



# WASHplus

## CONSUMER RESEARCH TOOLKIT

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## ABOUT WASHPLUS

The WASHplus project supports healthy households and communities by creating and delivering interventions that lead to improvements in WASH and household air pollution (HAP). This five-year project (2010-2015), funded through USAID's Bureau for Global Health and led by FHI 360 in partnership with CARE and Winrock International, uses at-scale programming approaches to reduce diarrheal diseases and acute respiratory infections, the two top killers of children under age five globally.

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—Elisa Derby and Julia Rosenbaum, 2016.

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This toolkit provides guidance on how to undertake consumer preference research on improved cooking technologies through Trials of Improved Practice (TIPs), including guidance in using associated data collection, entry, and analysis tools based on CSPro software available for free online. This toolkit also provides guidance on useful add-ons to consumer preference studies:

1. Willingness to pay assessments, to determine how consumers value and are willing to pay for these technologies, including through installment plans
2. Market demonstrations, to gather feedback from non-study participants
3. Controlled cooking testing, to assess stove performance in the local context; gauge the ability of the proposed technologies to meet local cooking needs; and identify necessary use and maintenance instructions for cooks
4. Kitchen performance testing, to assess the impact of the introduction of the improved stove on household fuel consumption
5. Stove usage monitoring, to determine how frequently the stove is used, for what purposes, and to what extent its usage displaces traditional stove use
6. Household air pollution monitoring, to assess the impact of the introduction of the improved stove on household air quality



# TOOLKIT OVERVIEW AND INTRODUCTION

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## **a. Why this toolkit?**

This consumer research toolkit was developed as a result of consumer preference studies that the WASHplus project undertook in Bangladesh and Nepal, and in response to interest expressed by stakeholders in the sector in undertaking similar research. It is designed to help cookstove-related businesses and organizations collect information from and about potential consumers for more effective design, selection, promotion, and sale of improved cookstoves (ICS). The tools help toolkit users identify: (1) stove designs, features, or models that appeal to consumers; (2) needed modifications to stove technologies based on consumer input and stove performance; (3) necessary consumer education on use and maintenance of stoves; and (4) marketing and financing approaches that stimulate stove dissemination and adoption.

Before stoves are marketed to the public, their performance (efficacy) should be tested in controlled laboratory settings. The stoves often perform differently, however, when consumers use them in the uncontrolled settings of their own homes. Further, a stove's impact on a household depends not only on stove performance, but also on the degree to which consumers replace their traditional cooking option with the improved stove. Through the consumer trials and associated tools presented in this toolkit, researchers can measure the in-home performance (effectiveness) of stoves when real consumers use them; learn about consumer likes and dislikes; and monitor use and misuse of the improved stove, including the level of displacement of the traditional stove. Stakeholders can use that information to design approaches that best support complete adoption and correct and consistent use of the technologies most acceptable to the target group.

Ideally, consumers should be intimately involved in product design at the outset to provide their input to the development of new stove models. This process is referred to as “human-centered design.” In reality, however, stoves are seldom designed with such an intense level of consumer participation. Conducting in-home product trials gives consumers an opportunity to interact with and provide input to stove designers and marketers, who can in turn work with consumers to troubleshoot barriers to use.

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## **b. Why perform consumer research; what is it and how can it help you?**

The objective of consumer research is to develop marketing and program strategies (including selecting appropriate products) that minimize risk to producers, distributors, and consumers alike and maximize the impact of improved behaviors and products (e.g., fuel savings, household air quality, quality of life). Consumer research takes place through the collection and analysis of data on cooks, current practices, and products suited to integrate with those practices, in order to select the products most likely to be appropriate, acceptable, affordable, and properly used by the target group.

Convincing consumers to adopt and exclusively use new, improved stoves is a complex proposition, affected not only by the choice of stove but also by fuel collection and preparation, cooking behaviors, and inter-family dynamics. Successful marketing thus should begin by identifying popular features or changes needed to make the product more desirable to consumers.

Consumer research, a kind of formative research, is the process of collecting information for use in “forming” an intervention appropriate for a designated audience. It involves developing a strategic tool called the “marketing mix,” which is based on in-depth knowledge of the intended audience. Planners use this knowledge to devise



appropriate behavioral recommendations, select the most appealing products, design persuasive messages to convince people to adopt the behavior or product, and choose the most effective channels and media for distributing the product to the intended audience.

Consumer research includes reviewing existing consumer/market information, collecting supplemental information on environmental and cultural contexts, and formulating a product that includes an appropriate combination of attributes and benefits. Based on consumer input, planners determine the critical elements of the complete product offering: product, price, place, and promotion, described in more detail below.

For instance, consumer research conducted by WASHplus in Bangladesh revealed that consumers appreciated a portable stove that could handle large,

heavy pots of rice, but they also expected to see leaping flames, which they associated with stove efficacy. These preferences affected the types of stoves they preferred and provided key information for businesses about marketing and education strategies.

### c. What are Trials of Improved Practice?

Cooking is an integral part of social and daily life. In many cultures, stove type, use, and location in the house reflect important family traditions. So, the best way to get feedback from potential consumers on a particular new stove type is to introduce the stove into their homes and track variables of interest as families go about their daily routine over weeks or months. The Trials of Improved Practice (TIPs) methodology<sup>1</sup> can be used to assess consumer preferences. It combines quantitative and qualitative<sup>2</sup> information gathering through a structured questionnaire format to facilitate data collection and analysis. It is an extended in-depth interview, during which the respondent serves as a consultant who provides input and suggestions over time. The TIPs method uses a range of measures. Among them are “elicitation questions,” which are semi-structured questions developed and validated to identify barriers and motivators to change. They address factors that are most influential in spurring—or deterring—a behavior such as consistent and correct use of a particular stove. Unlike other survey methods in which factors are held constant and researchers analyze the frequency and range of response, the TIPs mixed-method tool invites households to interact with researchers and identify, discuss, and—unique to this method—resolve barriers to using the new cookstove and/or fuel. Households may be asked to compare cooking on the new stove with cooking on the traditional stove using a range of criteria such as taste, smokiness, time, fuel preparation, and use. Through these comparisons, researchers elicit categories of attributes valued by the target potential consumer.

<sup>1</sup> Trials of Improved Practices (TIPs) is a methodology first developed by the Manoff Group in the late 1970s and early 1980s to develop ways to improve young child feeding by engaging mothers themselves to develop and test out improved practices, serving as consultants in participatory research to develop viable solutions to challenging problems. TIPs have since been used in various countries to involve affected populations in developing solutions to various nutrition, dengue fever, infectious disease, family planning, HIV, WASH and other topical challenges including HAP. ([www.manoffgroup.com/approach\\_developing.html](http://www.manoffgroup.com/approach_developing.html))

<sup>2</sup> Generally, quantitative methods convert data to numbers (how many?) and qualitative methods explain “why.”

The in-depth interview embedded into the TIPs methodology is appropriate for eliciting reactions to partially completed products, alternative versions of products, and/or final products for testing. This technique requires the interviewer to create a comfortable, nonjudgmental relationship with the person being interviewed.

Sample sizes are relatively small, but the method is intensive. Because several stove types are often tested in study homes, both quantitative and qualitative comparisons of the attributes and perceived benefits are possible. The mixture of closed-ended quantitative questions and open-ended qualitative questions provides rich data that include descriptive statistics as well as explanations and observations. These trials can uncover the relative ease or difficulty of using multiple stove types; potential modifications to make the stoves more attractive or easier to use; unanticipated resistance points; ways in which traditional habits/practices undermine correct or consistent stove use; and data on frequency or intensity of stove use, and for what purposes.

TIPs research is composed of the following elements:

*Study Introduction and Consent:* The interviewer reads a script to members of each participating household before the trial begins. The script includes a full explanation of the trial and how it will unfold, including any potential risks. It also secures written consent for participation. This script should be translated into the local language as necessary. Participants are given a copy to keep.

*Baseline Questionnaire:* A questionnaire is conducted with cooks in participating households on the first day of the trial before the stove is delivered. The interviewer records information about the existing (baseline) stove and fuel types, and usage patterns; household demographic and socio-economic information; and perceptions of traditional cooking. Once the test stove is delivered, study staff train participants on proper use and maintenance of the stove.

*Initial Follow-up Questionnaire:* A second questionnaire is conducted after each participating household has used the new stove for a short period of time, usually three to seven days. Interviewers collect data on initial preferences, use patterns, and other initial reactions. They examine the stove and ask questions to determine whether participants have made modifications to the stove and/or are using it as designed/correctly. Interviewers note any problems and record participants' suggested solutions. They relay this information to study managers, who visit the household to solve the problems, whether by retraining users or servicing the stove. All problems and proposed solutions, whether feasible or not, are recorded as part of the questionnaire. If possible, staff ensure that the stove is working properly before leaving; otherwise stove technicians will return to fix the stove as soon as possible.

