for community leader visit, quality of the house roof, and household index for respiratory diseases. Pre-registered models (1) and (2) are based on Equation (1). Pre-registered models (3) and (4) include interactions and are based on Equation (2). ***p<0.01, **p<0.05, *p<0.1.

housing quality that are conceptually more likely to be affected: for instance, beneficiaries report a lower incidence of pests such as rats. Another component that was large in magnitude was the indicator variable that equals one if beneficiaries find their housing unit better than that of their neighbors ("Relative house quality"). These results suggest that the relatively better housing unit can increase self-esteem.

Table 5 shows the results for an understudied topic: sleep quality. The better structure provided by the intervention (ventilation, isolation against environmental stressors) may improve the sleep of the treated group compared to the control group. We find a positive effect of the program on the quality of sleep, but notice that the coefficients are not precisely estimated.[14]

[14]We pre-registered the sleep outcome as one component of the subjective well-being index. However, the coefficient of sleep is not statistically significant even before correcting for multiple hypotheses.

**Table 5:** Intention to Treat Estimates (Initial Offer) - Additional Channels

| | Baseline Model | | Lin Model | |
|---|---|---|---|---|
| Dependent Variable | (1) | (2) | (3) | (4) |
| Sleep quality (Subjective Well-being Component) | 0.072 | 0.040 | 0.113 | 0.075 |
| | (0.108) | (0.108) | (0.118) | (0.119) |
| Worked Last Week? | 0.055 | 0.041 | 0.068 | 0.051 |
| | (0.066) | (0.066) | (0.063) | (0.067) |
| Living in the same community? | 0.132 | 0.135 | 0.159* | 0.181** |
| | (0.110) | (0.108) | (0.090) | (0.088) |
| Trust Index | 0.125** | 0.120** | 0.124** | 0.110* |
| | (0.056) | (0.057) | (0.058) | (0.059) |
| Fixed Effects | Yes | Yes | Yes | Yes |
| Pre-treatment Controls | No | Yes | No | Yes |
| Number of Obs. | 369 | 369 | 369 | 369 |
| Number of Blocks | 25 | 25 | 25 | 25 |

Notes. Reported results: estimated coefficients and robust standard errors (in parentheses). Specifications (2) and (4) include pre-treatment control variables for community leader visit, quality of the house roof, and household index for respiratory diseases. Pre-registered models (1) and (2) are based on Equation (1). Pre-registered models (3) and (4) include interactions and are based on Equation (2). ***p<0.01, **p<0.05, *p<0.1.

We check the effects on labor market outcomes to provide further evidence of the mechanisms. More specifically, we investigate whether the intervention interferes with labor market participation. Table 5 indicates no statistically significant effect on the employment likelihood. Notice that this result can be directly affected by the context in which the study occurred, the COVID-19 Pandemic. By contrast, the intervention led to meaningful average increases in the likelihood of being attached to the community. The results show that the group assigned to treatment is more likely to be located in the community where the housing unit was constructed—the magnitude of the intervention effects on squatters' propensity to move to other neighborhoods are large but not precisely estimated in some specifications. Our findings thus suggest a reduction in outmigration. Greater attachment to slum neighborhoods can have negative aspects: it may be associated with continuous exposure to health hazards and violence (which negatively affect mental well-being). However, local attachment may also translate into better communal integration, enhanced sociability, and improved mental well-being as a consequence.

To further investigate the impacts of the prosocial behavior component of the treatment, we rely on two different questions of trust that combined form our trust index. We first asked the respondents: "If you had a serious health problem due to Coronavirus, how much do you think you could count on the help of [GROUP]." The word

[GROUP] referred to either friends, family, community neighbors, church members, community leaders, or government agents/politicians. We then asked "how much do you trust in the Covid-related information provided by [leaders OR government]." We interpret the first question as a direct measure of interpersonal trust in specific agents in dire times. We expect the prosocial intervention to increase the trust that participants place in the agents who helped them during the program. We interpret the second question as a measure of general trust in times of great informational uncertainty. We focus on government agents and community leaders because both had a level of authority over disseminating preventive behavior news during the pandemic. While different tiers of government sent ambiguous information in Brazil during the pandemic (Ajzenman et al., 2023), community leaders were directly responsible for distributing masks and other personal protective equipment that were part of a mass donation campaign conducted by TECHO. We expect the intervention to increase general trust in the information provided by local leaders because they were more reliable and were in direct contact with the program participants.

The results in Table 5 suggest that social interactions may be a relevant channel underlying our main findings. We find a consistently strong effect of the program on our trust index. The impact varies around 0.12 standard deviations depending on the model specification (all precisely estimated). Appendix Table A.6 shows the components of the trust index. Among beneficiaries, we see increased trust in friends and church members at the direct interpersonal level and trust in community leaders in general. We see null or small and not precisely positive effects of trust in family, community neighbors, government, and leaders (interpersonal level). The results are consistent with the fact that the intervention strengthens close-connection relationships such as friends and church members—these are the first groups of people that participants tend to mobilize to help with the construction. The effect is probably weaker for family members because both treatment and control respondents generally count on family as their primary healthcare help provider. The low magnitude of the impact on trust in the government can be explained by the fact that the intervention is not associated with the public sector. We conclude that the prosocial component of the program appears to be a relevant channel.

### 4.3 Exploratory Analysis

In this section, we perform an exploratory analysis to test the hedonic adaptation hypothesis (Galiani et al., 2018). Hedonic adaptation occurs when the effects of an intervention on well-being diminish over time as individuals adjust to new circumstances. If this hypothesis is true, shocks in individuals' material levels of well-being tend to eventually return to a baseline level associated with one's personality. How-

ever, hedonic adaptation might not happen among individuals experiencing high levels of material deprivation because only after basic needs are met would happiness levels return to baseline levels—this is often referred to as the "basic needs" hypothesis. Galiani et al. (2018), using a different measure of subjective well-being, find a partial adaptation effect of another TECHO housing intervention (also in a high-poverty context).

To test the adaptation hypothesis, we allocate each slum settlement into two groups based on the number of months of "exposure" to treatment. More precisely, we set the date of the post-treatment survey as a reference and calculated the number of months between the survey and the randomization in each slum settlement. We then split the settlements into two groups: one in which the randomization took place several months before the survey period ("Phase I" group) and another group of settlements in which the randomization took place closer to the period of the survey ('Phase II" group, in which treated individuals received the treatment a few months before answering the survey). We use the median number of months between the survey and the randomization as the threshold to split the groups. We create a $Phase\ I$ indicator variable, which equals one for those settlements of the Phase I group and zero otherwise.

We then estimate Equations (1) and (2), adding to each specification an interaction term between the randomization assignment indicator variable ($Treat$) and the $Phase\ I$ indicator variable—see Appendix Table A.7 for more detail. If the coefficient of the interaction term is negative, this suggests hedonic adaptation because more prolonged exposure attenuates the treatment effect.

Appendix Table A.7 shows the results for two outcome variables: the subjective well-being index and the trust index. While the results of the baseline model (Equation (1)) do not support the adaptation hypothesis, the Lin model (Equation (2)) shows a negative coefficient for the interaction term, although not precisely estimated. In addition, when analyzing the trust index, the Lin model indicates a similar pattern: a negative coefficient for the interaction term but not precisely estimated. This channel suggests that as the pro-social component of the intervention weakens, so does the effect on emotional well-being. The strengthened social bonds created during construction may fade away after some time, possibly due to social isolation in pandemic times. Notice that these results should be interpreted with caution since our sample size and treatment rollout among settlements were not designed to test this additional hypothesis.

### 4.4 Qualitative Interviews

We use qualitative data to complement previous quantitative findings regarding the causal link between the intervention and mental well-being. The idea is to investigate the mechanisms further and understand the nuances that could explain our causal results. We conducted 42 semi-structured interviews with (randomly-selected) individuals from our sample.[15] To contrast the effects of the intervention between groups, we interviewed 22 individuals from the treated group and 20 from the control group. Because characteristics usually differ between communities, we interviewed at least one control and one treated family in each slum. We also tried to maintain a balanced number of male and female interviewees. When we could not conduct interviews in a small community, we transferred interviews to larger ones. Interviews were, on average, 60 minutes long and ranged from 33 to 105 minutes. They were conducted via WhatsApp, a widely used instant messaging application that also allows for phone calls, and they were recorded and then transcribed.[16] We rewarded our interviewees in the qualitative interviews with cash transfers in the amount of R$100.00 (Brazilian reais) as an acknowledgment of their time.

