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Improved cookstoves (ICS) have been distributed by many in the international development community to address the dangers faced by billions of people worldwide who use traditional open-fire cooking methods. Yet, impact evaluations of these ICS interventions have not always shown positive impacts. This case study followed the ICS adoption study being conducted by non-governmental organization in two communities of rural Guatemala. The intent of this case study was to incorporate qualitative methods to improve the understanding of the ICS intervention. Theoretical concepts of social space and the habitus were used to explore social dynamics of the target populations and the research team. Data was collected from household surveys and observation and semi-structured interviews in the two communities. Qualitative methods revealed how the higher social classification of individuals conducting the research often resulted in underserved positive feedback from community members, even when the donated ICS was not serving them well. This suggests a need to recognize social class dynamics in international development and improve our understanding of this phenomenon with future research. Several policy recommendations arose from this case study: to reduce the impact of the imbalance of power between the study participants and research team, to design impact evaluation studies to closely resemble the ICS implementation strategy used in the real-world setting, to increase focus on the market-driven model of cookstove promotion, and to encourage assessment of community needs in collaboration with community members.

Impact Evaluation in the Field:
A Case Study on the Evaluation of an Improved Cookstove Initiative in Rural Guatemala

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I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my thesis to any reader upon request.

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1. Introduction

An estimated 767 million people, or approximately 10 percent of the global population live in extreme poverty as defined by the World Bank (2016). There are millions more whose economic situation is only slightly better. These figures serve as an indication that inequality remains a global condition. Individuals in extreme poverty face conditions that many in the developed world are unable to imagine, generally with lower access to education, health services, environmental protections and work opportunities, to name a few. According to academic literature and political discussion, society largely agrees that severe poverty should be addressed, however what to do, who should do it, and how to design interventions remain debated.

The international humanitarian and development community has long been concerned with those individuals living in poverty who rely on traditional open-fire cooking methods. A large proportion of these individuals live in rural areas. The exposure to indoor air pollution from traditional cooking fires, such as three stone fires or U-shaped clay structures, has been proven to be of significant health concern, equivalent to smoking two packs of cigarettes a day (Differ group, 2012). Approximately 2.85 billion people worldwide rely on solid fuels for cooking, and more than two-thirds of these people use traditional, unimproved cooking stoves (Energy Sector Management Assistance Program, 2015). Secondary concerns commonly associated with reliance on traditional biomass fuels include contribution to deforestation and climate change and the burden of firewood collection which in some settings falls largely on women and children (Differ group, 2012). Addressing these concerns is clearly a priority for many in the development community, as a recent World Bank report states that, "improving access to affordable and reliable energy services for cooking is essential for developing countries in reducing adverse human health and environmental impacts hitherto caused by burning traditional biomass (Malla

& Timilsina, 2014, p. 1).” For decades, significant time and research has been devoted to design and distribution of alternatives to traditional open-fire cooking. Commonly, these alternatives are some form of improved cookstove (ICS) which offer improvements in fuel efficiency and emissions compared to traditional stoves. Due to the variety of concerns associated with traditional cooking, ICS are often expected to provide a trifecta of benefits: household health and time savings, reduction in local deforestation, and reduced impacts on climate (Pattanayak et al., 2016).

ICS initiatives have reached popular news headlines thanks to public supporters such as Julia Roberts. Hillary Clinton is also a well-known proponent of improved cookstoves (ICS), most notably for her role in the creation of the Global Alliance for Clean Cookstoves in 2010 (Dehejia, 2012). A public-private partnership hosted by the United Nations Foundation, the Alliance is working on a goal of providing 100 million households “access to clean and efficient cookstoves and fuels by 2020 (Global Alliance for Clean Cookstoves, 2016).” According to the Alliance, this goal directly supports their mission to “save lives, improve livelihoods, empower women, and protect the environment.” They describe the use of open and traditional fires as one of the world’s most pressing health and environmental problems. The Alliance and its hundreds of international partners are working to create a market for clean cooking solutions through increasing demand for clean stoves and fuels and strengthening the supply chain to be able to react to this demand (Global Alliance for Clean Cookstoves, 2016).

StoveTeam International is a partner organization of the Global Alliance based out of Eugene, Oregon. It operates on a model which helps local entrepreneurs start up and maintain factories to produce ICS locally in Latin America (StoveTeam International, 2016). This model is in line with a shift in the clean cookstove industry; where once the industry predominantly

existed as part of humanitarian and development aid, it lately has moved more towards becoming increasingly commercialized and concerned with local markets (Differ group, 2012). As StoveTeam International is a non-governmental organization (NGO) funded through charity donations and grants, they have a need to provide reports of their impact to satisfy concerns of donor organizations and encourage additional support. To respond to this need, in 2016 StoveTeam was working with a Guatemalan factory that they support to conduct an adoption study on two of the ICS models produced by the factory.

In this paper, I will present findings from a case study which was conducted on two separate research trips to the adoption study site in rural Guatemala. The first visit was in June 2016 before the ICS were distributed, and the second was after most ICS had been distributed, in September 2016. Data was collected through participant observation as a volunteer assisting with the adoption study, household surveys and observation, and qualitative interviews conducted with study participants. First, I will summarize relevant literature to illustrate the importance of this study and justify methodological design. Next, I will present the theoretical background and describe the research questions of the case study. Then, the findings of the research and discussion of implications will lead to the policy recommendations that arise from this work. The conclusions highlight insights obtained from this case study for organizations such as StoveTeam International and for the international development community as a whole.

Evaluating the effectiveness of ICS interventions is important because the livelihoods of individuals who are reliant on traditional cooking methods are hanging in the balance. If ICS interventions are successful in reaching the range of benefits associated with them, this would signal that more time and resources should be devoted to the ICS industry. However, if they are

unsuccessful in the field, those resources should be redirected elsewhere to find meaningful

solutions that do promote equality and development.

2. Study background

Prior to my involvement in the project, StoveTeam had identified households reliant on traditional open fire cooking methods in two rural communities of southern Guatemala, San Ramón and Las Brisas. Households in the communities would receive an ICS, and StoveTeam would track usage of the ICS and their traditional stoves in homes over several months. They started with a baseline household survey to identify households and collect household data. To be eligible, households needed to be occupied the majority of the year, in order to ensure they could participate throughout the length of the study. They identified 43 households in the community of Las Brisas and 38 in the community of San Ramón that were willing and eligible to complete the stove adoption study. StoveTeam and the stove factory had independently designed their adoption study and coordinated with appropriate local authorities for permission to conduct the study and what activities it could entail.

The first step for the adoption study was to place temperature sensors, known as SUMS monitors, on the household's current cooking fire to establish baseline data on the traditional fire usage. Since most of these households had temporary, traditional open-fire cooking spaces and thus no solid structure upon which to adhere the sensor, the sensor was taped onto a small brick which was then placed about a foot from the traditional fire. These sensors were left to collect data for several months in the homes prior to the family receiving a donated stove.

The Guatemalan stove factory produces a variety of stove models to fit different households. For this particular project, StoveTeam was interested in evaluating the adoption and desirability of two stove models, known as the Ecocina and Ecoplancha (Figure 1). They made the decision to donate the smaller Ecocina stove to the 38 households in San Ramón and the larger Ecoplancha stove to the 43 households in Las Brisas due to logistical constraints and the

cost of delivering the larger stove model to the more remote community of San Ramón. The Ecocina stove is a small rocket-model stove providing one cooking surface, where the cook can place a moderately large pot or use the included *comal*, a large disc-shaped surface used for preparing tortillas. The Ecocina does not provide a chimney or other escape for produced smoke, but it has been lab tested to require significantly less wood than a traditional fire, thus reducing the cook's exposure to smoke and the amount of firewood needed. The Ecoplancha model is significantly larger and includes a large flat *plancha* surface made of a thick metal. While there is still only one combustion chamber for inserting firewood, there are three different available openings in the *plancha* for placing pots. The first pot receives direct heat above the combustion chamber while the other two still receive significant heat from the passage of smoke and hot air below them before it exits through a chimney at the back of the stove. The plancha surface itself can be used for preparing corn tortillas, an important staple in the local diet.

Figure 1: Ecoplancha stove model (left) and smaller Ecocina model (right).

After obtaining several months of baseline data on the traditional open-fires, stoves were to be delivered to the households in the study with transportation assistance from the local municipality. While StoveTeam had attempted to coordinate the timing of stove deliveries to align with the needs of the study, unfortunately the municipality did not maintain the schedule. The Ecocina stoves were delivered to San Ramón in July 2016, so that all households had received their stoves between my first and second field visits. However, delivery of the Ecoplancha model to Las Brisas was staggered. About half the households had received their stoves by the time I visited in September.

StoveTeam international has published the results of their adoption study obtained from the SUMS temperature sensor data (Laughlin & Garland, 2017). Key findings of this report are reduced usage of the traditional open fire in by 70-80 percent in San Ramon and 56-60 percent in Las Brisas. About half of the households report continued use of their traditional stove to some degree. These findings represent a meaningful improvement to the reliance on open-fire cooking in these communities. The findings presented in this case study reflect on the process of the adoption study and observed behaviors of the community members to recognize ways in which implementation and evaluation may be improved, and to draw generalizable conclusions about the process of working in the developing context for the broader international development community.

3. Literature review

3.1   Improved cookstove literature

The variety of concerns associated with reliance on traditional biomass cooking methods are widely accepted as detrimental. However, there is debate in the literature as to whether ICS specific interventions by international aid or charity organizations are the optimum solution for addressing these concerns. It is well understood that households with higher education and income levels in developing regions are far less likely to rely on traditional biofuels, therefore this problem could be remedied indirectly with other forms of development. Yet as many organizations continue to support ICS initiatives, it is pertinent to review the academic literature that has measured the effectiveness of ICS interventions in developing countries over the last several years.

There have been several predominant randomized control trials (RCTs) on ICS interventions which provide somewhat limited evidence to the success of the programs they evaluate. Perhaps the most respected study in the development economics literature, due to its experimental design, is an RCT conducted in rural India by Hanna, Duflo, and Greenstone (2016). Titled "Up in Smoke: The influence of household behavior on the long-run impact of improved cooking stoves," this study has been referred to an "empirical knock-out punch (Matt, 2012)" because many members of the international development community consider it to provide convincing evidence that the ICS intervention was unsuccessful. The intervention did not result in positive health or environmental outcomes. This study reflected on the usage and health outcomes of distribution of an ICS to 2,600 households, making it one of the largest RCTs on the topic, and is rather unique from other studies in that it tracked outcomes for four years

after stove distribution. Overall, the researchers found that stove usage among the treatment group who received an ICS declined over time, households failed to properly maintain the ICS, and there was no long-run effect on smoke inhalation over time. Predominant conclusions from these findings are that there are significant barriers to widespread market penetration and usage of ICS, that it is critical to allow for household behavior when evaluating health and environmental technologies, and that laboratory estimates of effects of ICS should not be assumed to hold in the field (Hanna et al., 2016).