*Endline Questionnaire:* The final questionnaire is similar to the initial follow-up questionnaire but is conducted after households have used the stove for at least three weeks and preferably for several months. Semi-structured interview questions are again used to document preferences, use/experience with the stove, qualities attributed to new and old stoves, fuel use, cooking, and other outcomes.

The TIPs methodology is most effective when accompanied by methods to gather data on actual fuel use, stove use, and air quality. These quantitative methods include Kitchen Performance Tests (KPT), Stove Use Monitors (SUMS), and Household Air Pollution (HAP) monitoring. Willingness-to-Pay (WTP) assessments provide insights on how participants value the stove and the likelihood that they will purchase it at various price points.



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#### d. How can consumer research guide strategic marketing and promotion of improved cookstoves?

The results of consumer research provide cookstove-related businesses and organizations with important information for their future marketing and promotion of efforts.

**Guidance in identifying the target market:** Identifying core customers is the first strategic decision of a marketing plan or cookstove promotion program. Some initial consumers, called “early adopters,” are more likely than others to begin using new technologies. Consumer research can provide insights on which consumers are most likely to become early adopters of clean cookstoves and fuels. This knowledge can provide the foundation for a successful cookstove operation, because early adopters may influence the purchasing behavior of other customer segments. Other consumers “watch” and often follow the lead of earlier adopters after observing whether the cookstove is a safe and a “good buy.” Activating and supporting an early adopter segment is key to successful marketing. TIPs participants describe “what kind of people” are likely buy and use new cookstoves, and help to develop a profile of early adopters for the product.

**Informing the 4Ps Marketing Mix:** Most marketing decisions relate to what is commonly referred to as the 4Ps Marketing Mix: the right Product (s) at the right (affordable) Price, in the right Place(s), Promoted in a convincing manner to the right consumer (audience segment).

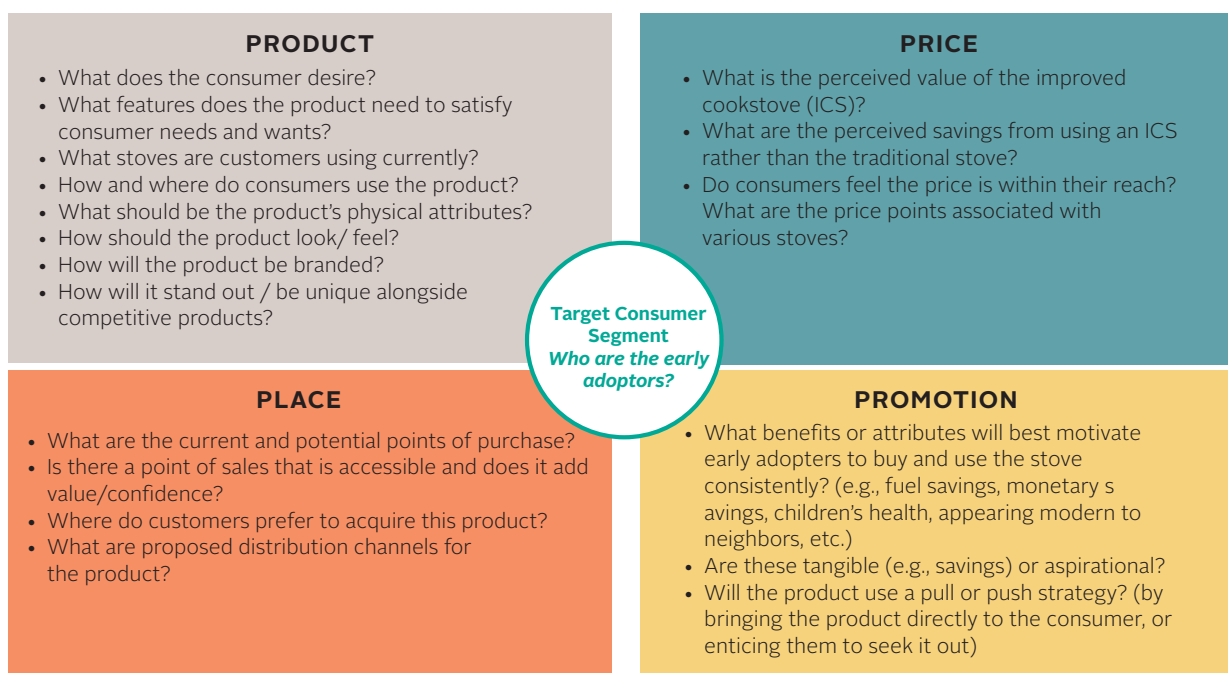
The 4Ps Marketing Mix is the principal means by which marketers engage with their target audience to encourage them to act in a certain way (e.g., purchase cookstoves or fuel). Because the 4Ps are such a critical decision-making tool, they can be a useful framework for structuring research questions and providing results that inform marketing actions.

Figure 1 illustrates how the research questions contained in the TIPs and WTP instruments can be organized around the 4Ps to inform action. The framework lists common questions that that TIPs/WTP can help answer.

Research can be both costly and time consuming, so the research objectives and specific questions for a given study should be focused and strategic. In other words, a study should be carefully designed to provide information for strategic planning and decision-making.

Effective marketing requires formulating a “marketing mix” that considers the “four 4Ps”—Product, Price, Place, and Promotion.

**Figure 1. 4Ps Marketing Approach**



This toolkit and the instruments it describes are useful to researchers/businesses focusing on expanding cookstove markets. The toolkit is meant to standardize qualitative research on cookstoves, so major adaptations are not recommended, nor can they be accommodated easily.<sup>3</sup> However, principal investigators and research managers must understand how the questions were designed to satisfy the research objectives, so they can critically analyze the instruments to modify them appropriately and utilize the data to their fullest. Country-specific revisions are detailed in Chapter 4.

### **e. What is the value of using multiple methods?**

Different research methods yield different kinds of information. Choosing the “right tools for the job” is vital, and often means using a mix of methods to collect different kinds of qualitative and quantitative data. Tools can be used simultaneously or in sequence. This toolkit recommends five methods (TIPs, KPT, SUMS, HAP monitoring, and WTP) to collect various kinds of data that inform the uptake, use, and ultimately impact of improved cookstoves.

The central premise of a mixed methods design is that use of quantitative and qualitative approaches in combination provides a more thorough understanding of research questions than either approach alone; together they capture the “what,” “how much,” and “why.”

In addition to capturing more robust data, researchers sometimes use different methods to collect the same kind of information to see if findings are similar. One would expect similar findings, but this is not always the case. This technique is referred to as “triangulation,” which is defined as using two or more methods to investigate similar issues to get a more complete, accurate picture than one method alone provides. If findings complement each other, they lead to deeper understanding. If they seem to contradict each other, researchers probe deeper into the data set to find a satisfactory explanation.

<sup>3</sup> The research instruments included in this toolkit, including questions, response categories, and analysis templates, have been carefully developed and tested. Only minor changes are recommended, and even possible given software limitations. Edits to the questions, including local foods and stove types, and response categories can be accommodated, but extensive revisions that include adding and deleting questions require reprogramming that the toolkit does not easily allow.



# KEY COMPONENTS

The toolkit includes the core consumer preference component of Trials of Improved Practice, and well as two add-on consumer preference activities: Willingness to Pay, and Market Demos. It also describes four add-on monitoring activities to evaluate stove performance and/or impact on the household: Controlled Cooking Tests (CCTs), Kitchen Performance Tests (KPTs), stove usage monitoring sensors (SUMS), and Household Air Pollution (HAP) monitoring.

COMPONENT	PURPOSE	TIMING/DURATION
TIPs	Assess consumer preference	Preferably 2 months or more
WTP	Assess consumer willingness to pay	At conclusion of TIPs; adds 30 minutes per household
Market demos	Gather consumer preference feedback from non-study participants	Ideally before TIPs, but can be done during or after; 1 half day per demo
CCT	Assess stove performance in local context	Ideally before TIPs; 1-2 weeks depending on # of stoves, plus cook practice on each stove ahead of CCTs
KPT	Assess changes in household fuel consumption	During TIPs period, ideally toward the end; each HH visited 4 consecutive days; 7-12 HH/surveyor/day depending on distance
SUMS	Monitor traditional and new stove usage	Ideally performed for the duration of the whole TIPs period; at least during KPT
HAP	Assess changes in household air quality	Performed during the KPT, or longer during the TIPs period

## Detailed description of data collection tools

### 1. Trials of Improved Practice

The TIPs instruments are designed to meet two overarching objectives:

- Document and compare consumer reactions, including how each stove meets expectations; and with the WTP and SUMS add-ons assess willingness to pay; and correctness and consistency of use of a variety of improved cookstoves<sup>4</sup>.
- Understand desired attributes and benefits of cookstoves (new and current) from the viewpoint of the consumer.