Our interviews covered various topics, partly driven by participants' narratives about their TECHO experience and housing situation. More specifically, for those treated, we asked open-ended questions about the home-building process and the connections made with TECHO volunteers, leaders, and other community members. We also asked about the experience with the new home (and their non-TECHO home for the control group). For treated and control individuals, we asked about everyday concerns, family and community relationships, and views about their residence.

We analyzed these interviews via both a deductive and an inductive process. We determined themes connecting subjective well-being and housing that we believed would be relevant based on the existing literature (safety, dignity, status, self-esteem, self-efficacy, life control, land tenure, sense of property, sleep quality). We also proceeded inductively by discovering themes that connected subjective well-being and housing that we did not anticipate (shelter, comfort, infestation, visits, tranquility, robbery/violence). Below, we present quotes that illustrate how better quality housing and social connection boosted by participation in TECHO's program connect to better subjective well-being. Furthermore, in Appendix C, we show a systematization of the qualitative evidence by examining the frequency in which our codifications of these themes were found in the interviews and how proximal they appear in the

[15] See Figure 2 in Section 3.

[16] We conducted interviews when COVID-19 was prevalent, and in-person interviews were not advisable. While phone interviews are relatively new for semi-structured qualitative interviews, we pre-tested the script, and our respondents were all well-acquainted with WhatsApp. As a result, we did not encounter challenges in conducting qualitative interviews via phone.

transcriptions.

The in-depth interviews offer evidence consistent with the quantitative findings. For instance, a wide range of interviewees in the treatment and control groups confirmed that housing collapse is a risk in the slums where TECHO acts. Storms and floods increase the risk of collapse or trees falling into people's houses. Additionally, when such events happen, households are expected to end up without electricity because networks are informal and poorly installed. Our respondents also indicate that the housing unit increases the sense of housing safety, reducing anxiety and worries about families' physical integrity. People from the control group are constantly afraid of losing their homes and belongings after storms and floods. The following interviews highlight how safe a TECHO house is:

> *Interview Nm. 6 (Treatment unit)*
>
> Q – How was the experience during the first rain after you moved into this house?
>
> A – Well, for the first one, I was kind of uneasy, thinking: "I'm gonna wait, but will this wind not even bend these tiles, or rip something off?"
>
> Q – And then, what happened?
>
> A – [The tiles] stayed there. The rain passed. Then I thought to myself: "Thank God, that rain is over." As for the other rains, I started to lose my fear of the roof ripping off, because it's a very safe house.

> *Interview Nm. 42 (Treatment unit)*
>
> Q – What do you think is the best thing about this TECHO house?
>
> A – About TECHO? Well, it is better; the best thing is that it is safer, you know?
>
> Q – How so? What do you mean by safer?
>
> A – [Safer] From rain, wind, you know? Like, if it rains, water doesn't get in because of the underside, you know? Because the house is elevated.

More subtly, TECHO's units are considered more comfortable and better looking. There were many reports (among treatment and control) that the house was beautiful and nice to live in. Notably, even residents in the control group find TECHO's houses good-looking. From a theoretical perspective, this could connect to previous evidence on the role of social status in housing programs. This mechanism could lead to feelings of self-esteem, as this respondent answered:

*Interview Nm. 20 (Treatment unit)*

Q – Did your feelings about yourself change after you obtained your house?

A – A little bit, yes. Because for me, it's a new little house. I've always had, thank God, my own little house; I've always managed to make ends meet in the community. But [the previous house] wasn't new as this one that I won is. So, this gives a lift to our self-esteem.

Q – And did you have a feeling like, as you said about self-esteem, that now you could do more, you know?

A – Yeah, now it's mine; look at my house. I have my house; look at my cute little house that I won. I was the one who got it.

In addition to safety and status, the housing unit generates comfort, which can impact our measures of emotional well-being. In our qualitative analysis, the word "comfortable" was salient for at least two reasons. First, the house is well structured to avoid problems related to weather events. Second, the housing unit protects residents from rats, insects, and other small animals that can carry diseases and that residents find disgusting.

*Interview Nm. 2 (Treatment unit)*

Q – And issues related to insects, cockroaches, ants, rats, do you have this type of problem there? Do you think you have less than you had before, or is it the same? How are you?

A – Look, mouse here, when I came here, there were no mosquitoes up here. Rat, mosquito, that sort of thing, came along with the residents. Amazingly, the rats came along with the villagers themselves. Here, what we had a lot of was snake, scorpion, lizard, spider... And it improved a lot. I used to sleep with a spider on my side. Nowadays, it doesn't have that anymore. Because, in the past, it was eucalyptus and madeirite. And, today, the roof shack is completely fenced, everything just right, there's no way to get in the insect; it's all closed, all right. "Noh", so good. I already woke up with a scorpion on the side of my head.

*Interview Nm. 19 (Control unit)* Q – I understand. And has anything worse, you being bitten, attacked, something like that?

A - Yes, my wife has already been bitten by a snake.

Q - And how did you solve it?

A – He took it to the hospital; I managed to kill the snake and took the snake with me.

The qualitative data also add several pieces of evidence supporting that trust is a potential mechanism. During the interviews, we identify how the housing program brings benefited families closer to leaders. The following dialogue illustrates this point:

> *Interview Nm. 26 (Treatment unit)*
>
> Q – As a leader, has she ever helped you with anything other than this housing issue?
>
> A – Yes, she helps me. When we were building the house, she came to talk to me, and now with the pandemic, [she helps with] donations of things we needed and such.
>
> Q – What other kind of help has she given besides the house?
>
> A – Basic food basket, whenever the TECHO NGO manages to raise funds, she always comes to see if we need anything. And then she helps.
>
> Q – And is she still helping you now?
>
> A – Yes.

We also asked what beneficiaries could remember from their meetings with TECHO's volunteers. Interviews reinforced the perception that meetings are not only about teaching families how to build houses. They connect people on some stances, even though this connection can be temporary. Meetings also enhance the values of cooperation, trust, and community engagement among participants. They practice collective action by dividing tasks and asking friends, family, and community members to help in the construction. The ties that strengthen the most are those previous connections with friends and members of institutionalized organizations (such as churches). Beneficiaries get to know each other during meetings and construction day, especially in recent settlements. Some became friends and nurtured networks of social support during the COVID-19 pandemic.

> *Interview Nm. 7 (Treatment unit)* Q – Before building the house, did you participate in a meeting, workshop, or any activity? What activity did you participate in?
>
> A – Yes, we participated. We went from an activity to a game of getting a bottle and asking "what dream do you have"... And then she kept that bottle so that when it was construction day, and the house was ready, everyone would take it and read that little piece of paper right away. It could be mine (dream) or a colleague's, and we would do it all together.
>
> Q – Did you think it was good?

A – Yes.

Q – Why?

A – Because it was something for us to get to know everyone there. There are people there that we... Like, five years, we live in this community, but there are residents that we say to each other like "hi, hi", and that's it, it's over. I didn't know them, I didn't have friendship with or anything. And we learned about each person's story there, about each dream they had... So it was good.

The role of housing costs was also noted during the interviews. Recall that although more than 95% of the house cost is subsidized, beneficiaries must pay for the construction. Our fieldwork during the selection of beneficiaries indicates that, in some slum communities, TECHO has waived households from paying for housing construction. However, we have also identified during fieldwork that most families bear an extra cost because they must rebuild utilities such as energy connections and existing, self-made sanitary infrastructure. On the other hand, this later autoconstruction triggered by the intervention is sometimes seen as another opportunity to strengthen social ties. Some of our interviewees emphasize that they count on neighbors and friends to improve housing conditions further. This feature of the intervention is especially salient to single mothers or families without adult males because construction activities require strength and knowledge usually associated with men.