Other RCTs have reached similar conclusions. Levine and Beltramo (2013) performed an RCT of solar powered cooking hotpots in rural Senegal which found no statistically significant effect of the intervention on fuel consumption, time collecting firewood, or carbon monoxide exposure and respiratory symptoms. Likewise, an RCT in rural Ghana found no significant reductions to time collecting firewood nor carbon monoxide exposure, but self-reported respiratory symptoms did decline in survey data (Burwen & Levine, 2012).

Another collection of studies contradicts these negative reviews of ICS. In a different RCT from rural Senegal, researchers found high adoption rates and positive health outcomes of an ICS. This ICS was a model known as the Jambar firewood model, which is a portable stove with a metal casing and clay combustion chamber (Bensch & Peters, 2012), a much different design than the HotPot solar powered device used in Levine and Beltramo's study in Senegal (2013). The RESPIRE study in rural Guatemala tracked respiratory symptoms and lung function of over 200 women who had been randomly assigned a to receive a *plancha* chimney woodstove and found significant reduction in carbon monoxide exposure and respiratory symptoms compared to the control group who had continued to cook with traditional open fires (Smith-Sivertsen et al., 2009). In a study from the Northern Peruvian Andes, a researcher took advantage

of a construction flaw in the iron-frame that had occurred in a sub-set of stoves randomly distributed to households. Using the iron-frame failure as an instrumental variable, households that received properly constructed stoves demonstrated significant decreases in firewood usage (Agurto Adrianzén, 2013).

A variety of factors may account for the conflict in the literature described above. Notably, the studies reviewed thus-far are diverse in many aspects, such as geographic location, stove model, and implementation strategies. For example, the Hanna et al. study (2016) tested the impact of a home-constructed ICS model made predominately of mud that the researchers recognize to be on the "lower end" in terms of value and design. In contrast, other studies tested interventions of factory-made portable stoves or various other technologies. In the RESPIRE study in Guatemala, trained fieldworkers visited homes weekly and provided maintenance and repairs when needed (Smith-Sivertsen et al., 2009). This level of monitoring and assistance was not common among other studies.

In addition to the variability of study designs, it is also well understood that at both household and regional levels, a variety of factors impact household cooking preferences and adoption of ICS. In a review of literature on fuel choice and ICS adoption in the developing world, Malla and Timilsina (2014) find these decisions to be "quite complex and multi-dimensional." Household decisions about ICS use can be impacted by a variety of factors ranging from the local environmental conditions, health and behavior choices, to socio-economic status (Malla & Timilsina, 2014). The heterogeneity of household preferences combined with the various combinations of other factors that impact household cooking decisions calls into question the external validity of studies conducted in specific contexts to test a specific intervention strategy. A robust study conducted on one intervention strategy in one region of the world cannot

necessarily provide definitive findings that would ring true in another region or when a different

ICS model is used (Matt, 2012). Therefore, it is wise to consider insights from other literature

related to household energy choices that are not necessarily strict impact evaluations.

By and large, ICS interventions have not proven to result in the full range of expected

benefits predicted from laboratory tests. To better understand why this might be the case, one

study employed a systems-based modeling approach to understand the most important factors to

determining success of energy interventions strategies (MacCarty & Bryden, 2015). Comparing

five potential intervention strategies for a remote village in Mali, the model determined that the

technology adoption rates and affordability were more important factors than the sophistication

or efficiency of new technologies. These results suggest that the design of technology

interventions, such as those for ICS, need to pay more attention to the demands of the user if they

hope to have significant impact on household energy choices. Lambe and Atteridge (2012) also

recognize that approaches to developing realistic solutions should be user-centered. By using a

qualitative case study incorporating in-depth interviews and household observation, they were

able to gain a better understanding of the issues of user preferences, cultural context, and

behavior choices among households in four rural communities of India. Their research found

significant complexity in the factors that impact household preferences and provided evidence

contrary to previously held assumptions about rural cooks. For example, the households

interviewed preferred to be able to diversity fuel type when cooking, allowing them to use cow

dung for preparing specific dishes. Previously many researchers in the area had assumed cow

dung to be a highly undesirable fuel type; this is an important distinction because not all ICS

designs allow for use of multiple fuel types. Furthermore, cooks indicated that their ability to pay

high upfront costs was not necessarily a limiting factor in purchasing an ICS, however they were

likely to be unwilling to do so if they were unfamiliar with the product or unsure of its benefits. This information was surprising as well, as the cost of ICS is usually considered a major deterrent to market penetration (Lambre & Atteridge, 2012).

Overall, the subject of ICS is extraordinary complex. We do know that certain factors are important in determining success of ICS interventions in many settings. For example, it is evident that cooks are unlikely to convert to ICS unless these specific stove models meet their needs and preferences and have user-observed benefits that outweigh the cost of converting to a new cooking method. Based on prior literature, it is unsafe to assume that laboratory expectations of ICS benefits will be met in the field (Burwen & Levine, 2012; Hanna et al., 2016; Levine & Beltramo, 2013; Ruiz-Mercado, Masera, Zamora, & Smith, 2011). The study that showed the most positive outcomes of an ICS intervention accompanied installation of the device with continued support and maintenance, indicating these to be important components to consider (Smith-Sivertsen et al., 2009). Recent research is finding that user preferences vary and ICS solutions are not one size fits all, even within communities there is heterogeneity of preferences (M. Jeuland, Pattanayak, Soo, & Sheng, 2014; Pattanayak et al., 2016). Furthermore, social factors can have impact on adoption and ICS desirability. For example, research has shown that women in Bangladesh can be more likely to desire a ICS, but often the men who make household economic decisions are less likely to give priority to healthier stoves (Miller & Mobarak, 2013). The same authors have also studied how social learning, in particular hearing negative feedback through local gossip lowers interest in purchasing or learning to use new technologies (Miller & Mobarak, 2014).

3.2   Methodological design literature

The ICS literature which has been reviewed demonstrates the importance of context in designing and applying appropriate evaluation strategies to ICS interventions. There remains a need for applied research of the effectiveness of specific ICS intervention strategies, especially as the ICS industry continues to diversify (Energy Sector Management Assistance Program, 2015; Pattanayak et al., 2016). Considering this need, a case study research project incorporating qualitative methods was designed to evaluate the process of StoveTeam's adoption study. The case study design, informed by *Case Study Research: Design and Methods* (Yin, 2013), could allow for comparison of findings and experiences from the two rural communities.

By presenting analysis of the case study research which was completed alongside a NGO's evaluation study, I hope to provide recommendations useful to StoveTeam and similar organizations to improve the design of evaluation studies performed in similar geographic and cultural settings. Based on these goals, a multi-strategy design is recommended (Robson, 2011, p. 75). The international, isolated research setting along with reliance on both NGO and international partners also required a flexible research approach. Furthermore, this case study incorporates insight from sociological theory, which will be described in the next section, to evaluate the underlying mechanisms that contribute to the success or failure of the ICS intervention. This strategy has recently gained momentum in the economic development literature (Deaton, 2010) but has not previously been applied in available literature on ICS interventions.

The choice of specific methodologies to incorporate into the case study was informed by other literature. The recent publication of *Monitoring and Evaluation in Health and Social Development: Interpretive and Ethnographic Perspectives* demonstrates the benefit of qualitative

and ethnographic methods to contribute additional depth to more traditional quantitative approaches of impact evaluation (Bell & Aggleton, 2016). In one study from this text, Plummer demonstrated how qualitative methods complemented and improved understanding of a sexual health intervention in Tanzania. Participants provided pertinent information on the sensitive subject matter in private semi-structured interviews that was not captured in the accompanying quantitative survey (Plummer, 2016). In other literature, Binder and Baker found that qualitative data revealed community perceptions that disaster relief efforts in American Samoa lacked respect for local cultural traits. With that information, the researchers could provide important recommendations for improving future efforts (Binder & Baker, 2016). Within the subject area of cookstoves, incorporation of qualitative research methodologies has not been a direct goal of many evaluation efforts. Yet as has been previously discussed, local context and user behavior are related to the success of ICS interventions. These issues can be better understood using the in-depth perspective provided by qualitative methods. Answering the research questions which are informed by sociological theory, also requires qualitative observation and reflection. The incorporation of qualitative methods in this case study attempts to reveal additional details about the ICS intervention that StoveTeam would not have been obtained from strictly quantitative methods.

4. Theoretical framework

A theoretical framework inspired by the work of Pierre Bourdieu informs the analysis of this case study. Pierre Bourdieu was a French sociologist and philosopher, who since his passing in 2002 has become widely recognized at a classical author and one of the most important thinkers in the second half of the twentieth century (Sapiro, 2015b). A few of Bourdieu's concepts will be described here for their applicability to this project. Those concepts are social space, the habitus, and symbolic violence. Additionally, from a methodological standpoint, an interesting component of Bourdieu's *theory of practice* is that it has been described also as a *practice of theory.* In other words, it is concerned not only with empirical data and analyses of research, but additionally with reflexive consideration of the role and the perception of what is going on imposed by the researchers based on their background and culture. Consideration of this combination of the objective and subjective realities of the research project is intended to help escape from the socially constructed definitions and assumptions adherent in most traditional research methodologies (Grenfell, 2012). By applying this approach for this project, I will be able to consider not only the various forms of empirical data collected through a lens of Bourdieu's concepts, but also consider how my position as a researcher and the positions of the other members of the study team impact the conclusions we draw from the stove evaluation study.

While Bourdieu's work is often associated with study of social class, a more proper terminology utilized by Bourdieu himself is one of social space. For Bourdieu, social classes technically do not exist, but rather what exists is a space of differences and people which occupy a point within those social spaces (Bourdieu, 1998). Bourdieu recognized the importance of various forms of capital in determining ones social classification, once stating that, "It is in fact

impossible to account for the structure and functioning of the social world unless one reintroduces capital in all forms and not solely in the one form recognized by economic theory (Bourdieu, 1986, p. 241)." With this quote, Bourdieu is stating the importance of recognizing that economic capital, or wealth, is not the only form of capital important to determining one's social classification, or their point of existence in social space. All forms of capital, be they economic, social, or cultural, help determine one's social classification. One of Bourdieu's depictions of social space based upon his study of French society contains elements of cultural and economic capital, in which individuals can exist in various points in this two-dimensional space based on their relative possession of high or low cultural and economic capital, the sum of which equals their total capital. Additional types of capital may also be important in other settings (Bourdieu, 1998).