#### Primary Endpoints/Outcomes

Targeting the objectives leads to the collection of the following information for decision-making:

- Description of consumer preferences related to improved cookstoves.
- Identification of any usage issues and corresponding needs for training on use, lighting, and maintenance

<sup>4</sup>We recommend up to 5 or 6 stove types; more than that can become unwieldy. Research can be done with just one stove, although comparing it to others with different features and manufacturing qualities/price points will yield more useful information.

TIPs interviews are designed to answer the following consumer preference research questions:

- a. What are the desired attributes of a cookstove in general in terms of characteristics such as size, portability, color, and function? Does the new stove meet expectations and provide desired attributes? What do they like about the stove and what is “easy” about using it?
- b. What other stove characteristics, attributes, likes, and dislikes are most desirable to households? Besides savings in fuel costs, are other more emotional or aspirational attributes such as “modern,” “luxurious,” or “generous” also desired?
- c. Over time, during the course of the trial, what makes a stove hard to use?
- d. Are solutions to these barriers feasible, either by changes at the household level or changes in the design of the stove?

Consumer preference is assessed through a semi-structured questionnaire administered at baseline, after a few days up to one week, and after eight weeks. The repeated questions over time allow for quantitative and qualitative assessment of the stove after initial and then extended use. All questions require a response, and response options to some questions are read aloud for respondents to choose one, while other questions are open-ended with pre-coded responses to facilitate data capture, coding, and analysis. Finally, some questions are completely open ended, and responses are recorded by interviewers in abbreviated verbatim form and later coded and analyzed.

Table 1 below details the type of information collected in each interview.

**Table 1. Interview Tools and Data Collected**

TOOL	INTERVAL	RESPONDENT	TYPES OF DATA COLLECTED
Baseline Questionnaire—semi-structured questions	Baseline (Day 1)	Primary cook	Demographics and socio-economic status: family size, religion, ethnicity, education, occupations/ sources of income, # of people regularly cooked for, assets, economic condition, recent household purchases, women's group participation, recent financing Current stove and cost Reported use Preferred uses Available and preferred fuel types, use patterns, and expenditures Seasonality of fuel availability and expenditure Kitchen details (e.g., location, vessels used for which purposes, cooking pattern, ventilation, etc.) Perceived smoke exposure
Initial Reactions Questionnaire—semi-structured questions	Week 1 (Day 3-7)	Primary cook	General impressions of new ICS Level of satisfaction with the new stove Perceptions of new stove as compared with traditional stove (smoke, fuel, cooking efficiency, cooking ease, taste, cost of use, etc.) Fuel use Problems encountered (technological or behavioral) Reported use of new and traditional stove ( <i>also measured objectively through SUMS and compared</i> ) Preference for new or traditional stove Observed proper use of stove and correct function Corrected use at end of interview if stove is improperly used or malfunctioning Modifications made Maintenance performed
Endline Questionnaire of Perceptions over Time (semi-structured questions)	Week 8 (or Later)	Primary cook plus household purchase decision-maker	All questions asked during Week 1 are again asked and later compared to see if perceptions and preferences have changed over time.  In addition: Desired qualities of a cookstove Assessment of whether traditional and new improved stoves have the desired attributes Perception of the kind of person who would like and use this stove Self-assessment of whether the stove is "right" for someone like the user Assessment of social acceptability, including who might approve or disapprove of use, impressions of family and neighbors Assessment of "aspirational" attributes associated with stove (modern, thrifty, risky, good wife/mother, etc.)

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## 2. Willingness to pay: methods, rationale for use, and what each method tells you

WTP assessments guide product pricing, which can include installment or credit options, and they indicate more generally the potential demand for a product by a particular consumer audience. Some methods ask consumers directly how much they value products and services, while others assess WTP indirectly by setting up situations to “reveal” it or by examining available market data such as sales statistics generated from actual purchases. The WASHplus WTP approach includes two separate methodologies, randomly assigned to different project sites.

**Bargaining/modified auction.** The first method melds two well-accepted WTP methods (Vickrey auction and the Becker, DeGroot, and Marshak procedure)<sup>5</sup>, modified to reflect marketplace bargaining practices common to developing countries. Following a script, enumerators inform study participants of the value of the new stove and offer to sell it to them at a discounted price, paid upfront in cash or through an installment plan offered through a local micro-finance institution (MFI). Participants who do not agree to the price are invited to bargain, with the interviewer making counter offers limited by the “bottom line” value, which is not revealed to participants. This number is the lowest price for which they can sell the stove. It is a calculation based on the actual cost of the stove minus a discount because the stove is now used, and because there will not likely be in-country after-sales service for stoves introduced new to the market for the purpose of the study.

Since financing is part of the method, any formal installment plan with local MFIs or other financing entities must be arranged ahead of time, with a payment period of a designated number of months. For example, the payment plan used for the Nepal study included 12 payments over six months. The payment terms can vary greatly depending on the types/cost of the stoves used for the study and the income level of the target study group. In some cases, especially where people can save significant amounts of money on fuel purchase as a result of using the new stove (as in charcoal stoves, for example), paying back the loan may take fewer months. In places where people don't normally purchase fuel, the payback period may be greater. Alternatively, the research team can offer payment plans directly. In Bangladesh, WASHplus offered a direct payment plan of weekly payments over five weeks. Because the project did not have a planned presence in the communities after the completion of the TIPs trial, a longer, more attractive installment plan was not possible. In Bangladesh, study participants' lackluster interest in the payment plan helped motivate WASHplus to work directly with a local MFI to develop a more comprehensive installment option in Nepal.

**Buy-back option.** In the second WTP method, interviewers award the study participants their stoves as a token of appreciation for participating in the study; moments later, they offer a cash buy-back if participants prefer. The buy-back price is the same as the “bottom line” value mentioned for the first method. When using this method, researchers should apply it in all households in a village and nearby villages to avoid animosity about some households receiving nicer “thank you” gifts than others.

The benefit of using both methods in a study is that the combination gives researchers a more complete picture of how consumers value the stove. In the WASHplus Bangladesh study, for example, if investigators had used only the modified auction method to assess WTP, the low number of households entering into negotiations to buy a study stove (12 of 105)—and the fact that only one study home actually bought a stove—would have led them to conclude that households do not value the stoves at market rates. The results of the second WTP assessment, however—12 out of 15 households chose the stove over cash—led investigators to understand that participants valued the stoves enough to forgo their cash equivalent. This result suggests that people valued the stoves when acquisition barriers were removed, although it might also demonstrate an endowment effect, the phenomenon by which people ascribe more value to things merely because they own them<sup>6</sup>.

<sup>5</sup>Breidert, Hahsler, & Reutter. 2006. A Review of Methods for Measuring Willingness-to-Pay, Innovative Marketing. Becker, DeGroot, & Marschak. 1964. Measuring Utility by a Single-Response Sequential Method. *Behavioral Science* 9 (3): 226–32.

<sup>6</sup>Roeckelein. 2006. Selected Bibliography - Psychological Theories. In: *Elsevier's Dictionary of Psychological Theories*, 675–692. London: Elsevier Science.

The willingness to pay assessments are designed to answer the following research questions:

- a. Do households value the ICS?
- b. How much do they think the stove is worth?
- c. Who decides whether to purchase a new stove?
- d. What would a household pay for a particular ICS?
- e. Are there obstacles to paying for the ICS all at once? Would paying in installments make the ICS more feasible / desirable to buy?

For further information, consult the U.S. Environmental Protection Agency/Winrock International webinar on “Willingness to Pay for Cookstoves and Fuels”: <http://pciaonline.org/webinars/willingness-to-pay>.

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### 3. Market demonstrations

The objective of the Market Stall Preview is to observe and record typical potential consumer reactions to the stoves overall (as a “class” of stoves), including inquiries, concerns, and selling points, and to note which stoves appear to be of most interest and most appealing on first impression. This tool also assesses perceived value, appropriateness of the sales venue, and potential marketing appeals, thus contributing to all 4Ps of the marketing mix. It is an informal market tool that does not screen participants other than by selecting a market location likely to serve early adopter buyers of improved cookstoves.

To be as unobtrusive as possible, no formal tool is used to elicit or record information. One researcher inconspicuously observes and takes notes from a distance, while other researchers acting as the sales force mentally note and later record observations.