Finally, to complement the analysis, we code important concepts and count the frequencies in which they appear in the open-ended interviews. Appendix C describes the coding process and the rationale behind each code in more detail. Appendix Figure C.1 presents the percentage of citations of each code. "Shelter" was cited in 85% of the documents, while "Infestation" comes next with 72.5% citations. These results reinforce that the housing unit indeed represents a material improvement. "Visual content," "Good sleep," and "Self-esteem" represent the second group of codes that appear as most relevant. Nearly half of the cases cited them during the interviews. Appendix Figure C.3 shows the text proximity between each code. If a code is less than one paragraph apart from another in a given transcript, then both are considered proximate. Next, we calculate the frequency of the codes that are proximate. "Shelter" seems to be the code with more correlates. It is intensely co-cited with "infestation," "bad sleep," and "safety." Lastly, Appendix Figures C.4 and C.5 show citations by interviewee group. "Self-esteem" and "self-efficacy" are more cited in transcripts of individuals in the treatment group than those in the control group. Moreover, citations related to the prosocial component—such as more citations for friends and family helping in construction, and more social connections—are more prevalent in treated

individuals.

In sum, qualitative analysis reinforces that the TECHO intervention reduces physical risks, improves sleep, provides better comfort for families, and is associated with relevant incentives for social interactions. Combined, the results suggest that these features of the intervention help beneficiaries cope with threatening physical conditions, increase their sense of self-esteem and efficacy, and promote social ties that ultimately may function as mechanisms to improve psychological health.

## 5 Concluding Remarks

The lack of access to proper housing is a problem afflicting millions of people with far-reaching consequences on health. We study a low-cost, reproducible intervention that mobilizes slum squatters to build higher-quality prefabricated houses. Using an experimental design, we show that the intervention improved subjective well-being. Testing for potential mechanisms that could be driving the results, we find that social interactions and attachment to the community are important factors. Qualitative evidence from in-depth interviews reinforces our quantitative results. These results are of particular interest to policymakers and development practitioners working in low-income urban settings. Housing programs that integrate social cohesion components may help meet both the material and psychosocial needs of marginalized communities.

Our findings have several implications. First, one takeaway from our analysis is that social interactions are relevant for *in situ* improvements and not only for interventions whose primary goal is to relocate families to remote areas. In particular, social cohesion can be an important mechanism to be aware of when designing policies, as this may enhance or block welfare gains. Second, even interventions not considered as of "higher dosage" can have overall positive effects on mental well-being—in our setting, housing units do not have sanitation, lack land tenure, and residents are continuously exposed to community problems (e.g., crime and health hazards). Third, since returns to policy and programs may vary depending on shocks and business cycle moments, it is relevant to study how interventions perform in pressing times—in our case, the outbreak of the COVID-19 pandemic. Last, housing interventions that affect mental health can have longer-term consequences. For instance, adult mental health also influences children's cognitive development (Ridley et al., 2020), so housing interventions can have longer-term welfare impacts and far-reaching consequences by indirectly influencing subsequent human capital accumulation.

## Bibliography


**Adams-Prassl, Abi, Teodora Boneva, Marta Golin, and Christopher Rauh**, "Inequality in the impact of the coronavirus shock: Evidence from real time surveys," *Journal of Public economics*, 2020, *189*, 104245.

**Ajzenman, Nicolás, Tiago Cavalcanti, and Daniel Da Mata**, "More than Words: Leaders' Speech and Risky Behavior during a Pandemic," *American Economic Journal: Economic Policy*, 2023, *15* (3), 351–71.

**Andersen, Asbjørn G., Andreas Kotsadam, and Vincent Somville**, "Material resources and well-being — Evidence from an Ethiopian housing lottery," *Journal of Health Economics*, 2022, *83*, 102619.

**Barari, Soubhik, Stefano Caria, Antonio Davola, Paolo Falco, Thiemo Fetzer, Stefano Fiorin, Lukas Hensel, Andriy Ivchenko, Jon Jachimowicz, Gary King et al.**, "Evaluating COVID-19 public health messaging in Italy: Self-reported compliance and growing mental health concerns," *medRxiv*, 2020.

**Barnhardt, Sharon, Erica Field, and Rohini Pande**, "Moving to opportunity or isolation? Network effects of a randomized housing lottery in urban India," *American Economic Journal: Applied Economics*, 2017, *9* (1), 1–32.

**Baumeister, Roy F and Mark R Leary**, "The need to belong: Desire for interpersonal attachments as a fundamental human motivation.," *Psychological Bulletin*, 1995, *117* (3), 497.

**Berry, Helen Louise, Kathryn Bowen, and Tord Kjellstrom**, "Climate change and mental health: a causal pathways framework," *International journal of public health*, 2010, *55*, 123–132.

**Bessone, Pedro, Gautam Rao, Frank Schilbach, Heather Schofield, and Mattie Toma**, "The Economic Consequences of Increasing Sleep Among the Urban Poor," *The Quarterly Journal of Economics*, 2021, *136* (3), 1887–1941.

**Brotherhood, Luiz, Tiago Cavalcanti, Daniel Da Mata, and Cezar Santos**, "Slums and pandemics," *Journal of Development Economics*, 2022.

**Bueno, Natália S, Felipe Nunes, and Cesar Zucco**, "Making the Bourgeoisie? Values, Voice, and State-Provided Home Ownership," *The Journal of Politics*, 2022, *84* (4), 2064–2079.

**Bueno-Notivol, Juan, Patricia Gracia-García, Beatriz Olaya, Isabel Lasheras, Raúl López-Antón, and Javier Santabárbara**, "Prevalence of depression during the COVID-19 outbreak: A meta-analysis of community-based studies," *International Journal of Clinical and Health Psychology*, 2021, *21* (1), 100196.

**Cavalcanti, Tiago, Daniel Da Mata, and Marcelo Santos**, "On the Determinants of Slum Formation," *The Economic Journal*, 2019, *129* (621), 1971–1991.

**Da Mata, Daniel and Lucas Mation**, "Housing Policies and Social Mobility," Technical Report, Sao Paulo School of Economics-FGV 2024.

**Diener, Ed and Martin EP Seligman**, "Very happy people," *Psychological science*, 2002, *13* (1), 81–84.

**_ , Richard E Lucas, Shigehiro Oishi, Nathan Hall, and M Brent Donnellan**, "Advances and open questions in the science of subjective well-being," *Collabra: Psychology*, 2018, *4* (1).

**_ , Shigehiro Oishi, and Louis Tay**, "Advances in subjective well-being research," *Nature Human Behaviour*, 2018, *2* (4), 253–260.

**_ , Weiting Ng, James Harter, and Raksha Arora**, "Wealth and happiness across the world: material prosperity predicts life evaluation, whereas psychosocial prosperity predicts positive feeling.," *Journal of personality and social psychology*, 2010, *99* (1), 52.

**Evans, G., N. Wells, H. Chan, and H. Saltzman**, "Housing quality and mental health," *Journal of Consulting and Clinical Psychology*, 2000, *68* (3), 526–530.

**Evans, Gary W, Nancy M Wells, and Annie Moch**, "Housing and Mental Health: A Review of the Evidence and a Methodological and Conceptual Critique," *Journal of Social Issues*, 2003, *59* (3), 475–500.

**Field, Erica**, "Property Rights and Investment in Urban Slums," *Journal of the European Economic Association*, 2005, *3* (2-3), 279–290.

_ , "Entitled to Work: Urban Property Rights and Labor Supply in Peru," *Quarterly Journal of Economics*, 2007, *122* (4), 1561 – 1602.

**Folha de São Paulo**, ""Ratos fizeram ninhada debaixo da cama das crianças", diz moradora de favela sem saneamento em SP," 2021.

**Foye, Chris, David Clapham, and Tommaso Gabrieli**, "Home-ownership as a social norm and positional good: Subjective wellbeing evidence from panel data," *Urban Studies*, 2018, *55* (6), 1290–1312.

**Frank, Robert H.**, "Positional Externalities Cause Large and Preventable Welfare Losses," *American Economic Review*, May 2005, *95* (2), 137–141.

**Franklin, Simon**, "The demand for government housing: evidence from a lottery for 200,000 homes in Ethiopia," Mimeo, London School of Economics 2019.

**G1**, "Enchentes deixam desabrigados em duas favelas na zona norte de Ribeirão Preto," 2018.

**Galiani, Sebastian and Ernesto Schargrodsky**, "Property Rights for the Poor: Effects of Land Titling," *Journal of Public Economics*, 2010, *94* (9–10), 700 – 729.