Bourdieu does not attempt to define particular social classes, but rather suggest a set of practices or principles that individuals are likely to hold based on their social classification (Grenfell, 2012). This set of practices and principles is referred to as the habitus, or the combination of the thinking, perceptions, and behavior that characterize a culture (Sapiro, 2015a). The habitus constitutes an individual's principles of practice, such as what one eats, wears or does for fun (Bourdieu, 1998) which are not governed by rules but are rather acquired through ones past experiences (Sapiro, 2015a). An individual's habitus provides an intuition as to what is to be done in given social situations, thus prior experience and exposure to similar social situations would be expected to give an individual a sense of the appropriate way to act should that situation arise again. The habitus of a group of people is related to their position in the social space, and this relationship reinforces itself creating cultural boundaries where there are differences in the quantity and types of capital possessed. (Bourdieu, 1998). Considering that

Bourdieu considered capital to equate to power (Bourdieu, 1986), this means variation in social classification creates a situation of imbalance of power. This imbalance of power between social classifications can be used as a mechanism of domination. Bourdieu referred to this mechanism as symbolic violence, where those with higher capital have internalized a sense of justification to exert domination over those with lower capital (Sapiro, 2015b).

As with most sociological theory, the ideas of Bourdieu are inherently complex, but they will be useful to guide the analysis of this case study. Bourdieu's lens encourages consideration of the habitus of different groups involved in the study. Examining the habitus could reveal underlying power dynamics between the study participants (individuals living in poverty in rural Guatemala) and those providing and evaluating the intervention. By utilizing this theoretical framework, this case study can attempt to provide some insight that will be generalizable to other projects in international development and evaluation.

5. Research questions

Considering the study background, methodological design, and theoretical background, this study is focused on a few research questions. Primarily, how do social dynamics related to the habitus and social classification of the groups involved impact the research process. Second, what observed household or behavioral factors influence stove adoption and usage? Also, does the ICS intervention in these two communities address social and community development goals of the clean cookstove industry, such as empowering women or improving work and education opportunities?

To address these research questions, this case study attempts to reveal both practical observed information about stove adoption and usage habits, and, in line with Bourdieu's theory of practice, a reflexive look at the process of the donation program and adoption study. This focus on the evaluation process will allow findings and recommendations to be generalizable to other forms of development initiations and the strategies used to evaluate them. In particular, the ability of qualitative research methods to contribute to the evaluation process will be considered.

6. Methodology

6.1 Data collection

Data for this project was collected on two separate research trips to Guatemala, which were organized in coordination with StoveTeam. StoveTeam worked with faculty at Oregon State University to host a two-week field course in Guatemala, in which I participated in June 2016. This trip served as my initial introduction to the stove factory and the adoption study underway in the two communities. At the time of the June visit, households had not yet received their donated ICS. In September 2016, I then returned for a one-week long follow up trip to the two communities to conduct household visits now that the families had been using their donated ICS.

6.2   Household Surveys

Household studies were completed on both research trips. As the study relates to household cooking, every effort was made to complete the surveys with the main cook of the household, although occasionally additional family members were consulted. In June 2016, the faculty-led field study course completed household surveys in a total of 60 households: 36 in San Ramón and 24 in Las Brisas. We split into four teams and canvassed the communities, attempting to visit every household, though time and logistical constraints prevented all teams from reaching their quotas. Furthermore, three of the households were excluded from our surveys upon arriving and realizing the main cook was under 18 years of age. Though we only reached 74 percent of the households in this study, there are no obvious reasons why this sample should not be considered generally representative of the communities as there were no specific reasons the additional households, aside from the three minors, were excluded from analysis. A complete list of the questions included in the June questionnaire are provided in Appendix B. In

addition to many multiple choice and short answer questions, the survey included several open-ended optional questions. I personally completed 13 of these household surveys.

On my separate trip in September 2016, I visited 40 households and completed an observational review of the state of the cooking area, including both the donated stoves and traditional fires. In San Ramón, I knew with time constraints I would only be able to visit about half of the households in the adoption study. As the community is naturally geographically divided into the households prior to the community center along the road and those past the community center, I attempted to reach at least half of the communities in each region. I reached 23 of the total of 43 households in San Ramón, 10 out of 15 in the region past the community center, and 13 out of 28 in the region before the community center. Unfortunately, several homes in the larger region were unoccupied at the time of my visit and therefore the spread of homes was somewhat uneven. However, there is no reason to assume that the households not visited would be significantly different than those visited. In Las Brisas, due to complications with the municipality, at the time of my visit 27 of 43 intended households had received their Ecoplancha stove. In two of those households, the primary cook was under 18 years of age and therefore not visited. I attempted to visit all the remaining 25 households, and succeeding in making contact in 17 of the 25 households, where I completed observation and interviews. The observational form which was used to record data can be found in Appendix C. The data obtained from both the September and June household and observational studies was compiled and IBM SPSS Version 23 statistical software used for analysis.

6.3   Semi-structured interviews

To gain more in depth information from the survey participants, I completed semi-structured interviews in several of the households in Las Brisas. Convenience sampling was used

to select individuals to interview; after completing the household surveys, I made a judgement call on whether the woman appeared comfortable and able to provide additional time and information. While this was not a random process for selecting interviewees, because of the nature of the situation as an outsider in a remote, rural community, this was the most unobtrusive and considerate method for selecting interviewees. I obtained consent to audio record these conversations, which were later transcribed. The conversations were fairly short, with an average length of eight and a half minutes. A total of 11 interviews were recorded, two with the same woman (once in June and once in September) and two women (an elderly woman and her daughter-in-law) were interviewed jointly. A list of these interviews, including interview length, household identification number, and a randomly assigned code name are provided in Appendix D. Assigned names were generated by randomizing the list of first names of study participants and are for presentation purposes only. In other households, an audio recorded interview was not attempted, but less formal conversation was recorded as field notes.

6.4   Participant observation

In addition to the basic kitchen observation described above, I additionally took extensive field notes describing my experiences and observations in the field. This information relates both to the actions and activities of the community members, the StoveTeam study team staff, and my fellow classmates on the June trip. Observed data is particularly important for describing interactions between different individuals and providing context for understanding the other data.

7. Findings

7.1   Setting

Nestled in the mountains of southern Guatemala, about twenty miles north of the Pacific Coast are two distinct and isolated rural communities. These communities are only about three hours by vehicle from populous areas of Antigua and Guatemala City. Despite only having a few geographic miles between them, they are very distinct communities.

The community of Las Brisas is reached by an hour long bumpy ride in a four-wheel drive vehicle, weather permitting, from the municipal center of Guanagazapa in the department of Escuintla. Just a few hundred yards outside the municipality, along the side of the road is what appears to be the city's open garbage dumping grounds, with several deserted vehicles and piles of pungent waste. Yet continuing farther, the view gets much more palatable, passing a few rural homes between scattered tracts of agricultural fields tropical broad-leafed forest. Plots of coffee plants, corn, and beans are common along with a variety of other crops not easily identifiable to the outside observer. A few chickens and pigs roam around mostly nearby homes. About an hour into the scenic but uncomfortable drive a small paved street branches off from the main road near a few school buildings, the only real indications that one has reached the community of Las Brisas. Taking the turn up the short strip of road reveals a collection of twenty or so homes grouped together, a few with small store windows at the front and all on rather hilly, uneven terrain. Some homes have concrete or block floors and porches, but many are simply made of wood posts and paneling with compacted dirt and the occasional wall made of black plastic. All homes have zinc roofing in various stages of deterioration, and it is sometimes used for siding as well. The muddy pathways between homes in the green and shady area are rather peaceful and

quiet, yet the mostly deteriorating home structures, several abandoned lots, and roadsides strewn with litter give the impression of a community that has seen better days.

Continuing farther along the main road requires traversing a few rocky creek beds and climbing further up the hills. Fifteen more minutes of a tumultuous and slow four-wheel drive ride reveals the second community of San Ramón, where the road comes to an end at a rather recently constructed large community center, which is also used as the primary school. In nearly all directions around this center are scattered households, but one will quickly notice a difference between these homes and those in Las Brisas. Nearly every home area has a small, approximately 200 square foot recently constructed block home, all painted a light pink color and sporting new zinc roofing. As I would learn, these homes have all been built in the last several years with the help of a Christian church group that frequently visits the community. Most households also have separate handmade wooden structures which usually contain the kitchen area or other living space. Different homes are connected through a maze of small paths in steep terrain. As San Ramón is situated nearly on the hilltop, it has nearly panoramic views of surrounding hillsides of green forest scattered with agricultural plots.

Aside from these physical differences of the two communities, their histories and people are also very distinct. While the area has most likely been scarcely inhabited by indigenous people for generations, the current populations of individuals that make up these communities are rather recent immigrants. Individuals in Las Brisas speak Spanish as a primary language and identify as of *ladino* heritage, a term used in Guatemala to represent *mestizo* or mixed Spanish and indigenous, or Latino, heritage. One women in Las Brisas remembered first moving to the area as a young girl about seventy years ago, when only the homes of her grandmother and an uncle were nearby. Since then a few more families had moved to the area and families had

grown, making up the community which now had about sixty separate households. The

established community in San Ramón however is much more recent. Named San Ramón for the

coffee plantation that operated on the land until about five years ago, the community of San

Ramón can be described as a transplanted population of families of the *Mam* indigenous group.

When the coffee farm was devastated by coffee rust, the land was subsequently parceled up into

smaller pieces and sold to the *Mam* families through a government program that was helping

relocate indigenous groups to farmable land. This community was therefore established only

three to four years ago, a group of families of the *Mam* indigenous group which relocated from

farther north in Guatemala near the Guatemala-Mexican border. While most younger individuals

and nearly all the men in the community now speak Spanish as a second-language, the main

language for the community is still the indigenous *Mam* language.

7.2   Household survey results

Key results of the household surveys and observation are presented in Table 1. The

household visits provided useful information, but the process also identified some issues. Certain

question formats were not well suited for this style of data collection in this research setting.

Questions that related to hypotheticals or asked about preferences were often met with confused

looks by respondents. For example, when we asked about the reported benefits of a traditional

stove, many respondents could not think of anything to say. When researchers asked about the

effects of the smoke from the stoves, often initially this was met with a blank stare and the

researcher had to provide an example of a potential effect, such as "stinging eyes," and the

respondent would then say "Yes, yes, it burns my eyes." Hypothetical questions were also

difficult and needed to be reworded in many homes to elicit a response. For example, the

question "Had you considered purchasing a new stove before hearing of this project?"; as

researchers in that setting we quickly realized it was an awkward question to ask given the economic conditions of the community; so, in the field the wording used was to ask about a type of stove they would prefer as opposed to purchase. In the upcoming sections, more details about the results from each community will be discussed.