The stoves are displayed at a local market using a store front, stall, or blanket to resemble a typical vendor. A banner announcing, for example, “SNEAK PREVIEW: NEW COOKSTOVES SOON AVAILABLE IN YOUR DISTRICT!” invites market attendees to see the new stoves. Additional appeals, such as “Requires less wood fuel, puts out less smoke! The new generation stove for your modern kitchen....” are advertised on banners and announced verbally (shouted) if needed to draw attention to the display.

Shoppers are free to examine, hold, and lift the unlit stoves. The “seller” casually interacts with interested customers, asking questions such as:

- Have you ever seen stoves like this before?
- What do you think of them?
- Do you think these stoves are something you might want in your home?
- What do you like about the stoves?
- If you went home today and told your husband/wife about this new stove, what would you say?
- If you had to guess, what do you think these stoves would sell for?

Researchers note questions consumers have about pricing, durability/expected lifespan, service, maintenance, safety, and fuel type/consumption/preparation.



At regular intervals, the research team fires up two stoves at a time to spark additional conversation and elicit feedback on new stoves. Researchers may choose to cook a typical local food, or just boil water on the stove. The drawback of cooking food is that it can become a distraction and attract many non-buyers (especially children), who make it harder to talk to the potential customers, and requires both pots and ingredients. The benefit is consumers can see that the stove can cook the staple foods they need, and is appropriate for more than just boiling water for tea.

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#### 4. Controlled cooking tests

If the improved technologies selected for the study have performed well in the laboratory, and if researchers have reason to believe the target audience will like them—but real cooks haven't tested them while preparing local cuisine—the CCT can provide valuable information. Cookstoves that perform well in a laboratory setting (to boil water) do not always perform well in the field, or for a specific local food. The CCT assesses the performance of stoves relative to the traditional stoves they are meant to replace. It consists of multiple (at least 3) cooks performing a standardized cooking task (the same meal, using the same amounts of the same ingredients) multiple times (at least 3 tests per cook per stove type) on each stove. Multiple cooks are needed because each person's cooking style varies, and cooking styles can have a major impact on stove performance. The test is meant to approximate cooking tasks that local people do daily, but with as few variables as possible. It often takes place in a central location (not in homes), with standardized fuels and pots that are representative of local cooking practices. The test reveals what is possible in households under controlled conditions, but not necessarily what households achieve during typical use. The test typically measures fuel consumption and cooking time; researchers may also measure emissions if they have the required equipment. The testing period should be scheduled for as many days as there are stove types, plus one day. This assumes each cook can complete three cooking tasks per day, and that all cooks perform cooking tasks in parallel.

CCTs should be conducted prior to the TIPs trial for two main reasons. The first is to confirm that stoves achieve the fuel/time savings and emissions reductions expected based on lab tests, are appropriate for local foods and cooking styles, and are therefore worth including in the trial. The second is to spot incorrect usage early on by observing the CCT cooks. Such observations will inform usage instructions given to study participants at the beginning of the trial. Cooks hired to perform the CCT should be given adequate time to practice on each of the stoves to be tested, ideally in their homes for at least 5 days per stove type, before the CCT testing takes place. Cooks selected should all use the same type of stove at home (ideally the type of traditional stove typically used in the study area) for replicability of test results.

More detail on the CCT, including the CCT protocol, can be found here:

<http://cleancookstoves.org/technology-and-fuels/testing/protocols.html>.

Only organizations specifically trained by experts in undertaking the CCT should do so; the protocol is not meant for inexperienced researchers to undertake.

For those without the resources or expertise to undertake a full CCT, a small focus group discussion or a simple test cooking a local meal with a local cook can help to at least rule out clearly inappropriate cookstoves, albeit without the scientific rigor and comparative assessment to the traditional stove that a full CCT provides.

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#### 5. Kitchen performance tests

The KPT is a field test for measuring daily household fuel consumption and requires weighing fuel consumed by a household daily over four days. The KPT measures all fuel consumed, not just the fuel consumed by the intervention stove. Especially when combined with stove use monitoring data, the KPT shows whether and how a household has incorporated an intervention technology into its cooking system. It does not measure the performance of any individual stove, but rather the impact of the introduction of an intervention stove on

(total) household fuel use. KPTs are conducted in real homes with real cooks preparing real meals of their own choosing, without standardization across households. Researchers may also monitor air pollution and track stove use during the KPTs.

KPTs should be performed as near the end of the trial period as possible, but before and without interfering with the endline survey.

More detail on the KPT, including the KPT protocol, can be found here:  
<http://cleancookstoves.org/technology-and-fuels/testing/protocols.html>

Only organizations specifically trained by experts in undertaking the KPT should do so; the protocol is not meant for inexperienced researchers.

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## 6. Stove Use Monitoring

In most improved stove interventions, households usually continue to use their traditional stove to some degree in parallel with the new stove. Researchers can track actual usage of both improved and traditional stoves through the use of temperature-sensing stove-use monitors, which record stove temperature at regular intervals over a period of time. SUMS provide an objective, quantitative, and unobtrusive measure of stove use (total time spent cooking) and usage patterns (number, timing, and duration of “cooking events,” i.e., times when stoves were lit), which can be compared with survey-reported use across study households. Researchers analyze data to determine the duration and frequency of cooking events per day, and to assess the proportion of cooking events using different fuel/stove combinations. Unlike survey methods, SUMS avoid recall and reporting bias issues and minimize the Hawthorne effect, which is the phenomena of people behaving differently when they know their behavior is being monitored.

Multiple SUMS options are available, at varying price points, some of which allow for remote monitoring. The best option for a given study depends on the budget and types of stoves being monitored. The data below include current pricing (as of January 2016) and may be subject to change. New devices are continually being added to this suite of tools, so it’s best to check with each manufacturer for the latest information on pricing and features before starting the study.

**Table 2. Profile of Various SUMS Available on the Market**

DEVICE	COST	MAX TEMP	NOTES
Data-logging iButton thermometer (solid-state)	US \$35-/\$70 each, depending on data storage capacity and max temperature	125°C	One-year life with a built-in battery, can be switched on/off to increase battery life. Data must be physically downloaded every 6 weeks at least. One iButton per stove; harder for open fires
Data-logging infrared thermometers	US \$100-\$150	250°C	Rechargeable LiPo battery (2-3 month life) Programmable, can monitor up to three stoves simultaneously plus ambient temperature tracking Easy to use with open fires
kSUMS (data-logging thermocouple)	US\$150; can be rented	1250°C	Rechargeable LiPo battery (2-3 month life) Programmable, can monitor up to three stoves simultaneously plus ambient temperature tracking Easy to use with open fires
Nexleaf StoveTrace (wireless temperature monitoring system)	US \$150; can be rented	300°C	Rechargeable lithium battery that can last five days without a power source Automatically logs and transmits real-time stove-use data, then uploaded to a central website
SWEETSense sensor (wireless temperature monitoring system)	US \$400; required data service \$50/yr		Uses AA batteries lasting up to 6-18 months Uses four thermocouples Automatically logs and transmits real-time stove-use data via a cellular network to a specialized database Provides summary statistics; frequency of use, performance of each sensor, and the technology it monitors

SUMS data can be analyzed online via a free Softsumit tool developed by the Universidad Nacional Autónoma de México (UNAM-CIEco) and a Winrock/U.S. EPA open-source household-level SUMS data analysis tool, and through the UC Berkeley SUMsarizer tool and Berkeley Air Monitoring Group PICA software platform, both available commercially.

## 7. Household air pollution monitoring

Those with the resources to do so can also assess the impact of the intervention on household air quality during the KPT monitoring (through hired experts). Small particles (PM<sub>2.5</sub>) and carbon monoxide (CO) are the most commonly measured pollutants in wood smoke, as they are widely accepted to be the source of the majority of the ill-health resulting from solid-fuel use<sup>7</sup>. Instruments for measuring these pollutants are placed in the kitchen, and minute-by-minute kitchen concentrations can be recorded using real-time data-logging instruments. Personal exposure can also be tracked through monitors worn around the neck. Factors in addition to stove emissions that affect pollution levels include ventilation rates, the size and type of kitchen, the mix of stoves and fuels used, the number of people cooked for, lighting, and other indoor sources of pollution, such as emissions from kerosene lighting and cigarettes.

HAP monitoring should only be undertaken by trained experts with specialized equipment.