**_ , Paul J Gertler, and Raimundo Undurraga**, "The Half-Life of Happiness: Hedonic Adaptation in the Subjective Well-Being of Poor Slum Dwellers to the Satisfaction of Basic Housing Needs," *Journal of the European Economic Association*, 2018, *16* (4), 1189–1233.

_ , **Paul J. Gertler, and Raimundo Undurraga**, "Aspiration adaptation in resource-constrained environments," *Journal of Urban Economics*, 2021, *123*, 103326.

_ , **Paul J Gertler, Raimundo Undurraga, Ryan Cooper, Sebastián Martínez, and Adam Ross**, "Shelter from the storm: Upgrading housing infrastructure in Latin American slums," *Journal of Urban Economics*, 2017, *98*, 187–213.

**Gee, Brioney, Faith Orchard, Emmet Clarke, Ansu Joy, Tim Clarke, and Shirley Reynolds**, "The effect of non-pharmacological sleep interventions on depression symptoms: a meta-analysis of randomised controlled trials," *Sleep medicine reviews*, 2019, *43*, 118–128.

**Gibbons, Charles E, Juan Carlos Suárez Serrato, and Michael B Urbancic**, "Broken or fixed effects?," *Journal of Econometric Methods*, 2018, *8* (1).

**Harari, Mariaflavia and Maisy Wong**, "Slum Upgrading and Long-run Urban Development: Evidence from Indonesia," Working Paper, University of Pennsylvania 2024.

**Helliwell, John F and Robert D Putnam**, "The social context of well–being," *Philosophical Transactions of the Royal Society of London. Series B: Biological Sciences*, 2004, *359* (1449), 1435–1446.

**Kahneman, Daniel and Angus Deaton**, "High income improves evaluation of life but not emotional well-being," *Proceedings of the national academy of sciences*, 2010, *107* (38), 16489–16493.

**Kling, Jeffrey R, Jeffrey B Liebman, and Lawrence F Katz**, "Experimental analysis of neighborhood effects," *Econometrica*, 2007, *75* (1), 83–119.

**Krieger, James and Donna L Higgins**, "Housing and health: time again for public health action," *American journal of public health*, 2002, *92* (5), 758–768.

**Kumar, Tanu**, *Building Social Mobility: How Subsidized Homeownership Creates Wealth, Dignity, and Voice in India* forthcoming.

**Lin, Winston**, "Agnostic notes on regression adjustments to experimental data: Reexamining Freedman's critique," *Ann. Appl. Stat.*, 03 2013, *7* (1), 295–318.

**Liu, Jingwen, Blesson M Varghese, Alana Hansen, Jianjun Xiang, Ying Zhang, Keith Dear, Michelle Gourley, Timothy Driscoll, Geoffrey Morgan, Anthony Capon et al.**, "Is there an association between hot weather and poor mental health outcomes? A systematic review and meta-analysis," *Environment international*, 2021, *153*, 106533.

**Michaels, Guy, Dzhamilya Nigmatulina, Ferdinand Rauch, Tanner Regan, Neeraj Baruah, and Amanda Dahlstrand**, "Planning Ahead for Better Neighborhoods: Long-Run Evidence from Tanzania," *Journal of Political Economy*, 2021, *129* (7), 2112–2156.

**Patel, Vikram, Shekhar Saxena, Crick Lund, Graham Thornicroft, Florence Baingana, Paul Bolton, Dan Chisholm, Pamela Y Collins, Janice L Cooper, Julian Eaton et al.**, "The Lancet Commission on global mental health and sustainable development," *The lancet*, 2018, *392* (10157), 1553–1598.

**Ridley, Matthew, Gautam Rao, Frank Schilbach, and Vikram Patel**, "Poverty, depression, and anxiety: Causal evidence and mechanisms," *Science*, 2020, *370* (6522), eaay0214.

**Robinson, Eric, Angelina R. Sutin, Michael Daly, and Andrew Jones**, "A systematic review and meta-analysis of longitudinal cohort studies comparing mental health before versus during the COVID-19 pandemic in 2020," *Journal of Affective Disorders*, 2022, *296*, 567–576.

**Rosenzweig, Mark R and Christopher Udry**, "External Validity in a Stochastic World: Evidence from Low-Income Countries," *The Review of Economic Studies*, 2020, *87* (1), 343–381.

**Sandstrom, G. M. and E. W. Dunn**, "Social Interactions and Well-Being: The Surprising Power of Weak Ties," *Personality and Social Psychology Bulletin*, 2014, *40* (7), 910—-922.

**Simonelli, Guido, Yvan Leanza, Alexandra Boilard, Martín Hyland, Jura L. Augustinavicius, Daniel P. Cardinali, Annie Vallières, Daniel Pérez-Chada, and Daniel E. Vigo**, "Sleep and Quality of Life in Urban Poverty: The Effect of a Slum Housing Upgrading Program," *Sleep*, 2013, *36* (11), 1669–1676.

**Singh, Ankur, Lyrian Daniel, Emma Baker, and Rebecca Bentley**, "Housing Disadvantage and Poor Mental Health: A Systematic Review," *American Journal of Preventive Medicine*, 2019, *57* (2), 262–272.

**Tella, Rafael Di, Sebastian Galiani, and Ernesto Schargrodsky**, "The Formation of Beliefs: Evidence from the Allocation of Land Titles to Squatters," *The Quarterly Journal of Economics*, 2007, *122* (1), 209–241.

**Undurraga, Raimundo**, "Housing Externalities in Poor Neighborhoods," Mimeo, Universidad de Chile 2021.

**United Nations**, *UNDESA World Social Report 2020*, United Nations publication, 2020.

**van Dijk, Winnie**, "The socio-economic consequences of housing assistance," Mimeo, University of Chicago 2019.

**Vandekerckhove, Marie and Raymond Cluydts**, "The emotional brain and sleep: an intimate relationship," *Sleep medicine reviews*, 2010, *14* (4), 219–226.

**Wells, Nancy M. and Gary W. Evans**, "Home injuries of people over age 65: risk perceptions of the elderly and of those who design for them," *Journal of environmental psychology*, 1996, *16* (3), 247–257.

_ **and** _ , "Physical stressors. In R. F. Ballesteros (Ed.)," *Encyclopedia of psychological assessment*, 2003.

# Online Appendix to "Housing, Social Cohesion and Well-Being: Evidence from Informal Settlements"

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# A Extra Tables and Figures

**Figure A.1:** Housing units in the comparison and treatment groups

**(a)** Typical dweller's unit

**(b)** Typical TECHO unit

Notes. The pictures show typical housing units in the comparison group (left) and treatment group constructed by TECHO (right). Source: TECHO.

**Figure A.2:** Location of Slum Settlements

Notes. The picture shows the location of the slum settlements where the intervention was conducted. The 24 slum settlements are located in 15 Brazilian municipalities. These municipalties are in the 6 states where TECHO operates in Brazil.

**Table A.1:** Comparison of characteristics of households in our sample with those in other slum settlements in Brazil

| *Variable* | All slum settlements in Brazil | Slum settlements in our sample |
|---|---|---|
| Median monthly *per capita* income (2020 Reais) | 865.40 | 210.00 |
| % of households with a bathroom | 99.0% | 88.5% |
| % of households with access to clean water | 94.2% | 82.8% |
| % of households with a refrigerator | 95.1% | 80% |
| % of households with a TV | 96.7% | 80.5% |

Notes. This table compares characteristics of households in the universe of slum settlements in Brazil with those of the communities targeted in the intervention. Data for the universe of slum settlements comes from the 2010 Brazilian Census (data on *per capita* income, the existence of bathrooms, and access come from the universe of responses, while data on the property of TVs and refrigerators comes from the sample questionnaire). Data for the experimental settlements comes from the baseline survey. The indicator for the percentage of households with access to clean water considers exclusively access within the property (for the Census, we sum those that have access through the general water distribution system and through a water well in the property).