Table 1. Selected summary statistics from household surveys and observation.

June household survey	Las Brisas	n	San Ramón	n
Most reported difficulty with traditional stove	Smoke emission (83%)	24	Smoke emission (49%)	35
Most reported benefits of traditional stove	Nothing (30%) Accustomed to using it (30%)	23	Nothing (58%)	31
Most reported effects of smoke from traditional stove	Stinging eyes (70%) Nothing (7%)	23	Stinging eyes (86%)	35
Percent of respondents that had considered getting a new stove	33%	24	79%	34
Percent who had considered getting plancha stove	13%	24	54%	34
Reported products received from government or other groups	House (0%) Water filter (0%) Food (8%)	24	House (43%) Water filter (17%) Food (6%)	35
Percent of households where husband collects firewood	71%	24	78 %	36
Percent of households where wife collects firewood	29%	24	36 %	36
Percent of households where children collect firewood	42%	24	47 %	36
Average time spent collecting firewood per week	8 hours (Range 1-21)	23	7.8 hours (Range 2-32)	26
Reported most difficult household chore of women	Washing clothes (68%) Food preparation (32%)	19	Washing clothes (64 %) Food preparation (24%)	25
September follow-up visit				
Age	Mean = 42.1 (Range 23-75)	17	Mean = 45.3 (Range 25-70)	23
Household size	Mean = 5.2 (Range 3-8)	14	Mean= 7.1 (Range 1-15)	14
ICS in flames or still warm	77%	17	65%	23
Traditional fire in flames or still warm	29%	17	52%	23
Portaleña properly placed			26%	23
Chimney status	Enclosed in home (94%)	16		
Plancha status	Good (63%) Blackened with rust (47%)	17		

7.3   Language and cultural challenges

7.3.1 Las Brisas

In the community of Las Brisas, other members of the research team and I were able to directly communicate with the cooks of the households. Having learned to speak Spanish in Central America, where I worked in similar rural communities of Nicaragua as a Peace Corps volunteer for two years, I was comfortable communicating in this community and witnessed that community members were comfortable with me. For example, on numerous occasions women I was interviewing would complement me on my Spanish skills and note that they could tell I had learned Spanish in Central American. We were able to converse in a friendly and comfortable way that facilitated the interview process.

Upon entering a household with an Ecoplancha, I was met with kind regards from all study participants. On initial questioning, all cooks expressed gratitude and contentment with their new stoves, and when asked directly, nobody identified specific concerns with the stove. Yet, the longer I stayed in a household, the more I would learn about their experiences and any difficulties they had with the stove. There were clearly visible concerns with some stoves, such as a broken brick in the combustion chamber or a blackened area along the sides of the stove indicating that smoke was escaping. The women were not quick to point out these concerns to me; I found that it required probing and patience to understand. In one household, an older woman initially expressed nothing but positive comments on the stove. But about ten minutes into my visit, in which we had chatted about unrelated topics, she revealed that she still very much preferred her open fire for cooking most meals. She used the Ecoplancha for smaller items such as heating water for coffee. Her daughters however, who also did some of the cooking in the home, preferred to cook exclusively with the Ecoplancha. This woman's initial reaction to

my presence had been to only express gratitude for the visit and the donated ICS. It took more effort and an unstructured conversation for her more honest opinions of the Ecoplancha to be revealed.

7.3.2 San Ramón

This was in sharp contrast to the experience in the indigenous community of San Ramón. In San Ramón, we required the assistance of translators from *Mam* to Spanish, and had requested from community leaders that female translators be found. However, upon arrival on the first day of the June trip, a group of all male community leaders informed us that they would be the ones assisting with the translating.

The translation process proved to be a limiting factor for collecting self-reported household data. On the initial June visit, our research teams visited nearly all the households in San Ramón, but this experience was more difficult than expected. In many households, it was apparent that the women being interviewed were shy and uncomfortable with the interview process; they seldom made eye contact with the survey team often looking at the ground. It was also apparent that several translators were most likely not completing word for word translation of many survey responses. The woman would respond to questions in short, one or two word replies of which the translator would provide multiple sentence translations in Spanish. There was variation in the performance of different translators as well. Some appeared to provide more direct and honest translations of the interviewee's response, while others were providing pre-planned responses to survey questions. For example, one survey question asked respondents, "What is difficult about using the open fire?" One survey team reported that every translated response they received that day was a very similarly worded response about the large use of firewood and the health impacts of smoke inhalation. This was most likely a calculated response

of the community leader doing the translating, as those leaders had received educational

information from StoveTeam about the benefits of improved stoves. Regardless of the length of

the response that the woman provided to the translator, his translated response was always the

same.

Meanwhile, other research teams with different translators did not get many responses to

this survey question. Women appeared confused by the question and only provided a few words

response, which was translated as a response of "nothing" or "she cannot think of anything."

Based on this experience, this mode of questioning seemed inadequate and not particularly valid,

both because some translators appeared to be guiding the answers, but also because for many

women it was hard to identify *difficulties* of something that is a habitual part of their lives. Most

women had cooked with traditional open fires their entire life and had little or no exposure to

other methods. Identifying the difficulties of that cooking method is easy for someone who has

experience with much more convenient methods, such as electric or gas stoves, but for these

women that was not a reality.

Another cultural challenge that was noted in the household survey process was an

observed impact on the demeanor of the women being surveyed when their husbands were

present in the household. In several households where the man of the house was present from the

start of the interview process, the men were very vocal and would respond to the survey question

even if it was intentionally directed at the female(s) in the room. The women would also divert

their eyes towards the men, appearing to signal them to respond to some of the questions. I

remember in one household I was in the process of interviewing a young woman and while she

was somewhat shy, she was responding to the majority of my questions with adequate details.

Her husband returned home about half-way through the interview, and from that point, I did not

get another response from the woman, her husband answered the rest of the interview questions. Due to these challenges in the interview process, for the September follow-up visit I did not ask for a translator when visiting San Ramón. I instead had a few short simple questions that I would ask upon entering a household to assess Spanish language ability. In a few homes, the woman present spoke a decent amount of Spanish and I was able to ask about her experience with the stove. In other households, the woman present did not speak Spanish or was not comfortable using it with me. I would ask a question such as, "Do you like the new stove," and get an affirmative nod or smile and a response of "*Sí, sí* (yes, yes)." Then I would ask, "What do you like about the new stove?" and get the same affirmative response, indicating that the inclination of the woman was to provide a positive or agreeable response to my question, even when the question was not understood. In those households, I then focused efforts on observational data and only attempted questions when a female household member that spoke Spanish was present.

7.4   Stove adoption and usage

7.4.1   Las Brisas

As delivery of the larger Ecoplancha stove to the community of Las Brisas had turned out to be problematic, at the time of my household visit families had only had their stoves for about two weeks. In 13 of 17 households, the Ecoplancha stove was hot or currently in use (76 percent). An open fire was in use or still hot in only 5 of the 17 households (29 percent). Discussion with the cooks and observation in these 17 households revealed important considerations about the Ecoplancha stoves for this community.

Most all the women reported that they preferred using the Ecoplancha instead of the open fire, except in some circumstances when they cooked with their largest pots. One woman who

sold homemade treats from her home used an open fire exclusively for preparation of those items, but used the Ecoplancha for all her household cooking. Most all women reported a learning curve with cooking tortillas on the Ecoplancha, and a few still preferred to do this task on the open fire.

Several factors were observed that raise concern about the expected long term benefits and overall fit of the Ecoplancha stove for this community. After only two weeks of household use, maintenance concerns were apparent for the Ecoplancha stoves. The metal *plancha* cooking surface of the stove was blackened and showed small signs of rust in 7 of 15 households visited, such as that shown in Image CB-12. The household visits did occur during the rainy season for this region, and it was evident that rain would enter many of the household cooking areas. As the *plancha* metal surface is intended to be kept dry, this was the most likely cause of rust on the material. In one household, the basic structure that was used as a kitchen had gotten damaged in the recent rain storm. Water had flooded the area and significant rain reached the Ecoplancha stove, getting the inside of the stove wet. At the time of the visit, the stove was dismantled and parts were sitting on the outside patio to dry (See Images CB-32-1 and CB-32-2). The family was ashamed that we had come across them in this circumstance and at first did not want me to enter their home to see. They hoped to fix up the kitchen in the near future and re-install the stove, but it was unclear whether their circumstances would allow them to do so.

In discussion with the cooks in Las Brisas, maintenance was the primary concern discussed with all households. They had been informed in a community meeting and during installation of the cleaning guidelines, however there was clearly confusion about the cleaning guidelines for the stove model. Several cooks were not aware that the *plancha* surface should be washed in water on occasion, but that this should only occur when the material was completely

cooled off after use. The *plancha* in one of the households had become warped when it had been washed while still hot. In addition to the occasional cleaning of the *plancha*, the area between the combustion chamber and chimney also needs to be manually cleared of ash approximately every two weeks. About half of the households visited inquired as to the proper cleaning procedure and schedule, indicating that they remembered the cleaning being mentioned but not the details.

A final area of concern for the installation and stove usage in Las Brisas regarded the chimneys. The Ecoplancha stove model came with a chimney, however the installation of this chimney was not funded by the project. Ideally, a chimney would be installed in the household by cutting a hole in the zinc roofing and passing the included chimney through the hole. Unfortunately, the zinc roofing in nearly all the homes in the community was old and damaged by rust, which would have made it difficult to cut a clean hole for the chimney that would not leak. During installation of the stoves, the households were not comfortable allowing a hole to be cut in the roof, thus, the chimneys were installed, but did not exit the room. Some of the cooking areas had openings in the walls which allowed most of the smoke to exit the area (See Image CB-33), while others were more enclosed and only had a small gap between the walls and roof (See Images CB-25 and CB-24).