<sup>7</sup> Berkeley Air Monitoring Group WASHplus Bangladesh HAP reporting, 2014

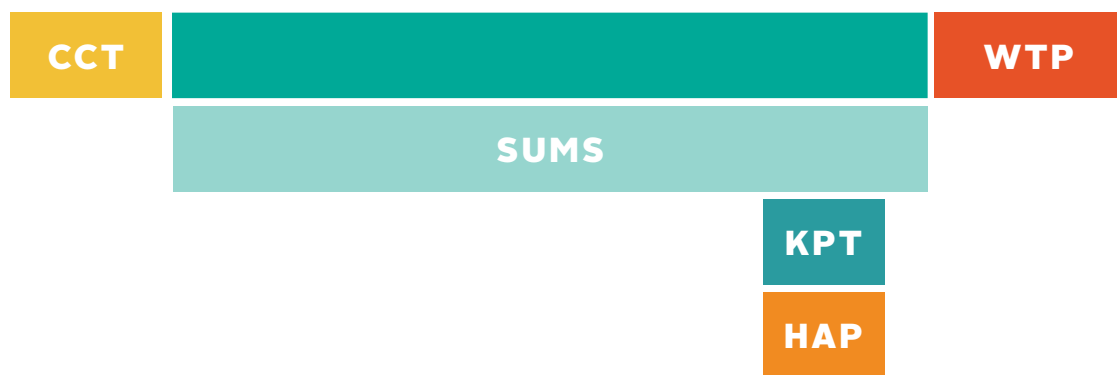


# TIMELINE AND SCHEDULING

The two first steps in undertaking a consumer preference study are to develop a study calendar and determine whether or not an external research partner is required. These steps can be undertaken simultaneously.

## Develop calendar

The consumer preference study requires three weeks of in-home trial time at a bare minimum; ideally 2 months or more. The WTP assessment is an add-on to the Trials of Improved Practice process, and adds about an hour per household to the final TIPs endline survey. KPTs, SUMS, and HAP monitoring all take place during the TIPs period. CCTs should be undertaken before start of in-home trials. Market demonstrations can be undertaken at any time before, during, or after the TIPs period, but performing them before TIPs can provide valuable information to guide stove and study site selections, as well as questionnaire modifications, particularly response categories.



Implementers need to clarify whether ethical review and clearance is required; if so, that process can take 2-6 months. For further detail on IRB applications and procedures, consult IRB Annex, p. 46.

Even when Institutional Review Board (IRB) clearance is not required by the donor or organization conducting the study, many countries require this ethical review before research is undertaken.

Other timing considerations include choosing the most representational time period for the field work in terms of seasonality, which affects site accessibility, cooking patterns (indoor or out), and fuel types and availability; and avoiding local holiday periods, which affect cooking patterns as well as willingness to participate in the study.

Even the most well-planned field studies experience unforeseen challenges, and while it is not possible to predict and plan for all eventualities, flexibility is certainly required. In the Nepal study, for instance, WASHplus encountered numerous obstacles to the timeline: political turmoil and strikes, which made study areas inaccessible; a vehicle fully loaded with equipment accidentally set on fire by a discarded cigarette; and extensive

delays following the tragic earthquake of April 2015, which caused such severe damage to homes in one study site that they could not participate in the study, pushing the trial period into the monsoon season. Researchers must therefore be resourceful, flexible, and prepared to develop Plans B, C, and D as needed.

Table 2 below shows a sample calendar for all research steps given a 2-month in-home trial window. It does not account for preparation, IRB, or analysis.

**Table 3. Timeline of Research Steps**

RESEARCH STEP TIMING	ACTIVITY	NOTES
<b>3+ months prior to baseline, or any time during timeline</b>	Market stall ICS preview demonstration, with data/ reactions collected by discreet observation.	Stall set up at real market; customers view, ask questions, and react to new stoves.
<b>1-2 months prior to baseline</b>	CCT	CCT cooks practice on stoves for at least 6 days/type ahead of testing. Schedule 1-2 days/stove type for testing.
<b>Baseline</b> (Day 1 of in-home trials)	Stove installation Brief semi-structured questionnaire to assess current practice	Interviewers complete the questionnaire at the beginning of the study and later “circle” back to houses for the Day 5-7 interview. Baseline questionnaire is approximately 40 minutes per household.
<b>Day 5-7</b>	Semi-structured questionnaire of initial reactions	Approximately 40 minutes to complete per household.
<b>Week 6</b>	KPT	Measure fuel use at 24-hour intervals over three days, with limited accompanying questions. 4 total visits to each house, including initial introduction. Depending on the distance between households, each surveyor can visit 7-12 HH/day.
<b>Week 6</b>	HAP monitoring	Measures concentrations of particulate matter (PM <sub>2.5</sub> ) and CO room concentrations 24 intervals over 3 days as part of KPT (continuous data logging).
<b>Week 8 or later</b>	Semi-structured interview WTP	Approximately 60 minutes to complete without WTP; 90 minutes with WTP.

### Conduct research “in house” or find the right research partner

Market research requires specialized skills (outlined in the next section below), which might or might not reside in the organization planning the study, or the organization might be too busy with general operations and program initiatives to engage in sophisticated research endeavors. In these instances, organizations have the option of hiring a research company or consultant to support market research.

If research is not to be conducted “in-house,” the next step is to find a partner. Hiring a research partner still requires careful planning and clear articulation of the goals of the study, the data to be gathered, and the purpose for which it will be used, as well as management of the research partner throughout the research process.

Study organizers can find a research partner by creating a terms of reference (TOR) for the work and using it to solicit proposals. Clear, specific research questions are the cornerstone of the TOR. The TOR also acts as a checklist and point of reference throughout the process. It guides discussions among study organizers, stakeholders, and the consultant or vendor around methods, questionnaires, and analysis. The TOR is the foundation for the entire study.

Consultant/vendor deliverables listed in a TOR might include: study protocol, a document that summarizes background, purpose of study, research objectives, and questions; methods to be used with detailed plans, including sample size and study location; an analysis plan; initial data frequencies, codes, and tables; draft and final reports; and graphic presentation of findings.

Once the TOR is completed, it can be circulated to newspapers, online classifieds, listservs, or a “shortlist” of vendors and potentially interested partners, inviting submissions of study proposals. Often each organization has existing guidelines or regulations for selecting a development partner or stove organization with regards to release and publication of the TOR, e.g., that announcements must be published in local newspapers and on organizational websites for at least 10 working days.

More than one person should evaluate proposals using numeric criteria that are clearly stated in the TOR. Budget is often one criterion, but should not be “the” determining factor. Other criteria often include proposed methodology, timeline, past performance, and familiarity with the technical subject matter.

Once the organization has contracted with a vendor/consultant, the next step is to work together to develop or adapt existing research instruments, questionnaires, and interview guides. Study managers should review these tools, and, as discussed in greater detail in Chapter 4 of this document, pretest them with small samples before beginning the general study.

During data collection, study managers should keep in regular contact with the vendor to track progress, obstacles, and unanticipated conditions. The means of tracking progress must be specified in the contract with the research vendor (e.g., weekly reports from the field tracked against the established timeline). Other ways to do this include regular “check ins” with the researchers on the following questions: “Is collection on schedule?” “What’s the plan to get back on track?” “Any difficulties or variations from protocol?” “How are participants reacting? Are many not responding to us?”

Once data are available, the consultant should provide top-line results or a summary of key findings. This information can be released early and can provide critical input to improve program design, as well as begin to answer the initial research questions.

This top-line assessment will also guide final reporting. A live presentation of top-line results is highly recommended and can include additional stakeholders. The Table of Contents for any final report can be written with the consultant and with insights from the study managers. Final reports may require several drafts and can be time consuming, so having early input into the content of the report helps to save time down the line. Before beginning to plan and draft the report, be clear about the purpose and design the report to address specific needs, e.g. specific categories of analysis or validation of methods requested by funders or other key stakeholders. Despite the time and expense involved, final reporting is an important part of any research activity, to validate data and methods, and to advance knowledge within the sector.

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### Steps and competencies required for conducting TIPS

In general, TIPS requires fluency in both quantitative and qualitative research methods, from study design and sampling through data analysis and reporting. As noted in the previous section, if these competencies are not available within the organization, a local research vendor can be hired to assist with the study. Whether study organizers decide to carry out TIPS in-house or hire a local firm, they must be able to manage the study. To do so,

they will need a certain level of technical understanding, clarity of information needs, and on-going engagement with the research firm, if one is hired, to ensure that the study will yield helpful findings and information for decision-making.

Each step of a mixed-methods study such as TIPs requires a comprehensive set of competencies. Steps and related competencies are outlined below.