**Table A.2:** Outcomes

| | |
|---|---|
| *Primary Outcome* | **Subjective well-being index, average z-scores of:** |
| | Feel happiness during most of the day? |
| | Feel worried during most of the day? |
| | Feel sad during most of the day? |
| | Feel alone during most of the day? |
| | How was your sleep? |
| | Take any medicine for depression, stress, or anxiety? |
| | Were you more stressed yesterday than normally |
| *Exploratory mechanisms* | **Housing quality index, average z-score of:** |
| | Have you found rats in the last two weeks? |
| | Do you have a sink? |
| | Do you have a toilet or shower? |
| | The toilet you use is just for your family or do you share it? |
| | Do you think your house is better than the ones of your neighbors? |
| | Do you have a TV or fridge? |
| | **Trust index, average z-score of**: |
| | Do you believe in the government's information on what to do about the coronavirus? |
| | Do you believe in the community leaders' information on what to do about the coronavirus? |
| | If you had a major health problem due to coronavirus, how much do you think you could count on your family for help? |
| | If you had a major health problem due to coronavirus, how much do you think you could count on your friends for help? |
| | **Worked last week?** |
| | **Living in the same community?** |

**Table A.3:** Robustness: Adding Unbalanced Controls — Intention to Treat Estimates (Initial Offer)

| | Baseline Model | Lin Model |
|---|---|---|
| Dependent Variable | (1) | (2) |
| Well-being Index | 0.210** | 0.264** |
| | (0.103) | (0.109) |
| **Index Components** | | |
| More Happiness | 0.156 | 0.193* |
| | (0.106) | (0.108) |
| Less Worry | 0.229** | 0.254** |
| | (0.115) | (0.126) |
| Less Sadness | -0.005 | 0.007 |
| | (0.107) | (0.106) |
| Less Loneliness | 0.117 | 0.158 |
| | (0.110) | (0.113) |
| More Sleep Quality | 0.061 | 0.096 |
| | (0.113) | (0.143) |
| Less Depression Medication | 0.211** | 0.223*** |
| | (0.089) | (0.082) |
| Less Stress | 0.159 | 0.237** |
| | (0.107) | (0.094) |
| Fixed Effects | Yes | Yes |
| Pre-treatment Controls | Yes | Yes |
| Number of Obs. | 369 | 369 |
| Number of Blocks | 25 | 25 |

Notes. Reported results: estimated coefficients and robust standard errors (in parentheses). All specifications include pre-treatment control variables for gender, race, community leader visit, claim-making to the leader, location of previous home, and infrastructure problems. Models (1) is based on Equation (1). Model (2) is based on Equation (2). ***p<0.01, **p<0.05, *p<0.1.

**Table A.4:** Robustness: Alternative Models — Intention to Treat Estimates (Initial Offer)

| | IWE Model | | RWE Model | |
|---|---|---|---|---|
| Dependent Variable | (1) | (2) | (3) | (4) |
| Well-being Index | 0.258*** | 0.237** | 0.263** | 0.237** |
| | (0.098) | (0.099) | (0.104) | (0.106) |
| **Index Components** | | | | |
| More Happiness | 0.155 | 0.140 | 0.156 | 0.141 |
| | (0.104) | (0.106) | (0.108) | (0.112) |
| Less Worry | 0.289*** | 0.266** | 0.294** | 0.268** |
| | (0.110) | (0.112) | (0.115) | (0.115) |
| Less Sadness | 0.005 | 0.010 | 0.007 | 0.019 |
| | (0.099) | (0.102) | (0.112) | (0.115) |
| Less Loneliness | 0.169* | 0.165 | 0.173 | 0.160 |
| | (0.101) | (0.103) | (0.109) | (0.112) |
| More Sleep Quality | 0.113 | 0.072 | 0.119 | 0.068 |
| | (0.109) | (0.109) | (0.114) | (0.114) |
| Less Depression Medication | 0.209*** | 0.195** | 0.215** | 0.191** |
| | (0.081) | (0.082) | (0.084) | (0.083) |
| Less Stress | 0.198** | 0.199** | 0.198** | 0.198* |
| | (0.092) | (0.096) | (0.099) | (0.102) |
| Fixed Effects | Yes | Yes | Yes | Yes |
| Pre-treatment Controls | No | Yes | No | Yes |
| Number of Obs. | 369 | 369 | 369 | 369 |
| Number of Blocks | 25 | 25 | 25 | 25 |

Notes. Reported results: estimated coefficients and robust standard errors (in parentheses). Specifications (2) and (4) include pre-treatment control variables for community leader visit, quality of the house roof, and household index for respiratory diseases. Models (1) through (4) are based on Gibbons et al. (2018). ***p<0.01, **p<0.05, *p<0.1.

**Table A.5:** Robustness: Dropping communities "Piquete" and "Terra Nossa" - Intention to Treat Estimates (Initial Offer)

| | Baseline Model | | Lin Model | |
|---|---|---|---|---|
| Dependent Variable | (1) | (2) | (3) | (4) |
| Well-being Index | 0.187* | 0.172 | 0.233** | 0.199* |
| | (0.108) | (0.111) | (0.111) | (0.112) |
| **Index Components** | | | | |
| More Happiness | 0.145 | 0.128 | 0.163 | 0.144 |
| | (0.111) | (0.116) | (0.121) | (0.119) |
| Less Worry | 0.226* | 0.202* | 0.260** | 0.205 |
| | (0.118) | (0.120) | (0.126) | (0.126) |
| Less Sadness | -0.003 | -0.001 | 0.017 | 0.023 |
| | (0.109) | (0.113) | (0.100) | (0.102) |
| Less Loneliness | 0.095 | 0.095 | 0.142 | 0.139 |
| | (0.117) | (0.119) | (0.116) | (0.119) |
| More Sleep Quality | 0.050 | 0.015 | 0.076 | 0.038 |
| | (0.113) | (0.114) | (0.126) | (0.128) |
| Less Depression Medication | 0.194** | 0.199** | 0.205** | 0.183** |
| | (0.095) | (0.098) | (0.088) | (0.091) |
| Less Stress | 0.118 | 0.120 | 0.165 | 0.148 |
| | (0.111) | (0.117) | (0.101) | (0.108) |
| Fixed Effects | Yes | Yes | Yes | Yes |
| Pre-treatment Controls | No | Yes | No | Yes |
| Number of Obs. | 337 | 337 | 337 | 337 |
| Number of Blocks | 23 | 23 | 23 | 23 |

Notes. Reported results: estimated coefficients and robust standard errors (in parentheses). Specifications (2) and (4) include pre-treatment control variables for community leader visit, quality of the house roof, and household index for respiratory diseases. Pre-registered models (1) and (2) are based on Equation (1). Pre-registered models (3) and (4) include interactions and are based on Equation (2). ***p<0.01, **p<0.05, *p<0.1.

**Table A.6:** Intention to Treat Estimates (Initial Offer) - Trust Index

| | Baseline Model | | Lin Model | |
|---|---|---|---|---|
| Dependent Variable | (1) | (2) | (3) | (4) |
| Trust Index | 0.125** | 0.120** | 0.124** | 0.110* |
| | (0.056) | (0.057) | (0.058) | (0.059) |
| **Index Components** | | | | |
| Trust: Friends | 0.154*** | 0.146*** | 0.142** | 0.130** |
| | (0.054) | (0.055) | (0.058) | (0.057) |
| Trust: Family | 0.014 | 0.012 | 0.034 | 0.022 |
| | (0.048) | (0.049) | (0.045) | (0.046) |
| Trust: Church members | 0.164*** | 0.165*** | 0.161*** | 0.164*** |
| | (0.052) | (0.053) | (0.054) | (0.054) |
| Trust: Community neighbors | 0.011 | 0.008 | 0.010 | 0.003 |
| | (0.050) | (0.051) | (0.056) | (0.058) |
| Trust: Government agents | -0.049 | -0.048 | -0.036 | -0.038 |
| | (0.049) | (0.050) | (0.048) | (0.049) |
| Trust: Community leaders | 0.044 | 0.035 | 0.035 | 0.019 |
| | (0.054) | (0.055) | (0.054) | (0.056) |
| Trust: Government information | 0.059 | 0.079 | 0.058 | 0.059 |
| | (0.110) | (0.113) | (0.115) | (0.116) |
| Trust: Community Leaders information | 0.243** | 0.226** | 0.214** | 0.206** |
| | (0.111) | (0.112) | (0.096) | (0.098) |
| Fixed Effects | Yes | Yes | Yes | Yes |
| Pre-treatment Controls | No | Yes | No | Yes |
| Number of Obs. | 369 | 369 | 369 | 369 |
| Number of Blocks | 25 | 25 | 25 | 25 |

Notes. Reported results: estimated coefficients and robust standard errors (in parentheses). Specifications (2) and (4) include pre-treatment control variables for community leader visit, quality of the house roof, and household index for respiratory diseases. Pre-registered models (1) and (2) are based on Equation (1). Pre-registered models (3) and (4) include interactions and are based on Equation (2). ***p<0.01, **p<0.05, *p<0.1.