The households indicated to the stove installers that they would in the future purchase an 'elbow' piece of chimney to allow the chimney to exit through existing gaps in the walls, but only one household had accomplished this at the time of the visit, the home of Gabina (See Image CB-07). While the chimney in this household did exit the room, at the time of our visit, Gabina was utilizing her stove and it was apparent that the smoke was not exiting through the chimney. The tilted chimney was allowing water to enter, which appeared to have moistened ash in the stove and partially clogged the chimney exit. Gabina showed me how for the last few days,

she had simply been removing the cover on the furthest hole of the stove to allow for air flow and to make it possible to cook using the first two holes. As a result of removing the cover over the last hole without placing a pot over it, a significant amount of smoke was entering her cooking space. Interestingly, during the initial visit in September, Gabina had reported that her open fire produced a lot of smoke and that it caused her eyes to sting. Now however, even with the new stove also emitting a lot of smoke, she said she did not mind the smoke in her kitchen and she preferred using the stove in that condition over using an open fire. During the follow-up visit, we assisted Gabina in cleaning out the wet ash and attempted to better secure the chimney to not allow for water to enter, but the potential longevity of this fix was unclear.

7.4.2 San Ramón

By the time of the September visit to the indigenous community of San Ramón, households had had their donated Ecocina stoves for approximately five weeks. Households were visited from late morning to midday. In 15 of 23 households visited (65 percent) the Ecocina was currently in use or still physically warm from recent use. In 12 of 23 households (52 percent), the traditional cooking fire was in use or still warm. Five households were clearly using both the Ecocina and traditional fire at the same time to prepare multiple dishes. It was observed that households that were using their traditional fires were preparing food with several pots at once, and using generally larger cooking pots. This likely is related to household size. Indeed, for households which reported household size, the households of those using only the traditional fire were larger (mean = 8.9 individuals; n=7) than those only observed using the Ecocina (mean = 5.3 individuals; n=7). Average household size in San Ramón was 7.1 individuals. When cooks utilize both stoves at the same time in order to prepare multiple dishes, the benefits to having the Ecocina model are less clear. For example, the firewood usage efficiency of using one large open

fire versus one small sized open fire together with the Ecocina stove has not been measured. Additionally, in many cooking areas, the traditional fire and Ecocina were placed in the same room near one another, so that a cook using the Ecocina will be subject to the indoor air pollution emitted from the traditional fire if it is also in use (See Image CR-12).

During the June household surveys, the households were asked if they had previously considered getting a new stove prior to hearing about the StoveTeam project. Over half the households (20 of 36) in San Ramón indicated that they had previously wanted an improved cookstove, specifically a *plancha* style stove. Upon hearing this consistent answer, I first thought that the households must have been aware that the neighboring community of Las Brisas would be receiving the Ecoplancha stove from this project while they were to receive the smaller Ecocina model. While this may be true, it also became apparent that many members of this community had been recipients of another *plancha* stove donation program in their former community and they had been unable to bring this stove with them to their new homes. There was only one household in the community who had the *plancha* stove model with them in their home. It was a large stationary *plancha* model with a chimney, as shown in Image CR-15. It appeared that many families in Las Brisas would have preferred this stove model had they been given a choice.

The Ecocina stove model has a removable wire frame that is placed inside the combustion chamber to allow for proper airflow below firewood inserted in the combustion chamber, which is known as the *portaleña.* StoveTeam had informed cooks of the important role of this device; if it is not in place, the fire in the combustion chamber will not receive proper oxygen for hot, efficient burning. However, it was observed that the *portaleña* was only in proper place in 26 percent of households. In other households, the device had been removed,

some households could not locate the device at the time of the visit, and several were using it for other purposes, such as a prop for situating pots over their traditional open fires. It is most likely that the cooks remove the device to have more room to insert additional firewood into the combustion chamber as they are accustomed to cooking with larger amounts of firewood than fit into the chamber as designed. In many households that were using their stove, the combustion chamber was packed full of firewood. Images CR-01 and CR-08 provide comparison of a properly placed versus a missing *portaleña*. When performance of the Ecocina has been measured, the *portaleña* would be used in the combustion chamber, so it is unclear if it is accurate to assume that the benefits of using the Ecocina would be the same with or without the *portaleña.*

At the time of the observation visit, it was apparent that at least two households were using the Ecocina stove to burn household garbage. The combustion chamber and area above were filled with garbage items, such as plastic bottles and food wrappers, as in Image CR-37. To my knowledge, the community of San Ramón has no formal garbage service; the burden of waste disposal falls on individual households. It is understood that garbage would often get burned, but this remains an unintended use of the Ecocina stove for which the impact has not been tested.

7.5   SUMS measurement factors

The adoption study used SUMS temperature measurement devices to track the use of both the open fire and the ICS in order to determine the revealed stove preference of the cooks. The SUMS monitor needed to be placed in a location that was close enough to register changes in temperature that would indicate a stove was being used, but not too close to overheat from the fire. Unfortunately, on the return visits many monitors were found to have overheated and

needed to be replaced. The SUMS device would be replaced on the next visit with insulation or in a place where it was less likely to overheat. While this issue was detrimental to the study in that days or weeks of data was lost for households, it should not present a bias in the study because the loss of data could be traced and should not have been systematically more nor less likely to happen in certain households.

What was a more concerning problem with the SUMS measurement devices related to the collection of open fire data. One of the advantages of cooking with an open fire is they are very easy to set up with little materials, making it a very portable cooking method. Also while cooking, the cook is likely to move around whatever propping objects she has, such as stones or pieces of brick, to accommodate her pots. The SUMS monitor for the open fires was taped onto a brick that was placed near the open fire. In observation, it was noted that often this brick had been moved, or even removed entirely from the cooking area. In at least three households, the cook handed the SUMS monitor to the StoveTeam researcher; it had apparently become displaced from the brick it was on or the cook had removed that brick entirely from the open fire area. Furthermore, it is common for households in these communities to simply start up another open fire on the ground or outside on the patio whenever they may need to cook large quantities of food, such as for a family gathering or community event. The flexibility of the open fire cooking method makes it inherently hard to track. This could likely bias the study results on continued usage of the open fires, because there was no guarantee that the measurement device was recording data from all open fire usage of the households. Image CR-04 provides an example of an open fire that was found at one of the San Ramón households that had not been present on prior visits and thus there was no SUMS monitor tracking its use.

7.6   Community needs and priorities

In effort to better understand the communities, a variety of questions were asked to a selection of participants regarding their community and households. When asked about the needs of the community, the issue of transportation was mentioned by many individuals from both communities. The road that connected the communities to the municipal capital was in poor condition and public transportation did not reach these communities consistently. Several individuals in Las Brisas were also concerned about the lack of sanitation services. The sewage system of the public elementary school was broken at the time of our visit. San Ramón in contrast had a sewage system for the toilets available at the community center that had been constructed by the missionary group. In homes, families in both communities either used latrines or went to the "*campo abierto* (open field)".

Forty-four women among the two communities were asked to identify what was their most difficult household chore; 28 of those women (64 percent) indicated washing clothes. Washing clothes, which is done by hand with a sink and washboard in these communities, had not previously been discussed with any of the households by the research team. In contrast, collecting or chopping firewood was mentioned as one of the most difficult chores for women by only 3 of the 44 women (7 percent). This may in part be because men commonly handle the chore of gathering firewood in these communities. In the 60 households surveyed, only in 20 (33 percent) of those households do the women report assisting in firewood collection, and only in 8 (13 percent) of the households do women go to collect firewood without the help of a husband. Families were also asked to estimate time spent per week collecting firewood, which for the two communities averaged 7.6 hours (n=51).

There was also interesting information about the dynamic between the two communities which highlighted the poor economic condition of the communities. The community of San Ramón had moved to the area only about three years previously, and they had moved onto land that previously had been a coffee plantation that provided local employment. Florenda from Las Brisas informed me that the coffee farm had been sold or turned over to the government, who then parceled up the land to give to the *Mam* community. She noted, "*Y fíjese que eran fincas que daban trabajos* (And imagine, those were farms that gave jobs.)" Several other women in Las Brisas also noted how they had noticed the Christian missionary groups drive by on their way to San Ramón to build houses in the community, but noted that they did not get visits like that in their town. Darlin noted:

> *Mire, en esa comunidad, ha sido bastante abandonada, ayuda dan a otros lugares, se oye uno, que dan algunas cosas, pero aquí no, no vienen ayudas, no sé cuál es el problema, aquí no vienen ayudas de ninguna que hace.*
>
> Look, here in this community, it has been very abandoned, they (the government or other groups) give help to other places, one hears about it, that they give some things, but here no, help does not come. I do not know what is the problem, but no forms of help come here.

This sense of neglect was palpable in the community. In conversation, many women referenced the nice little homes that had been built in San Ramón.

As Juana informed me when asked what the biggest problem they had in the community, was "*Pues mi mamacita linda, hay de todo verdad! (*Well my pretty lady, there is a bit of everything right!" Recognizing the complexity of these issues, I started to ask women more specifically about the economic situation in the community and the availability of jobs. The difficulty of steady work opportunities was obvious. Simply put by María, "*Por aquí fíjese que no hay por decir cómo ganarnos la vida. Estamos que deseamos trabajar, pero no hay trabajo.*

(Around here imagine that there is not, how do you say, a way to make a living. We are people that want to work, but there is no work.)" Most all the households in the community were supported at least in part by agricultural production, but with little land and capital available, agricultural output was inconsistent. Individuals, mostly men, traveled long distances to work, and if they were lucky, returned every few weeks to see their families. Prior to the recent closures of coffee farms in the region, there had been more work available locally. Florenda noted:

> *Era bien alegre antes porque había trabajo. En el tiempo de cortar café hasta los niños ganaron su poquito. Pero ya paso el tiempo, ahora no hay cafetales aquí cerca.*
>
> It was very happy before because there was work. In the time of coffee cutting, even the kids earned their little bit. But now that time has passed, now there are no coffee farms near here.

Families likely had still struggled to get by even before the local coffee farms were closed, but the prior times are now remembered for having more work opportunities.

All families asked about the school expressed that they were happy that their children had access to a school and many of the older women acknowledged that they had not had this opportunity when they were younger. There had been a public primary school in Las Brisas for about 20 years. I asked Milvia about how often children missed school days and if she thought this had an impact on the students and this was her response:

> *Si eso pasa, a veces hasta que avisen que hasta nuevo aviso no hay clase, que no tienen que ir. Y después, no hay ganas de ir. Ahora este año, no dieron comida. No dieron.*
>
> Yes, this happens, sometimes they send notice that until further notice, there are no classes, that (the students) do not have to go. And after, they do not want to go. And now, this year, they did not give food. They did not give food.

Milvia, a mother with school aged children, recognized the impact of missed school days on student learning and student motivation to attend classes. Her comment about food referred to

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the lack of funding given to schools that year to provide school lunches, which apparently had been provided in the past and was missed. I asked another woman, Teresa, a grandmother of school aged children, how she felt about her grandchildren having the opportunity to go to school*:*

> *Me siento contenta. Pues alegre, que todos estudian, que no vayan a quedar, así como nosotros, ¡a dios que tristeza!*
>
> I feel content. Well happy, that they all study, that they are not going to stay like us, oh God, how sad!