- a. **Develop research protocol** – Researchers must determine the best methods to collect needed data for decision-making, taking into consideration feasibility and budget, and construct a study design or protocol. These tasks require skill with a range of study techniques to select the best tool for the job.
- b. **Develop sampling plan** – The proposed TIPs sampling methods combine purposive sampling based on screening criteria with random sampling to reduce bias and enhance representation. Qualitative researchers must select a sample of households that are representative of the particular group of interest. To do this, screening criteria (e.g., age of participants, presence of children in the home, socio-economic status) must be carefully articulated, and households selected to meet them. Often, professionals familiar with a particular population and/or geographic location are consulted to identify the study sample; this could include guidance from (for example) local community organizations, community leaders, health workers, governmental or financial intuitions. Once a full sample of eligible households is identified, households should be randomly selected from the eligible pool to participate as intervention or control households.

To choose sampling methods for a study, researchers must have sufficient mastery of statistics to design the representative sampling strategy with enough statistical power to detect variables of interest. (If a sample is not large enough, there may be differences among subsamples or over periods of time that simply cannot be detected).

- c. **Hire and train experienced enumerators**– The interviewer is responsible for asking questions objectively in line with study protocol, ensuring respondent understanding of questions, and clarifying or rephrasing as needed without changing the meaning of questions (e.g., what do you mean by that? Is that a good thing or bad thing? What makes it hard to light the stove?). Interviewers must also have the ability to manage group dynamics to identify households and navigate in the field. While TIPs interview questions are directed at one respondent (the cook), often other family members or neighbors are in the room or within earshot. Skills to manage group dynamics are required to allow the respondent to answer questions independently and without undue influence and to provide adequate but not excessive information to the respondent's family and neighbors to allow respondent participation.
- d. **Design or customize and pretest data collection instrument(s)** – Quantitative data are often collected through closed-ended questionnaires to elicit variables of demographics (age, schooling, housing, possessions, participation in various groups, etc.), knowledge, attitudes, reported behaviors, and other information that can be quantified into statistics, analyzed, and generalized to represent a larger population. Qualitative data are most often collected through semi-structured or open-ended questions that allow respondents to use their own words, rather than selecting from a pre-coded set of responses, to describe and explain “why;” give context and meaning to what respondents do and feel; and shed light for researchers on aspirations and motivations. Designing or customizing research instruments or questionnaires ensures that questions are reliable (they mean the same thing to different respondents) and valid (they measure what they are supposed to measure). With valid and reliable questions, researchers can be confident that differences in responses are not by chance but rather reflect meaningful differences in opinions, attitudes, and reported behaviors. Required competencies include crafting of reliable and valid questions, overall questionnaire development (flow, skips, response coding), and instrument pretesting.
- e. **Undertake field work to collect data from sampled households** – Extensive logistics are often required to implement a study protocol and carry out data collection or field work. Logistics include obtaining local



government permissions, identifying and training skilled interviewers, arranging transportation and travel to the data collection area, mobilizing interviewers to identify households for the random sample, and finding potential interview subjects at home and determining whether they are willing to participate.

- f. Analyze data** – The team must be able to analyze qualitative data, including coding and analyzing content, often using qualitative analysis software. Asking respondents open-ended and semi-structured questions yields a large body of words. Making sense of these data requires a special set of skills to translate, organize, and interpret meaning. The general, cross-cutting technique is content analysis, which first requires identifying a set of themes across the data, then sorting responses by theme. This work often takes place using qualitative software packages that count word frequencies to assist in identifying themes and allow sorting and organizing for analysis. This WASHplus toolkit uses CPro software (available free, online) with accompanying customized data entry templates for analysis. Some of the most-used commercial qualitative data analysis software packages include: ATLAS, NVivo, XSight, Dedoose, QDA Miner, and Saturate, among others. Descriptions of these and other free and paid qualitative data analysis software tools can be found at: <http://www.predictiveanalyticstoday.com/top-qualitative-data-analysis-software/>

The team must also be able to clean and code (and translate if appropriate) quantitative data. Participant responses are usually recorded onto paper questionnaires but sometimes electronically onto tablets or smartphones. Quality control during field work minimizes errors or ambiguity in recording responses. Nonetheless, data must be entered, cleaned, and coded. Cleaning requires resolving conflicting responses, clearly identifying missing data fields, and filling in missing data if errors occurred during data entry. “Other” responses must be examined and recoded to an existing code if appropriate or, if given by more than 10% of respondents (as a rule of thumb), a new code must be created.

After a data set is cleaned and coded, researchers must run statistics to quantify and analyze responses, producing frequencies and cross-tabulations (at a minimum). This work usually takes place using statistical analysis software such as EpiInfo, SPSS, SAS, STATA, etc. Data are organized into tabular format; each observation has a row, and each variable has its own column. Data are then analyzed for frequency of response and relationship between variables (e.g., is age associated with a certain stove use or preference?). Such relationships do not imply that one variable causes the other, but that an association exists between them.

- g. Synthesize data and provide recommendations** – After analysis is complete, quantitative and qualitative data sets must be brought together, and researchers must synthesize findings to present results in a meaningful way and to develop programmatic recommendations. Researchers must clearly identify the target audience for the findings and recommendations to be able to present them in a manner appropriate for that particular audience (e.g., syntheses prepared for researchers would be different from those prepared for policy makers or community members).

Additional competencies include:

- h. Good interpersonal skills** – Interviewers must be able to interact with respondents in a way that encourages them to answer questions thoroughly and honestly. In addition to the interviewing skills detailed above, this ability can include appropriate body language/non-verbal communication. The interviewer must put the respondent at ease and ensure confidence. Doing so includes dressing appropriately for the local setting, and greeting, sitting or standing, and gesturing in ways that are culturally accepted and expected. The interviewer’s demonstration of an open, unprejudiced attitude allows a respondent to answer freely without fear of judgment.

The study methodology engages the cook in structured conversation, which requires attention to gender and social dynamics. The cook is most certainly a woman, often with little education and from humble background, and enumerators must manage the dynamic to put the cook at ease to speak freely. In many cultures, a woman enumerator is often best suited to enter the household compound and speak directly with the cook. In addition, in some cultural contexts, the woman enumerator may need to be accompanied by a man for security and cultural expectation.

- i. **Ability to reflect and summarize** – Respondents' words serve as qualitative data, and interviewers must be able to record information for analysis. They must decide when verbatim responses are relevant, and when it is adequate to summarize a response. Interviewers must know how to avoid adding meaning or bias when recording data, clarify with respondents when necessary, and summarize accurately.
- j. **Negotiation and problem solving skills** – Because the TIPs methodology is distinctive in engaging the respondent in a consultant role and eliciting problems or barriers encountered with stove trials, interviewers must be able to discuss and problem solve with a respondent to identify priority issues and develop a possible solution or multiple solutions. For instance, if a respondent is having trouble lighting the new stove, together the respondent and interviewer could look for possible solutions. For instance, they would reject using plastic wrappers as a fire starter, but would agree to set up a make-shift wind shield and use dried corn cobs as a fire starter. Both the problem and solution are then noted as study data. Note that this level of problem solving requires technical knowledge of acceptable and unacceptable solutions, which should be incorporated into field training if the interviewer does not already have this level of cookstove-specific technical expertise.
- k. **Ability to adapt on the spot** – Although research requires adherence to a protocol, the unexpected often happens when conducting field work. Research managers must assess and decide on the best option when things don't go as planned.



# PLANNING AND LOGISTICS

Understanding a consumer preference and willingness-to-pay study requires somewhat complex planning and logistics. Steps are outlined below. These steps are numbered for clarity, but are not necessarily sequential. Many are iterative or need to happen simultaneously, as is further discussed for each step.

## 1. Select sites

Sites, which usually correspond to administrative units like villages or districts, are selected purposively based on geographic/climatic and/or demographic/ socio-economic variables of interest and representation of the consumer target audience. If the target audience spans multiple socio-economic categories or climatic areas, sampling should reflect the same span. An example of purposeful site selection for a study involving commercially distributed wood stoves might be communities where people primarily purchase cooking fuelwood, where indicators of poor child health and/or nutrition are apparent, and/or where the ecology is vulnerable. Feasibility of study implementation or ease of access/logistics is also an important consideration and might include such factors as accessibility by road during the study period and/or existence of non-governmental organizations (NGOs) willing to assist with household selection and stove installation.

✓	Select sites
✓	Coordinate with stakeholders
✓	Select households
✓	Select/order stoves
✓	Order usage monitors
✓	Modify instruments/protocols
✓	Hire experts
✓	IRB

## 2. Liaise with relevant country stakeholders

As soon as potential study sites are identified, the research team will need to meet with both village leadership and local partner organizations to obtain their support in implementing the study in the selected villages.

Study staff should also work closely with local government entities responsible for cookstove dissemination or research in-country, ideally building on existing relationships with in-country partners. Local partner organizations might have rosters of households in the villages and key demographic data that allows for initial household screening. Equally important, they are often known by villagers and have their trust; they can introduce study teams for further screening and data collection. Local government entities might also have networks that can help facilitate IRB approval or clearance through customs of imported stoves. These entities must be thoroughly briefed on taking precautions to avoid biasing study participants in any way.