**Table A.7:** Hedonic Adaptation - Main effect and Trust Channel

| | Subj. Well-being Index | | Trust Index | |
|---|---|---|---|---|
| | (1) | (2) | (3) | (4) |
| Regression terms | Baseline model | Lin model | Baseline model | Lin model |
| Treatment | 0.023 (0.877) | 0.22 (0.04) | 0.05 (0.574) | 0.147 (0.034) |
| Treatment x Phase I | 0.312 (0.136) | -0.701 (0.507) | 0.231 (0.074) | -0.149 (0.794) |
| Fixed Effects | Yes | Yes | Yes | Yes |
| Pre-treatment Controls | Yes | Yes | Yes | Yes |
| Number of Obs. | 369 | 369 | 369 | 369 |
| Number of Blocks | 25 | 25 | 25 | 25 |

Notes. Reported results: estimated coefficients and p-values (in parentheses). Outcomes include the Subjective Well-being Index and the Trust Index (channel for the effect on well-being). All specifications include pre-treatment control variables for community leader visit, quality of the house roof, and household index for respiratory diseases. Models (1) and (3) are based on Equation (1) with an interaction term as follows: $y_{ij} = \alpha + \rho Treat_{ij} + \theta PhaseI_{ij} + \lambda Treat_{ij} \times PhaseI_{ij} + \beta X_{ij} + \gamma_j + \varepsilon_{ij}$. The coefficient of interest is $\lambda$, $Treat_{ij}$ indicates treatment, and $PhaseI_{ij}$ indicates longer exposure to treatment. Models (2) and (4) are based on Equation (2) with an interaction term as follows: $y_{ij} = \alpha + \rho Treat_{ij} + \theta PhaseI_{ij} + \lambda Treat_{ij} \times PhaseI_{ij} + \phi Treat_{ij} \times \bar{\gamma_j} + \delta Treat_{ij} \times (X_{ij} - \bar{X}) + \beta X_{ij} + \gamma_j + \varepsilon_{ij}$. The coefficient of interest is $\lambda$, $Treat_{ij}$ indicates treatment, and $PhaseI_{ij}$ indicates longer exposure to treatment.

**Table A.8:** Local Average Treatment Effect - Trust Index and Channels

| Dependent Variable | (1) | (2) |
|---|---|---|
| Well-being Index | 0.594* | 0.641* |
| | (0.323) | (0.326) |
| **Channels** | | |
| Housing Index | 0.307 | 0.381 |
| | (0.301) | (0.317) |
| Sleep quality (Subjective Well-being Component) | 0.216 | 0.187 |
| | (0.328) | (0.347) |
| Worked Last Week? | 0.175 | 0.169 |
| | (0.209) | (0.205) |
| Living in the same community? | 0.399 | 0.396 |
| | (0.334) | (0.339) |
| Trust Index | 0.378** | 0.350* |
| | (0.178) | (0.184) |
| Fixed Effects | Yes | Yes |
| Pre-treatment Controls | No | Yes |
| Number of Obs. | 369 | 369 |
| Number of Blocks | 25 | 25 |

Notes. Reported results: estimated coefficients and robust standard errors (in parentheses). ***p<0.01, **p<0.05, *p<0.1.

# B Pre-Analysis Plan and More Details on the Sample and Randomization

## B.1 Sample and Randomization

We build our sample by aggregating waitlists from lotteries of different construction moments and places. Most communities received only one construction task force during the research period (from March 2019 to February 2020), that is, only one lottery. However, in some communities, TECHO decided to build houses twice, leaving room for a second lottery after a couple of months. As we should not prevent losers from the first lottery from taking part in the second, we pooled them in the new lottery with dwellers that had recently moved to the settlement. Consequently, some households were more likely to be treated within the same community. If we pool all households of two different lotteries within a given community, we would wrongly attribute them equal weights. We circumvent this issue using a *community-lottery* unit of analysis. In other words, we duplicate households (or individuals) that appear in two different lotteries and use fixed effects not at the slum settlement level but at the slum settlement-lottery level. Communities in which TECHO performed two lotteries appear twice in our data set as if they were distinct communities.

Although lotteries went on well and TECHO's volunteers succeeded in delivering houses according to the waitlist, there was some non-compliance with the treatment. One reason for the non-compliance was the fact that the land plot often did not fit TECHO's house, or the terrain was steep. Other examples of non-compliance include individuals in discordance with the program's rules, families moving out of the community or giving up on receiving the intervention, and people going to jail and dying. Volunteers guaranteed that the waitlist was respected.

We used the results from an audited national Brazilian lottery to randomize our waitlists. The randomization worked as follows. First, we would receive the list of eligible families from TECHO and assign random ticket numbers to each family. We sorted the tickets and used the audited national lottery number as a cutoff point from where we started delivering the housing units. All but two lotteries happened according to plan. In "Terra Nossa" and "Piquete", we had repeated members of the same household running for the lottery, which accidentally gave them a greater chance of being assigned to treatment. Our full sample analysis includes these two lotteries, but we dropped the two communities mentioned above in a robustness check.

### B.2 Pre-Analysis Plan

This section explains the deviations from the Pre-Analysis Plan (PAP). The PAP was posted at EGAP registry in May 2020 (EGAP Registry ID 20200521AA). This paper's PAP can be accessed using the following link.

Our main analyses follow the pre-analysis plan's specification and our main outcome (emotional well-being) follows our pre-analysis plan's specifications.

For the sake of clarity, it is important to note that we investigate one of the five hypotheses listed in the pre-analysis plan. The pre-analysis plan contained five hypotheses (listed below) and we expect to explore these hypotheses in other studies. In this study, we examine hypothesis 2. While the language in the hypothesis does not refer to the emotional well-being, we operationalize it in the pre-analysis plan using the emotional well-being index.

Hypothesis 1: Better housing quality facilitates preventive behavioral changes.

Hypothesis 2: Better housing quality alleviates the pressure of being locked down in the housing unit.

Hypothesis 3: Beneficiaries may have more skills in claim-making in periods of crisis.

Hypothesis 4: Squatters who mobilized their neighbors in the process of building their own home (with TECHO's support) will have higher levels of solidarity towards neighbors and members of the community.

Hypothesis 5: Trust in the community may dampen trust in the government.

Finally, the pre-analysis plan contained a discussion of exploratory mechanisms related to housing quality. We included a discussion of a few of the listed outcomes since it speaks directly to the findings related to emotional well-being.

# C Qualitative Analysis: Coding

The codes were decided in an inductive process based on their relative importance throughout the interviews. While reading the first ten transcripts, we paid extra attention to the main topics raised by the interviewees and tried to create new codes that were not necessarily related to previous literature. We then ceased creating inductive codes and revised the initial ten interviews. Conversely, part of the codes was previously determined by concepts from the literature. Since the beginning of the coding process, we had them in mind, and every time they appeared, we would highlight them in the transcripts. We created two groups of codes. The first refers to concepts directly linked to psychological well-being. The second group refers to social constructs that are indirectly related to mental health and which were asked in a separate part of the qualitative interviews.