This response revealed that the Teresa felt regret and sadness about not having an education herself, but that she was hopeful of a different future for her grandchildren.

8. Discussion

8.1   Social dynamics in the research process

The experience of surveying felt very different in the *Ladino* Spanish-speaking community than it did in the indigenous community. It was observed that the way in which questions were asked as well as who was asking them had important impacts on the responses received. Bourdieu's work advises to consider the role of social space and the habitus of groups of people in understanding their reactions in social situations.

Educated, socially advantaged Americans are accustomed to surveys and providing feedback as a normal part of our lives. In many circumstances, we expect a service or product to be improved as a reaction to our negative feedback as customers or citizens. This familiarity with the process of providing feedback and expecting something from that feedback can be described as part of our habitus. The individuals being surveyed as a part of this study do not have that same habitus. Many have likely never been asked to participate in a customer satisfaction survey. Yet surveys are often a critical element of the processes used by international organizations to understand household needs prior to an intervention, or satisfaction with an intervention after the fact.

Several observations from the case study reveal information about the inherent customs and tendencies, or the habitus, of the community members being surveyed which are important for interpretation of the answers provided. Many women in San Ramón had the tendency to provide affirmative answers to questions even when it was not clear that the question was well understood. Women in Las Brisas did not reveal any issues or problems with their stove when asked directly, but were more likely to bring up concerns as informal conversation continued. Certain questions, such as asking women to identify the difficulties she faced when using an

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open-fire, were hypothetical and confusing to women who had only ever cooked with an open fire. There was an observed change to the surveying process when men entered the household during the visit. The tendency to use impromptu open fires was not measured in the research design. These observations all call into question the ability of structured quantitative surveying to explain household preferences, behavior, and satisfaction.

In this situation, the individuals involved in the stove adoption study, myself included, possessed significantly more capital than the community members. While we had good intentions to try to understand the needs of families and the performance of the ICS, our social classification could operate as a form of Bourdieu's symbolic violence. By this, I mean that our position as a group of people providing a free or subsidized product to the community carried with it an element of power. If they were unhappy with a donated good or service, they would have no incentive to express that unhappiness, because they have no reason to expect that their negative feedback would lead to additional or improved donations in the future. They could have incentive to express gratitude for a product that was not serving them well. Providing a negative, but honest, opinion could be expected to eliminate their chance for additional donations or projects in the future. This incentive structure is dangerous; the group with more power in the situation receives positive reinforcement for providing a product, regardless of its impact. Positive reinforcement could justify a sense of success and altruism that is not deserved and lead to additional, poorly designed interventions in the future.

It is reasonable to assume that these factors related to social dynamics are important for understanding the results of other studies as well. Recall that in the Burwen and Levine study (2012), self-reported respiratory symptoms declined based on survey data even though no significant reductions in carbon monoxide exposure were found. In the Hanna et al. study (2016),

researchers report that they believed households had understood the information provided about the health benefits of the ICS, but regardless stoves were not regularly used or maintained. It is possible these study participants provided positive feedback because they felt incentivized to do so. In most of the ICS studies discussed in the literature, details about the research process are not revealed. Many simply state that the research was performed by trained staff. This study reveals that the process of data collection is important. Further field-based research in international development should be more cognizant of the evaluation process and take steps to avoid data collection methods that incentivize underserved positive feedback.

Through observation and spending time talking with the women, I was able to recognize when the answers provided to survey questions were not accurate depictions of the experience that cooks were having with their ICS. Qualitative methods were more successful than the structured, quantitative household survey at recognizing social dynamics that could impact the results of the study. There are several implications here. First, social class dynamics are important to consider in the design and evaluation of development interventions, especially when the target population and those providing the intervention are socially, culturally, and economically very different. In this study, Bourdieu's understanding of the habitus and social space were useful to examine the differences between the different groups of people involved. Second, qualitative methods of observation and semi-structured interviews were more useful than structured household surveys at understanding how the ICS intervention worked. This type of qualitative research requires trained researchers. Researchers should be encouraged to develop relationships with members of target communities to ensure the social and cultural dynamics of the community are well understood and accounted for in research design. A reflexive look at the

people completing the research and their underlying biases and assumptions is required to produce reputable research findings.

8.2　Stove adoption and behavior

In both communities, there were many households that seemed satisfied with their donated ICS stove and took steps to adapt to using it. In households that were not happy with the ICS or had stopped using it, there were generally observable reasons related to their preferences and needs. In other words, the behavior of not using the stove could usually be explained. Qualitative methods of interviewing, casual conversations, and observation helped reveal these reasons. The larger households in San Ramón were more likely to be continuing to use their traditional open fires, and many of those households had indicated when asked that they would have liked a larger stove model. Meanwhile many smaller households appeared very happy with their Ecocina stove.

In Las Brisas, there was evidence that the physical condition of the cooking areas of many households could limit the longevity and benefits of this larger expensive stove model. The Ecoplancha model, while commonly preferred by cooks because of its larger size, is a more expensive model. The materials used for the Ecoplancha require protection from the elements; they can quickly become damaged from rain or other environmental factors. Without adequate household conditions, this model is not expected to last long. Rain water entering some cooking areas was already causing problems for the Ecoplanchas in several households. The chimney situation also exhibited that the cooking area structures were not prepared for the ICS installation. A limitation of this study is that there was a limited time frame between when stoves were installed and the follow-up visit. Based on what was seen about the condition of households and stoves, it is expected that stove usage may decline over time due to maintenance concerns.

Improper usage of stoves in both communities, such as to burn garbage, or stove usage without the portaleña or proper chimney, may result in the ICS not providing the full range of benefits expected based on laboratory tests. The observations and interviews with cooks conducted for this study help understand why usage of these ICS may decline over time.

In other studies, notably the *Up in Smoke* study (Hanna et al., 2016), when families stop using their stove, this is described as a behavioral decision. The insight gained from this study is that through a mixed-methods research design, the behavior of cooks was understood and described. There was a practical reasoning process that cooks took when deciding what cooking method to use, such as they needed more space to cook or their stove had maintenance issues. By understanding these reasons, specific recommendations can be made to improve the design of the intervention.

Household preferences and conditions are not homogenous. The Guatemalan stove factory understands this, and for this reason, continues to improve stove designs and offer various model options. A problem with this adoption study, however, was that the applicability of the stove model for each individual household was not considered. Instead, the adoption of the same stove across the entire community was tested. This study supports the prior literature that has found that behavioral decisions in the household are key determinants of stove adoption. However, this study informs the literature one step further by explaining some of the factors that influence behavior with regards to stove usage. The Ecocina stove was likely not the best stove model choice for all households in San Ramón. Likewise, many households in Las Brisas may not be structurally sufficient to support longevity of the Ecoplancha stove. This does not necessary imply that the ICS models would be unused or damaged in all households. It does imply however that they are not suited for homogenous distribution in the field.

If ICS models are not well suited for homogenous distribution across entire communities, as this research has suggested, then evaluation strategies need to adapt to allow to test the true potential of household based interventions. A preference for randomized control trials in the development economics literature seems to imply that it is not okay for different interventions, in this case different stove models, to be more suited to some households than others. The desire for a clean evaluation methodology that is possible with homogenous distribution should not be favored over a heterogenous distribution strategy is the latter is more likely to help people. Indeed, some household may not desire an ICS at all. Donation projects and further research should adapt to allow for heterogeneity of household needs and preferences. This could be accomplished by taking advantage of the fact that various ICS models are available, especially in this specific case where the same stove factory produces various stove models. Different stove models could be distributed based on household characteristics (such as household size) or preferences to households that are likely to benefit from receiving an ICS.

8.3   Expectations of ICS and the local context

As was mentioned in the introduction, the Global Alliance for Clean Cookstoves, of which StoveTeam International is a partner organization, states their dedication to improving livelihoods and empowering women and children. It is important to consider therefore whether this ICS intervention has demonstrated ability to improve the daily lives of women and children. A frequently cited burden of traditional open fires is the amount of time it takes to collect large amounts of firewood, and often it is believed that a large amount of this burden falls upon women and children (M. A. Jeuland & Pattanayak, 2012). The StoveTeam International website indicates that "An average man, woman, or child spends 20 hours each week gathering wood (StoveTeam International, 2016)." The data collected from these community surveys suggest

these estimates to be exaggerated for these particular communities. Therefore, the practical day-to-day household benefit of adopting a more fuel-efficient stove in these communities is not as high as StoveTeam may have thought going into the study. The household's perceived benefit of adopting the new stove technology is lower than expected because the burden of collecting firewood is lower.

Another common assumption about the benefit of ICS is expressed with this statement; "Wood collection takes valuable time that could be spent at work or school (StoveTeam International, 2016)." Qualitative interviews with women in Las Brisas revealed very limited available work opportunities and thus it does not appear likely that time is a limiting factor to obtaining paid work; rather many able individuals have an excess of time and difficulty finding work. Furthermore, other household chores were recognized as more or equally time consuming as firewood gathering and food preparation, such as washing clothing. Children may help with the chore of gathering firewood in some households, but other factors with the school system and lack of work opportunities seem to have more impact on educational attainment than the burden of household chores.

Benefits of ICS interventions are contingent upon local context. Positive externalities of stove adoption, such as empowering women or freeing up time for work or school, are not practical expectations in some communities. This is important when thinking about an ICS intervention, because benefits of the ICS that the family can observe will factor in to their decisions about adopting and maintaining the ICS. If an organization has higher expectations about the observable benefits of stove adoption than will be realized, the rate of user adoption and continued usage will likely be lower than anticipated. Generic expectations for all forms of ICS paint an image of ICS interventions that are not necessarily practical. This can lead to a lot

of attention, in the form of time and money, to be given to ICS design, which may distract

international development organizations and donors and from developing and supporting

interventions that would more efficiently address local community needs and priorities.

9.   Policy recommendations

9.1   Reduce the impact of the power dynamics between researchers and study participants.

Social class and the habitus of different groups have the potential to impact household responses about their needs, preferences, and satisfaction with donated or subsidized interventions. Households may feel incentivized to please the individuals conducting the study or providing the intervention. Incorporating understanding of the imbalance of power in situations of working with poverty stricken communities is imperative, both from an ethical standpoint and to better understand what intervention strategies actually help communities. There is a wide range of literature available from the fields of anthropology and sociology on suggested protocol for completing ethnographic research. Still, until recently many these insights have not been thoroughly applied to impact evaluation studies. The recent publication of *Monitoring and Evaluation in Health and Social Development* edited by Bell and Applegate (2016) provides a variety of suggestions and insights from recent development work on how to integrate ethnographic methods into monitoring and evaluation programs. Researchers, including local study team staff, should receive training in ethnographic research methods prior to starting a community based impact evaluation.