## 3. Identify and select households

Once sites are selected, researchers must identify a pool of households that meet the defined criteria. Household eligibility screening criteria could include:

- Age of participants
- Number of people who eat in the house  
(some improved stoves are not well suited for cooking for large groups)
- Presence of children in the home
- Socio-economic status  
(targeting families who are poor but have some purchasing power, such as to buy a financed stove)
- Lack of prior experience with improved cookstoves
- Traditional stove/fuel type used

From the pool of eligible households, researchers randomly select study households (and if undertaking KPTs, control households) to minimize selection bias. Local NGOs or other professionals who are familiar with a particular population and have good community relationships can provide valuable support in identifying villages and households and introducing study team members to them after random selection. Alternatively, researchers could decide to purposively rather than randomly select households for this mixed method research, to assure thoughtful participants meeting set criteria; but some randomization minimizes selection bias and is more acceptable to non-qualitative researchers. Randomization also allows for meaningful statistical tests using the full data set, although sample sizes are still small for many statistical tests.

At least five households in at least three sites should test each kind of stove to allow for a variety of experiences and responses. Oversampling by 10-20% accommodates respondent dropout or other unanticipated needs. As with other in-depth, qualitative methods, there are no hard and fast rules to sampling, besides having respondents meet key criteria. The best guidance is to sample to include a full representation of responses, to capture a variation of views and reactions. In the Bangladesh and Nepal studies, we chose a sample size that we expected would result in statistically significant KPT results, which was 24 and 28 households per stove type, for totals of 120 households in Bangladesh and 140 in Nepal.

#### 4. Select and order stoves: what to consider

Researchers must select study stoves that are most likely to meet the needs of the consumer population, based on consultation with key informants and available existing data. Factors that guide stove selection include:

- *Common household size.* Selected stoves should have sufficient capacity to cook meals for an average-sized family and any staff that commonly eat in the home.
- *Typical foods.* Does the local cuisine require specific cooking techniques, such as boiling (i.e., rice and beans)? Frying? Roasting? Is the staple food dense, like ugali/sudsa found in much of East Africa, and does it require a stable stove for stirring? Selected stoves must be able to handle local foods commonly cooked on traditional stoves.
- *Cooking patterns.* Do families keep the stove lit all day (for cooking and other tasks such as producing liquor, space heating, smoke for pest control) or light it only once or twice per day?
- *Cooking vessels.* Are most pots flat-bottomed or rounded? Will commonly used pots fit on the cooktop, both in terms of size and shape?
- *Fuels.* Selected stoves should be able to operate with fuels that are commonly used and available in the study area. This should include clean liquid fuels (ethanol, liquid petroleum gas (LPG)), and processed biomass fuels like pellets or briquettes where those are available and affordable.
- *Climate.* Do families require space heating stoves or do they use their stoves only for cooking?
- *Seasonality.* What fuels and stoves are commonly used, and do cooking practices vary over the course of the year? Studies should be timed to take place during seasons that are most representative of the fuels and cooking practices used throughout the year.

Cookstove selection checklist	
✓	Family size
✓	Foods
✓	Cooking pattern
✓	Cooking vessels
✓	Fuels
✓	Climate
✓	Seasonality
✓	HAP severity
✓	Income/Socio-economic status

- *Household air pollution.* Is household air pollution a significant problem? Pollution is a problem in all homes that burn solid fuel indoors and can be especially bad in homes with poor ventilation (for example, in cold climates) or that burn particularly dirty fuels (such as dung, coal, or wood with an especially high sap content). In such cases, researchers may choose to select stoves with chimneys.
- *Income and socio-economic status.* If target consumers can afford clean liquid fuels or processed biomass fuels, and they are available in the study area, stove selection should focus on stoves that accommodate these fuels, as they have significantly lower health risks. If consumers can access only unprocessed biomass, a range of improved biomass stoves are available and can be affordable with appropriate financing.

Beyond selecting specific stove models, researchers should choose stoves that have a mix of features and attributes so as to get feedback not only on the specific models but also on key characteristics, which might be common to multiple stoves. For example, characteristics might include single vs. double burners, with chimneys vs. without, portable vs. installed in place, and use of a fan to optimize combustion vs. reliance on natural draft. Selected stoves may include but need not be limited to stoves currently available in the local market, as long as a mechanism exists by which stoves not available in the market would be introduced. For example, the WASHplus Bangladesh study was undertaken to inform the USAID Catalyzing Clean Energy in Bangladesh project of viable stove models for that project to promote in-country; similarly, the WASHplus Nepal study was undertaken to help the national stove program select additional stove models to be incorporated into their product offerings.

For stoves purchased internationally, customs duties and wait times can be extremely onerous, varying by country from one week to several months. Researchers should ascertain the regulations at the onset of the study and plan the calendar accordingly.

Once available stove models are procured and delivered to the study team, they are randomly assigned to study households.

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## 5. Order stove use sensors, if applicable

Researchers should determine the study's stove use monitoring needs (see SUMS section above) and capacity early on. Studies should include plans for at least two sensors per household (at a minimum, one to be placed on each stove the household uses) plus ambient sensors (at least two per site/village) and 10% extra in case of burn-out or failure. Because SUMS technologies are often not in mass production/circulation, sensor providers may need a few months of notice to fill large orders. WASHplus partner Berkeley Air Monitoring Group is a common provider of Maxim iButtons pre-formatted for use on cookstoves, as well as kSUMS. Nexleaf Analytics sells the StoveTrace sensor, and SweetSense, Inc. sells the SweetSense sensor described in Chapter 2.

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## 6. Decide what to ask and modify protocol and instruments to match information needs

This toolkit follows the recommendations of Alan Andreasen, the “father” of social marketing, and his *Backwards Research Model*.<sup>8</sup> In this model, research must be strategic, with each “question” filling an information gap, and designed from the beginning to deliver required outputs, with research design determined by the questions “What information do I need to make decisions? How will results be applied?” Other information, no matter how fascinating or undocumented, is superfluous.

Forgoing needless research that is nice to have, but ultimately does not aid in decision-making, helps organizations gather the correct data in the most cost-effective way. The suite of methods found in this toolkit have been selected as the best tools to elicit needed information, based on WASHplus field testing in Bangladesh and Nepal.

<sup>8</sup> Andreasen. 1985. “Backward” Market Research. *Harvard Business Review*.

The toolkit provides two options and methods for collecting data: (1) using paper-based surveys or (2) using an electronic platform with android phones or tablets. For both paper-based survey and electronic platform options, researchers should review and, as needed, modify study protocol and instruments based on the local context. Researchers may edit options for existing multiple choice questions, or the questions themselves. Similarly, precoding for open-ended questions should be modified accordingly. Some factors to consider that influence modifications include:

- *Study area geography, topography, and climate.* Do households have space heating needs?
- *Cooking patterns.* Do households commonly use multiple stoves? Do they use different stoves for different purposes? For commercial activities? For preparation of animal feed or liquor? Do they normally cook indoors or outdoors? For example, many households that participated in the WASHplus Nepal study have a stove dedicated to cooking animal feed and/or making liquor for domestic consumption and sale. In contrast, study households in Bangladesh don't make liquor at home, and animals eat plentiful agricultural residue rather than cooked feed. Cooking patterns can change according to season. Questions and responses should address all of these scenarios. Taking pictures or drawing sketches of kitchen set-ups, especially windows and doors, can help identify ventilation options for studies focusing on HAP.
- *Common foods and pot types.* Questions should include the local names for food and cooking pots, and when possible, enumerators should take photos or draw sketches of the pots.
- *Socio-economic status.* Questions about income are often unwelcome and/or difficult to answer; over the years, researchers have developed and validated proxy measures for income and wealth such as housing materials, including flooring, walls and roofs, or means of transportation (bike/motorbike); in some places, ownership of animals is more indicative.
- *Cultural norms.* In some locations, asking about religion, ethnic group, and/or caste is acceptable and/or visually obvious (dress, prominent religious objects in the home); in other places, these questions would be inappropriate.
- *Commonly used fuel types.*
- *Stove model selected for the study.* Follow-up and endline questions depend on the characteristics of the stove the household is testing, including specific questions related to quality and performance of stove parts. These could include the fan, control switch, solar charging panel, charger quality, color, rusting, warping of stove body, cracking (for concrete or mud stoves), temperature of the outer body, and durability. Other questions might relate to safety, including stove stability (risk of the stove tipping, or pots sliding off), and incidents of burns when adding fuel or cooking, or scorching of wooden table tops or cracking of floors due to overheating stove bottom. Specific questions on this topic may be included, or these issues may be precoded for open-ended questions.
- *Chimney condition.* For chimney stoves, enumerators should observe or ask about the condition of the chimney at the time of the endline (whether it is cracked, or fully/partially clogged), its position and height (especially the angle at which it leaves the house, which affects the draft), ease of cleaning, and frequency with which cleaning was performed.
- *Decision-makers.* Would women in the study area typically be the decision-makers for purchasing a new stove? If not, who would the decision-makers be? WTP assessments should target the decision-makers accordingly.