The list of Well-being codes is the following:

- Shelter (inductive)
- Safety (literature)
- Comfort (inductive)
- Infestation (inductive)
- Visits (inductive)
- Dignity (literature)
- Status (literature)
- Self-esteem (literature)
- Self-efficacy (literature)
- Life control (literature)
- Tranquility (inductive)
- Land tenure (literature)
- Property sense (literature)
- Bad sleep (literature)
- Good sleep (literature)
- Robbery/violence (inductive)

The list of socialization codes is the following:

- Community engagement (literature)
- Positive leadership (inductive)
- Negative leadership (inductive)

- Neighbors social connection (inductive)
- No social connection (inductive)
- Neighbors autoconstuction (inductive)
- Family autoconstuction (inductive)

A brief description of the rationale of each code is as follows:

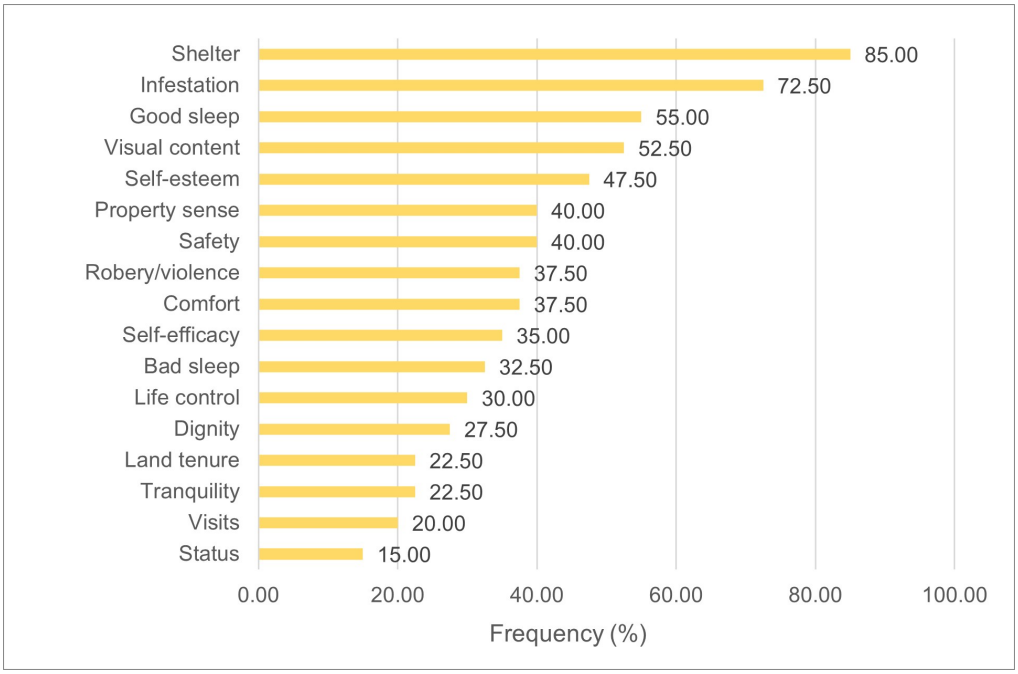
- Shelter: this code relates to how the physical structure of TECHO's housing unit is better than the other shacks in Brazilian slums. Almost all interviewees (treatment and control) recognize that the house provides a much better shelter, especially regarding exposure to bad weather conditions. Hence, this code captures the views about protection against storms, intense wind, floods, cold, heat, etc.
- Safety: feelings of protection and safety that are connected to the housing unit. Safety can refer to protection from bad weather or urban violence (robbery, for example). Sometimes it is unclear which type of safety the interviewee refers to, so we kept this generic code in the list.
- Comfort: the extent to which people feel their home is comfortable and cozy. A place where they like to stay.
- Visual content: how TECHO's housing unit looks like. Usually, this is a positive evaluation.
- Infestation: exposure to insects, snakes, rats, and the extent to which TECHO prevents infestation from these animals.
- Visits: being able to receive visits from friends and family at home.
- Dignity: how poor housing conditions can be viewed as a lack of dignity, often associated with the shame of being in extreme poverty. In other words, a sense of humiliation.
- Status: how housing can be a symbol of status within slum communities. This is a notion of social position frequently related to leaving extreme poverty. The extent to which one evaluates how other people view him/her.
- Self-esteem: how you feel about yourself. The extent to which people like and value themselves. The way housing can impact this assessment.
- Self-efficacy: feeling capable of evolving and improving.
- Life control: the extent to which people feel they can control their lives. In the context of the present study, how people find life burdensome and deal with challenges.
- Tranquility: feelings of serenity, calmness, and lack of worry or stress.

- Land tenure: having the land title, land ownership. In the context of the present study, security against eviction.
- Property sense: the extent to which interviewees value not paying rent and having their own place to stay (property of the house). Not necessarily related to land tenure.
- Bad sleep: not sleeping well at night.
- Good sleep: being able to sleep well at night.
- Robbery/violence: specific threats to one's physical well-being or to property values. How the house may protect against crimes.
- Community engagement: the extent to which residents get involved in community activities related to social mobilization (e.g., attend community board meetings, help distribute aid, help construct infrastructure, engage in solidarity networks).
- Positive leadership: positive assessments of how participants evaluate the work of community leaders.
- Negative leadership: negative assessments of how participants evaluate the work of community leaders.
- Neighbors social connection: the extent to which participants create new social connections with neighbors and strengthen previous connections.
- No social connection: lack of social ties with neighbors
- Neighbors autoconstruction: the extent to which neighbors helped interviewees construct their homes.
- Family autoconstruction: the extent to which family members helped interviewees construct their homes.

Having decided on the main components that could explain the relationship between the intervention and subjective well-being, we now turn to evaluate how codes might be interconnected. The goal is to identify possible pathways through which causal chains operate.

Figure C.1 presents the percentage of citations that each code appears in the total number of interviews (for the Well-being codes). Codes are ranked from the most cited to the less cited. It does not matter how many times each code was cited in a given document; what matters is the number of interviews in which it appears. For example, "Shelter" was cited in 85% of the documents, making this code the most salient. "Infestation" comes next with 72.5% citation. These two codes are far ahead when compared to the others. These results suggest that the housing unit represents a material improvement, with impacts on protection from weather and animal infestations.

**Figure C.1:** Codes: Frequency in Interviews - universe of interviews



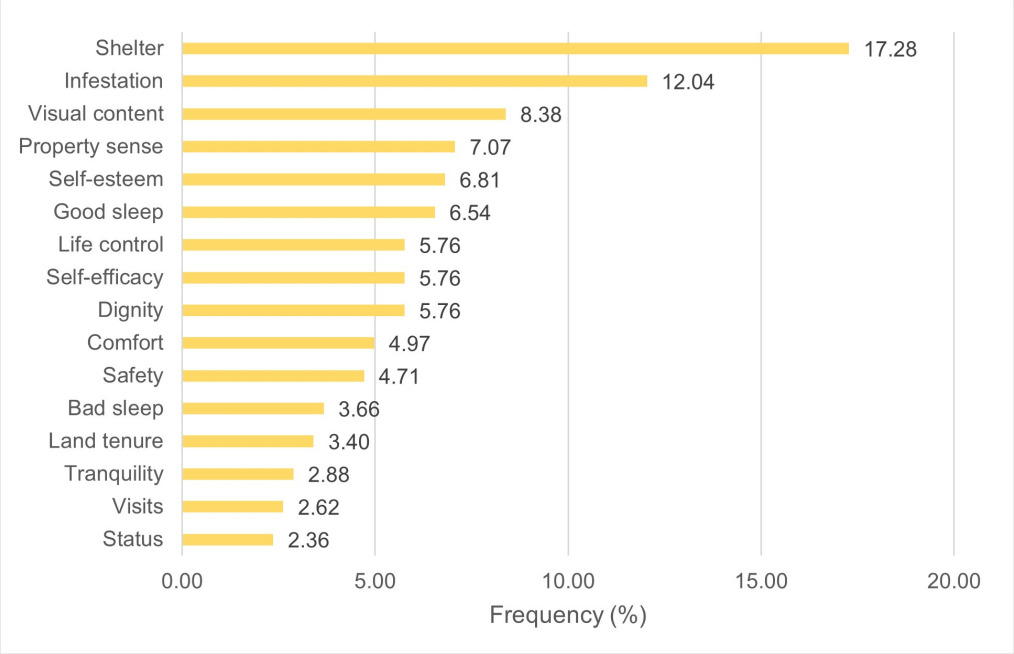

Notes. The picture shows the frequency at which each code appears in the 42 interviews.