A few suggestions for decreasing the impact of the power dynamic between researchers and study participants arise from this study. First, focus groups may be useful for portions of the evaluation so that community members are not out-numbered by the research staff. In one of the semi-structured interviews conducted for this project, the researcher interviewed two study participants at the same time as they were family members with adjacent households. This process was beneficial as the study participants appeared relaxed and could consult one another

to understand the questions and provide responses. This could be tried with a portion of the study participants to compare the type of feedback provided in a focus group setting versus a one-on-one interview. Second, the researcher should establish understanding with the study participants that they are separate from the individuals that provided the donated product, especially when praise or appreciation for the product is offered to the researcher. In this project, this was accomplished by reminding the study participant that the researcher had not been responsible nor provided funding for the donated product and that the researcher's position was as a student with interest in improving interventions in the future.

In many impact evaluations available in the literature, the details of the training of researchers and the methods and questions employed to understand user behavior are not detailed or justified. It is unclear when proper methods of survey design and implementation are employed. The field of international development is encouraged to develop a set of standards, or required practices and principles, regarding the training of researchers, questionnaire design, and specific methodologies employed in impact evaluation research. This would allow research designs across projects to be repeatable and ensure that only high quality results are used for policy recommendations.

9.2   Impact evaluation study should closely resemble the intervention strategy employed in the real-world setting.

A limitation of this case study was that it examined the process of an ongoing adoption study; therefore, it is difficult to generalize some of the observations from this study that are related to the specific challenges faced during this adoption study implementation. For example, a few challenges of this study, such as the challenges of using male translators who were also community leaders and the issues with proper stove installation were unintended problems with

this adoption study that would hopefully be mitigated in future efforts. However, this presents an important observation about how the implementation of this cookstove initiative did not match the actual implementation strategies employed by the organizations who purchase and distribute stoves from the EcoComal factory in Guatemala. Based on conversations with EcoComal staff, the majority of cookstoves produced by the factory are purchased by international organizations who then distribute the cookstoves as part of community projects. It should be clear based upon the challenges faced in this study and from prior literature that the actual implementation strategy is a crucial component to the success of cookstove initiatives. Factors such as education about proper stove usage, proper installation of stoves, and response and resources for stove maintenance play an important role in the long-term usage and longevity of cookstoves.

Indeed, Hanna et al. (2016) have recognized this issue in their critique of the findings of the Guatemala Respire Study. In the Respire Study, significant follow-up and maintenance support was provided to households throughout the duration of the study of stove usage. In that sense, the findings of the Respire Study are only relevant to further projects that provide the same level of maintenance, education, and follow-up as were provided during the study. A similar lesson is relevant with this case study. The challenges of implementation that occurred in this study, such as improper chimney installation, lack of use of the *portaleña*, and the unexpected construction of extra open fires during the study could also occur in stove donations projects completed by other organizations who purchase stoves from the factories supported by StoveTeam. Therefore, in order to measure actual impact of the stove in the real-world setting, future adoption studies should reflect the same implementation strategy used by organizations who purchase the stoves.

One particular challenge of the implementation of stoves from this study is that of the proper chimney installation on the Ecoplancha stove model. Based on conversations with community members in Las Brisas about this issue, the community members had legitimate fears about the possibility of cutting a proper hole in their rusty metal roof. They believed that attempting to cut the hole would lead to cracking of the material and leakages in the roof in the future. In the StoveTeam report of the adoption study, they note, "In retrospect, this [proper chimney installation] should have been explained in the consent and selection process as a requirement of participation (Laughlin & Garland, 2017, p. 22)." A potential consequence of excluding participants from the study process based on their willingness to install their chimney in their existing roof may be that those households with the worst roofing material, who are likely to be those with lower economic possibilities to maintain their roof, would be systematically excluded from the study. A recommendation to mitigate this issue without biasing the study through this systematic exclusion would be to provide at least one new sheet of tin roofing material in which the chimney could be properly installed without passing the risk of a leaky roof onto the household.

9.3   Increase focus on the market-driven model.

StoveTeam International promotes a market-driven model for cookstoves in which they support local entrepreneurs in design and maintenance of cookstove factories. The ingenuity and promise of this model are evident; the Guatemalan based stove factory supports the local economy with jobs, and the various stove model designs produced by the factory demonstrate the promise of supporting local entrepreneurs who improve stove designs for the local cultural context. The Ecoplancha stove model, for example, had design elements that were highly desirable amongst local women, such as the ceramic "wings" along the sides and the *plancha*

surface for preparing tortillas. The factory produces a variety of stove models which demonstrates an understanding that households and communities have different needs and preferences with regards to cookstoves.

Yet, the majority of cookstoves produced by the Ecocomal factory are being purchased by other international organizations to conduct community projects. The demand for cookstoves which the Ecocomal factory is supporting is therefore driven by the demand of other international organizations and not necessarily the demand of the local economy. Therefore, it is recommended that more emphasis be placed on promoting local demand for cookstoves as this is a way to ensure that cookstoves meet an exhibited desires of local people.

9.4   Conduct community needs assessment

If the primary demand for cookstoves produced by StoveTeam factories remains other international institutions, a broader criticism of this development strategy arises. This study did not have the opportunity to observe an implementation strategy of one of the organizations that purchases Ecocomal stoves. However, in the communities that were a part of this study, there were complex barriers to development and a lack of economic opportunities that may have prevented a cookstove donation initiative by itself from fulfilling secondary benefits of cookstoves, such as increasing economic possibilities by freeing up time spent on firewood collection. When the stoves produced by local factories are supplying the development initiatives of other organizations that handle implementation, there should be a strong emphasis or recommendation to these organizations that the cookstove initiative be in tandem with the community needs and priorities and conducted in a way that empowers local residents. This finding is in line with the work of William Easterly, who argues that viable long term solutions to addressing global poverty must focus on increasing the rights of the poor (Easterly, 2014).

Considerable collaboration with local community members and completion of community needs assessments to recognize when an ICS intervention is or is not the best intervention strategy for a particular community is recommended to any organizations that purchases cookstoves to then donate to international communities.

This critique reflects a broader criticism international aid organizations and urges that organizations take steps to minimize the potential for negative impacts of paternalism. As Bourdieu's theory of symbolic violence warns, when one group of people has a high level of power, in this case the organization providing international development assistance, their unique habitus can unconsciously lead to reproduction of inequality in society. Evidence from this case study demonstrated that this could occur, for example, when community members expressed gratitude for their cookstove even when the product is not functioning properly or meeting their expectations. If nothing is done to reduce the power dynamic and ensure reliable measurement of outcomes in this setting, as suggested in the first policy recommendation, the intervention strategy will not be improved and the real problems faced by the communities will not be addressed.

10.   Conclusion

There are many diverse opinions in the academic and policy arenas regarding how to address global poverty. This case study focused specifically on one somewhat controversial intervention strategy, that of improved cookstoves. Data collected for this case study was obtained through observation and participation of a cookstove adoption study conducted by a NGO in rural Guatemala. While many families were happy with their stoves and using them daily, there was room for improvement to fulfill the needs of all households and ensure long-term viability of the donated stove. Qualitative observations and interviews revealed important information regarding stove usage habits and factors that may impact longevity of use of the stove models in these communities.

Some findings from this research are generalizable to other forms of household level interventions and the evaluation efforts of those interventions. Through the incorporation of qualitative methods, this study has developed an understanding of the habitus of the target populations and how it impacted the evaluation strategies used. Household surveys, which are commonly used for at least a part of the evaluation of many programs in international development, have limitations in their ability to understand behavior. If social class dynamics change the results obtained from impact evaluations, as this study has suggested, this issue needs to be taken seriously by anyone conducting field evaluations in the developing world, not just those interested in cookstoves. Steps to reduce the power differentials during the impact evaluation process need to be taken in order to ensure that the outcomes of the research are properly measured. By decreasing the power differential, it is hoped the target populations of development projects will be empowered and able to ensure that their voice is adequately represented in measuring the impact of the project.

Further research incorporating social theory in international development evaluation is desired to ensure that interventions are being accurately evaluated and adjusted when necessary to accommodate social class dynamics. Ultimately, the goal of this form of research is to allow governments and organizations to design development strategies that produce results that are deemed desirable by target populations, not just by those that are conducting the intervention.

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Appendix A – Images

Image CB-12: Blackened Ecoplancha surface with spots of rust.

Images CB-32-1 and CB-32-2. The Ecoplancha stove that had gotten wet (right) sat out to dry while the base structure (right) was still being used to prepare tortillas.

Image CB-33: Kitchen only has partial walls, allowing most smoke to exit even with the shortened chimney.

Image CB-24: Ecoplancha chimney does not exit roof, and smoke noticeable in the room.

CB-25: Ecoplancha being used to prepare tortillas with noticeable smoke in the room.

Image CB-07: Ecoplancha with elbow to turn the chimney outside the room.

Image CR-12. Ecocina and traditional fire in use at the same time.

Image CR-15. Large plancha model stove was present in the home.

Image CR-01 (left); Ecocina in use without portaleña. Image CR-08 (right); Ecocina with portaleña.

Image CR-37. Ecocina loaded with trash at time of visit.

CR-04. Note improvised open-fire in upper left corner.

Appendix B – June Questionnaire

Installation Survey

Participant Identification Sheet

Please ensure you are interviewing the main cook

A. Participant Identification		
A1	Date [dd / mm / yyyy]	_ _ / _ _ / _ _ _ _
A2	Time of visit [hh:mm] 24-hr time	_ _ : _ _
A3	Household ID	
A4	Study village *[circle one]*	1
		2
A5	Surveyor Name/ ID	
A6	Name of main cook	
A7	Age of main cook	
A8	Telephone number	
A9	Address or identifying features of home such as next to the market, church etc. Add enough detail so the home can be found in subsequent visits.	
A10	Was verbal consent granted?	Previously 1
		Presently 2

Please note: In order to maintain confidentiality of each participant, information from this cover sheet will be entered and stored separately from the data in the completed questionnaire

All notes and guides for field team on the form are in written in *italics* and placed in [*square brackets*] please ensure you read all of these carefully.

MA means multiple answers are allowed. SA means **single answer only**.