"Visual content," "Good sleep," and "Self-esteem" represent the second group of codes that appear as most relevant. Nearly half of the cases cite them during the interviews. At least conceptually, sleep quality should be more correlated with stress, tiredness, and productivity than with how people think of themselves. The remaining codes in Figure C.1 vary from being cited by nearly a third and a fourth of the sample. Although some of them are less cited, it does not mean they are irrelevant. Take the case of the last two codes: "visits" and "status" may not appear much, but they may be essential to better explain some of the mechanisms we aim to understand in the analysis. C.2 shows similar patterns but now considering the universe of text fragments that were coded in all the interview documents.

Figure C.3 shows the text proximity between frequencies of each code. The measure of text proximity is the following: if a code is less than one paragraph apart from another in a given transcript, then both are considered proximate. They receive frequency one each time they are proximate. Several patterns in Figure C.3 are salient. "Shelter" seems to be the code with more correlates. It is intensely co-cited with "infestation," "bad sleep," and "safety." If the housing unit represents a substantial quality improvement, it should alleviate the risk of storm hazards and animal invasion inside the house.

The second cluster of correlates can be viewed in the middle of Figure C.3. "Visits," "dignity," "status," "self-esteem," and "self-efficacy" all have high levels of co-citation relative to others. One possibility is that all these categories represent how residents

**Figure C.2:** Codes: Frequency in Interviews - universe of code fragments



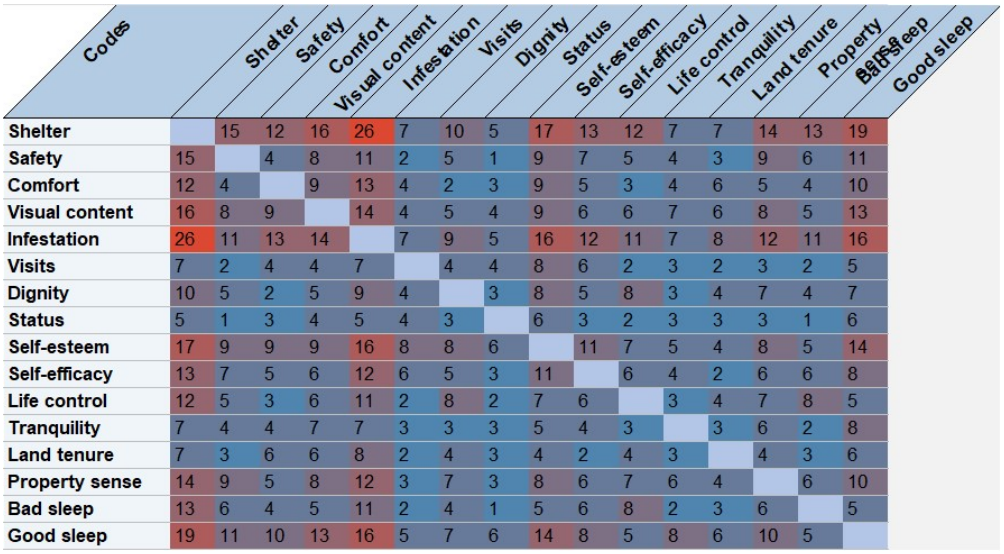

Notes. The picture shows the frequency at which each code appears relative to the sum of all fragments coded.

rationalize their position within society. For example, if housing works as a cue of the minimum standards of life quality, residents can look at their situation and think of how they are positioned in terms of poverty. Thus, self-esteem and self-efficacy may be how people see themselves compared to social norms of dignity and status.

Figure C.4 shows a heat measure of how many citations for each type of interviewee. "Self-esteem" and "self-efficacy" are more cited in treatment transcripts than controls. To a lesser extent, "Dignity," "status," "visits," "sleep quality," and "comfort" also seem to be more salient among treated individuals. By contrast, "Shelter" and "Infestation" are cited irrespective of treatment assignment status but slightly skewed toward treatment. This is because individuals recognize that not having proper protection from weather conditions and animal invasion are negative. Figure C.5 shows that citations related to the prosocial component—such as more citations for friends and family helping in construction, and more social connections—are more prevalent in treated individuals.

No social connection

**Figure C.3:** Codes: Proximity Analysis




| | Shelter | Safety | Comfort | Visual content | Infestation | Visits | Dignity | Status | Self-esteem | Self-efficacy | Life control | Tranquility | Land tenure | Property sense | Bad sleep | Good sleep |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Shelter | | 15 | 12 | 16 | 26 | 7 | 10 | 5 | 17 | 13 | 12 | 7 | 7 | 14 | 13 | 19 |
| Safety | 15 | | 4 | 8 | 11 | 2 | 5 | 1 | 9 | 7 | 5 | 4 | 3 | 9 | 6 | 11 |
| Comfort | 12 | 4 | | 9 | 13 | 4 | 2 | 3 | 9 | 5 | 3 | 4 | 6 | 5 | 4 | 10 |
| Visual content | 16 | 8 | 9 | | 14 | 4 | 5 | 4 | 9 | 6 | 6 | 7 | 6 | 8 | 5 | 13 |
| Infestation | 26 | 11 | 13 | 14 | | 7 | 9 | 5 | 16 | 12 | 11 | 7 | 8 | 12 | 11 | 16 |
| Visits | 7 | 2 | 4 | 4 | 7 | | 4 | 4 | 8 | 6 | 2 | 3 | 2 | 3 | 2 | 5 |
| Dignity | 10 | 5 | 2 | 5 | 9 | 4 | | 3 | 8 | 5 | 8 | 3 | 4 | 7 | 4 | 7 |
| Status | 5 | 1 | 3 | 4 | 5 | 4 | 3 | | 6 | 3 | 2 | 3 | 3 | 3 | 1 | 6 |
| Self-esteem | 17 | 9 | 9 | 9 | 16 | 8 | 8 | 6 | | 11 | 7 | 5 | 4 | 8 | 5 | 14 |
| Self-efficacy | 13 | 7 | 5 | 6 | 12 | 6 | 5 | 3 | 11 | | 6 | 4 | 2 | 6 | 6 | 8 |
| Life control | 12 | 5 | 3 | 6 | 11 | 2 | 8 | 2 | 7 | 6 | | 3 | 4 | 7 | 8 | 5 |
| Tranquility | 7 | 4 | 4 | 7 | 7 | 3 | 3 | 3 | 5 | 4 | 3 | | 3 | 6 | 2 | 8 |
| Land tenure | 7 | 3 | 6 | 6 | 8 | 2 | 4 | 3 | 4 | 2 | 4 | 3 | | 4 | 3 | 6 |
| Property sense | 14 | 9 | 5 | 8 | 12 | 3 | 7 | 3 | 8 | 6 | 7 | 6 | 4 | | 6 | 10 |
| Bad sleep | 13 | 6 | 4 | 5 | 11 | 2 | 4 | 1 | 5 | 6 | 8 | 2 | 3 | 6 | | 5 |
| Good sleep | 19 | 11 | 10 | 13 | 16 | 5 | 7 | 6 | 14 | 8 | 5 | 8 | 6 | 10 | 5 | |

Notes. The picture shows a heat frequency of codes that are located less than one paragraph distance. Red color means higher frequency.

**Figure C.4:** Codes: Frequency per Treatment Status

| Qualitative codes | Treatment | Control |
|---|---|---|
| Shelter | 20 | 14 |
| Safety | 10 | 6 |
| Comfort | 9 | 6 |
| Visual content | 10 | 11 |
| Infestation | 18 | 11 |
| Visits | 7 | 1 |
| Dignity | 8 | 3 |
| Status | 6 | 0 |
| Self-esteem | 18 | 1 |
| Self-efficacy | 11 | 3 |
| Life control | 7 | 5 |
| Tranquility | 6 | 3 |
| Land tenure | 4 | 5 |
| Property sense | 8 | 8 |
| Bad sleep | 5 | 8 |
| Good sleep | 16 | 6 |

Notes. The picture shows the frequency at which each code appears during the interviews per treatment status.

**Figure C.5:** Codes: Frequency per Treatment Status (Prosocial component)

| Social Codes | Treatment | Control |
|---|---|---|
| Neighbors autoconstruction | 9 | 0 |
| Family autoconstruction | 9 | 2 |
| Negative leadership | 4 | 7 |
| Positive leadership | 14 | 12 |
| Neighbors social connection | 8 | 10 |
| No social connection | 3 | 7 |
| Community engagement | 9 | 7 |

Notes. The picture shows the frequency at which each social code appears per treatment status.