PART I - Current Practices

101	What difficulties do you have using your traditional stove? (Do not read list; can enter multiple codes.) *Cuáles son las dificultades que tiene usted usando su fuego tradicional?* *Que le hace difícil o desagradable?*	A. Consumes more firewood	1	
		B. Takes more time to cook	2	
		C. Emits more smoke	3	
		D. Not durable	4	
		E. Aesthetics; looks ugly	5	
		F. Difficult to light/ignite	6	
		G. Difficult to move; handles get hot	7	
		H. Not stable; easy to tip over	8	
		I. Stove is too tall; cannot sit and cook	9	
		J. Stove is too short; cannot sit and cook	10	
		K. Surface gets hot; difficult to remove pot	11	
		L. Not proper size; too large for most tasks	12	
		M. Not proper size; too small for most tasks	13	
		N. Doesn't fit the pots I have	14	
		O. Not safe during cooking	15	
		P. Pots get too dirty	16	
		Q. Have to spend too much money on fuel	17	
		R. Other (please write in) Takes too much tending/attention	96	
102	What is most challenging about using the traditional stove? *Cuáles son las dificultades que tiene usted usando su fuego tradicional?*			
103	Are there things that you do like about using your traditional stove? *Hay cosas que si le gusta de su fuego tradicional?*	A. Cooks food quickly	1	
		B. Easy to use	2	
		C. Stove at the right height	3	
		D. Other	96	
107	How much smoke would you say the stove you use most frequently produces: a lot, some, hardly any or none? *Que cantidad de humo produce la cocina que usted más?*	A. A lot – Mucho (bastante humo)	1	
		B. Some –Algo de humo	2	
		C. Hardly any – Poco humo	3	
		D. None - Nada de humo	4	
		E. Other (please write in)	96	
108	What is bad about the smoke it produces? [Do NOT read the list] *Que son los aspectos malos del humo?* *Como le afecta el humo de su cocina?*	A. Stinging eyes	1	
		B. Headache	2	
		C. Cough	3	
		D. Difficulty in breathing	4	
		E. Makes utensils dirty	5	
		F. Makes kitchen dirty	6	
		G. Other (please write in)	96	
109	What is good about the smoke the stove produces? – Read list *Que le parece bueno sobre el humo?* *El humo de su cocina le ayuda con las siguientes tareas?*	A. Insects *Repelente de insectos*	1	
		C. Useful to cure food *– para secar comida*	3	
		E. Flavors the food *– para el sabor de los alimentos*	5	
		F. Other (please write in) _____	96	
110	Would you please show me your cooking pots? (take photos and note	A. Round bottom		
		B. Flat bottom small		

	size and shape (round/flat bottom) and quantity of each) *Nos podría mostrar (ensenar) sus ollas que usted usa para cocinar?*	C. Flat bottom medium		
		D. Flat bottom large		

Other Energy Uses

119	Does the household have a functioning cell phone? *Usted tiene movil?* *Alguien en su casa tiene celular o teléfono móvil?*	No	0	
		Yes	1	
122	How many hours per day do you light your home? *Cuantas horas al día mantiene usted la casa iluminada?*	Value _____		
123	Do you heat water for: Usted calienta agua para algún uso personal, como por ejemplo: *Para que calienta usted el agua?*	A. Bathing Bañarse	1	
		B. Washing dishes Lavar trastes	2	
		C. Other cleaning Otro uso de la limpieza	3	
		D. Other _____	96	
124	How much water per day? [estimate volume by cooking pot size] *Cuantos galones o litros de agua caliente usa usted cada día?*			
125	What time of day? *Cuando calienta usted el agua?* *A que hora normalmente calienta el agua?*	Before breakfast	1	
		Morning	2	
		Afternoon	3	
		After Dinner	4	
		At night	5	

NGO Involvement

140	Prior to hearing of the StoveTeam project, had you considered purchasing a new stove? *Antes de conocer a Stoveteam, usted había considerado (o pensado) comprar una cocina así como esa?*	1- Yes 2 - No		
141	What kind? *Que tipo do cocina había usted considerado (o pensado) comprar?*	A. Wood-burning traditional	1	
		B. Wood-burning improved	2	
		C. LPG	3	
		D. Kerosene	4	
		E. Other:	96	

143	Has your family received any products or services from government or community projects? *Su familia ha recibido productos o servicios del gobierno o de ONGs?*	A. Food	1	
		B. House	2	
		C. Water supply/filter	3	
		D. Fuel subsidy	4	
		F. Latrine	5	
		G. A product:	6	
		H. Other:	96	
144	What type of product? From whom? Is it still in use? *Cual tipo de producto?* *De quien/ cual proyecto?* *Lo ocupan todavía?*	1- Yes 2 - No		
147	Do you know why you have been chosen to receive a cookstove today? *Usted sabe por qué está recibiendo una nueva cocina?*	1- Yes 2 - No		
148	If yes, why? *Por qué usted la recibió?*	A. Research study	1	
		B. Government program	2	
		C. Volunteer	3	
		D. Other:	96	

Part II – Social questions

203	How many children do you have? Do they go to school? *Cuantos hijos tiene? Van a la escuela?*	A. I don't have any children	1	
		B. No.	2	
		C. Yes, only the boys	3	
		D. Yes, all of them	4	
		Number of children:		
204	Who collects your firewood? (Circle all that apply) *Quien recoge la lena para la casa?*	A. Husband B. Cook being interviewed C. Children	1 2 3	
205	Do you collect every day or during certain seasons? *Horario de recoger la leña? Recoge la leña todos los días?*			
206	How long does it take? *Cuánto tiempo lleva recoger la leña? O cuanto tiempo se tarde en recoger su leña?*			

207	Do you always have to dry your firewood? How do you dry it? *Hay que secarla? Como la secan?*			
208	How much wood do you carry in one trip? [estimate or weigh if possible] *Cuanto traen en un viaje? (En libras)*			
210	What do you like about collecting wood? *A usted que le gusta sobre el recogimiento (la recolección) de la leña?*	A. Socializing- gather with friends B. Time to get outside 		
211	What don't you like about collecting wood? *A usted que le molesta sobre el recogimiento (la recolección) de la leña?*	A. It is heavy B. It takes too much time C. 		

Optional semi-structure questions

1. What types of improvements to your home would you like to make? (Do not prompt – may list multiple options) If you could improve one thing in your home, what would it be?
   Si usted tuviera posibilidad de mejorar alguna cosa en su casa, que escogería? (O cual cosa considera usted que le beneficiaria más?)

2. How is your access to energy in the community? Are there ways it could be improved?
   Como es su acceso a la energia?

3. What do you think are the priorities for improving the community?
   Para usted, que piensa que son las prioridades para mejorar la comunidad?

4. For the woman: What is the most difficult task you do? What would make that easier for you?
   De todas las cosas que hace usted durante el día, cual le cuesta mas? Como podría mejorar eso?

Información básica

Casa ID (Household ID)	Comunidad (Community)	
Fecha: (Date)	**Hora: (Hour)**	
Datos de la cocinera (Stats of the cook)	Edad: _____ (Age)	¿Cuántos años tiene de vivir en la comunidad?: (How many years have you lived in the Community?)
Número de personas que viven en la casa: (Household size)		Fuentes de ingreso para la casa: (Sources of income for the household)
¿Hay niños menores de edad en la casa? (Are their children in the home)	☐ Si ☐ No	Sus edades _____ (their ages) ¿Están estudiando? ☐ ☐ (are they in school)

Observación

La estufa (Ecoplancha o Ecocina) esta: (The stove is:) ☐ En llamas (burning) ☐ Caliente (hot/warm) ☐ Fría (cold)	El fuego tradicional esta: (The traditional fire is) ☐ En llamas (burning) ☐ Caliente (hot/warm) ☐ Frio (cold)
¿Dónde está la portaleña? (Where is the portaleña) ☐ Adentro de la cámara de combustión (inside the combustión chamber) ☐ Afuera de la cámara de combustion (Outside the combustión chamber, where?) Donde:_____ ☐ No esta (Not found) Otras notas de la cámara de combustión: (Other notes about the combustión chamber)	**Las Brisas solamente (Only Las Brisas)** Como aparece la chimenea: (How is the chimney) ☐ Conectado al techo bien (connected to the roof properly) ☐ Despegado del techo o mal ubicado (disconnected from roof or poorly placed) ☐ No esta (Not present) ☐ Con oxidación (With rust) Otras notas: (other notes) Como aparece la plancha: (How is the plancha Surface?) ☐ Bien (good condition) ☐ Con oxidación (rusty) ☐ Deformado (mis-shapen) Otras notas: (other notes)

Otras notas sobre las cocinas (por ejemplo, ubicación de las ollas, si están llenas de ceniza) (Other notes about the kitchens, for example, location of pots, ash, etc.)	
Estufa: (Stove)	**Fuego tradicional: (traditional fire)**

Notas de la entrevista

☐   ¿Obtuvo consentimiento de la cocinera? (Was consent obtained)

☐   ¿Uso grabación de voz? (Was voice recording used)

Preguntas opcionales (optional questions)

1. **¿Cómo le ha ido con la nueva estufa?**
    a. ¿Delata más o menos tiempo cocinar?
    b. ¿Hay comidas que no cocina bien en la estufa?
    c. ¿Qué le gusta sobre la estufa?
    d. ¿Le costó aprender a usarla?
	How has it been with the new stove?
	
	    a. **Does it take longer or less time to cook?**
	    b. **Are there foods that don't cook well on the stove?**
	    c. **What do you like about the stove?**
	    d. **Was it difficult to learn to use?**

2. **¿Cuáles son los problemas más graves de la comunidad?**	**What are the biggest problems facing the community?**
3. **En todo su tiempo en esa comunidad, cuando era mas alegre? Por que?**	**In all your time in the community, when was it the happiest and why?**
4. **¿Qué opinas de la educación?** 5.	**How is the education?**

6. **Situación económica de la comunidad**
    a. Hay trabajos disponibles?
    b. Como ha cambiando en los últimos años?
    c.
	About the economic situation:
	
	Is there work? Has this changed in recent years?

7. **Otras notas**	**Other notes**

Appendix D – Interview details

Household ID	Assigned name	Interview in June	Interview in September	Interview length
CB-05	Florenda	X		8:02
CB-02	Maria	X		3:55
CB-35	Teresa	X		7:26
CB-38	Fabianna	X		12:37
CB-07	Gabina	X		5:16
CB-10	Petrona		X	4:04
CB-01	Juana		X	11:12
CB-08	Margarita	X	X	5:01
CB-22 and CB-23 (joint interview)	Milvia and Silvia		X	19:04
CB-25	Darlin		X	12:10

Note: First names of participants were randomized and assigned to household ID to use locally representative names.