<sup>8</sup> Alan R. Andreasen, "Backward" Market Research,

The data collection, data entry and processing, and data analysis software components of the toolkit rely on CSPRO (U.S. Census and Survey Processing System), free online software. The key components of the software guidance component of this toolkit include:

- A. Data collection instruments/survey forms in MS Word/ Excel (for printing) and in the CSEntry electronic platform
- B. Guidance for editing the CSEntry CSpro Data Entry program based on changes made in the questionnaire
- C. Guidance for data collection in electronic platform
- D. Data entry, cleaning, and analysis program (CSEntry CSpro Data Entry program)
- E. Guidance for coding open-ended data
- F. Guidance for exporting data into other advanced analysis software
- G. Guidance for exporting analyses into Excel to create presentation graphics

Any changes made in the questionnaire must be replicated in CSEntry, the data entry program. Researchers who plan to collect data through the electronic platform can directly upload this software to their android phones/tablets. Those who plan to collect data on paper must enter the revisions to the questionnaires into the CSEntry program on their computer. Instructions for modifying (as per above) and using CSEntry are included as video tutorials on the WASHplus Consumer Cookstove Toolkit web page.

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## 7. Confirm availability of/book outside experts

Many of the TIPs complementary add-on activities (CCTs, KPTs, SUMS, and HAP/emissions monitoring) require expert support at specific points along the study timeline; such support should be budgeted and planned well in advance. Some add-on activities can take place concurrently (SUMS monitoring with KPTs, for example, which both occur during the trial period).

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## 8. Prepare and submit ethical review

The United States government has strict procedures to protect the rights and welfare of research study participants to ensure that their participation is both informed and voluntary. These procedures require study staff to clearly explain the risks and benefits of participation before any research activity begins. To monitor adherence to ethical standards, many U.S. institutions as well as international ones have established IRBs that administer review processes, including a template for creating an IRB Review Package. The review package includes a description of objectives and procedures, as well as inclusion of data collection instruments and informed consent scripts.

For research being conducted by a U.S.-based organization in another country, standards require IRB review and approval both in the US and the country where the research is to be conducted. For further detail on preparing IRB applications and procedures, consult the IRB Annex, p. 46.

This section describes steps needed to translate survey instruments, train field workers, and pretest the instruments.





**GUIDANCE ON  
CONDUCTING  
THE SURVEYS**

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## A. Guidance on translating

WASHplus Trials of Improved Practice tools and instruments are in English and need to be translated into the local language of the study area. These documents include questionnaires (including the questions, answer options, and pre-coded responses) and consent scripts. Willingness-to-Pay scripts are also included for those interested in undertaking WTP assessments. Cookstove manuals should also be translated if the staff supporting stove installation, training, and servicing is not fluent in English.

Translators should be professional, fluent in both English and the local language, and familiar with local colloquial words, especially those that relate to cooking stoves, pots, utensils, foods, and fuels. Translated questionnaires and scripts should avoid formal language, which makes following the script difficult for local enumerators. The same person or group of people should translate all documents to ensure consistency in terminology; key word translation lists can also help. Finally, as part of their training, enumerators should closely review translations for accuracy and nuance, with revisions encouraged where needed. Arabic numerals should be used for numbers (in both the surveys and the enumerator recorded notes), rather than local script, to avoid confusion from similarities between different numbers with similar appearances. For example, in Bangla script, the number four is written as “৪,” which looks like the Arabic numeral eight. Similar problems exist in Hindi Devnagari script vs. Arabic numerals for the numbers one and two. For similar reasons, internationally accepted Arabic calendar years should be used, not the local calendar year.

Once translated into the local language, all documents should be back-translated into English (by other translators) and compared to the original documents to ensure the focus and nuance have remained the same.

It is common for local enumerators to record answers to open-ended questions in the local language; these answers need to be translated back into English (or another language in which the analysis and reporting will be performed), preferably by the same translators who conducted the initial translation.

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## B. Guidance on training field workers and pretesting instruments

Fieldworkers/enumerators play an important role in the success or failure of a research study. Well-trained and skilled enumerators can extract key information through their interviews and discussions with study participants.

Enumerators should be selected locally, both from the host country and ideally from the part of the country where the research will take place. They should have a secondary school education at a minimum. Enumerators should understand basic English and be proficient in reading, writing, and speaking the local language. They need to understand the local dialect of the study area and be easily understood by study participants. They should be willing to travel for 10-15 days at a stretch if needed. Study participants are usually women and may be more comfortable with female enumerators.

Enumerator training takes 4-5 days, including pretesting, and possibly slightly more or less depending on whether the trainees are experienced in gathering qualitative data. More enumerators than needed should be trained, both in case of drop-out, and so that the most skilled enumerators can be selected at the end of the training. Training methods/approaches should include short presentations, role-play, and field practices.

The initial training should take place 1-2 weeks before data collection begins and should cover the topics below, which may be broken down by day. A summarized (follow-up) re-training is recommended just before the endline survey and WTP are administered, especially if they take place more than a month after the baseline.

*Day 1 – Overview and TIPS*

- Orientation on the purpose of the study and its objectives
- General orientation on stove products and differences between models
- Human subjects and research ethics, to ensure that only consenting adults are interviewed and that informed consent is obtained at each data collection instance; review of all consent scripts
- Enumerator etiquette: greeting and introductions before entering a study participant's house; punctuality for participant interviews; conversational and neutral tone (so as to not come across as aggressive or intrusive)
- Orientation on study instruments and methodology
  - » How TIPs differs from other research approaches
  - » Multiple methods
  - » Introduction to the questionnaires; detailed explanation by the instructor of the questions and how responses should be recorded (e.g., in pencil, using coding and key words, Arabic numerals, etc.)
  - » Interview techniques, including observation, open-ended questions, and probing (interpersonal skills, listening for unexpected feedback)
  - » Problem-solving techniques: treating respondents as consultants to solve challenges with the new stoves
  - » Data recording and note-taking: using codes, coding open-ended responses when possible, writing full answers in detail/whole phrases when not, recording observations in addition to verbal responses, recording all solutions/options/reactions for problem-solving discussions, writing legibly, using Arabic numerals
  - » Final review of completed form before leaving the household to identify and fill in any missing information

#### *Day 2 – Translation review and TIPs practice*

Trainees should closely review the questionnaires and scripts in English and the local language to check the translations for accuracy and nuance, recommending revisions where needed. Trainees then take turns playing the role of study participant and enumerator to practice conducting and recording the baseline, the initial follow-up, and endline questionnaires under the guidance of the trainer (with separate enumerators performing each role). This will include extensive practice recording responses to open-ended questions using both coded responses and full narrative notes.

#### *Day 3 – WTP training and practice*

Trainees are introduced to willingness-to-pay methodologies and scripts (both stove bargaining and buy-back). They then practice each exercise, with trainees again taking turns playing the roles of study participant and enumerator.

#### *Day 4 – Pretesting*

Pretesting the instruments gives trainees field experience, confirms the time required for interviews (which will help later in scheduling interviews), and allows researchers to identify and resolve any last issues with the instruments and/or sampling. Pretesting should take place in a community that is a close demographic and socio-economic representation of the target consumer research audience, ideally near the study area so that colloquial words used in the questionnaire are well understood by the local participants. Trainees should practice (and trainers will monitor) following survey scripts and protocols closely (including reading the response options or not, as indicated), recording observations that may be independent of what participants say, recording uncoded

narrative responses, and following proper recording procedures.

Pretesting the baseline instrument is straightforward and can take place with any family that cooks with a traditional stove, but pretesting the initial follow-up and endline surveys (or only the endline, since there is significant overlap between the two) will require practice respondents who use at least two different stoves regularly. Enumerators can ask which is newer and use that as the “new stove” to provide feedback comparing the stoves and their advantages and disadvantages, etc. If this is not feasible, trainees should conduct additional intensive role plays with each other and the trainers.

#### *Day 5 – Instrument modification*

The pretesting could identify flaws in questions, skip patterns, and questionnaire flow (e.g., “If no, skip to question #6”), additional response codes, and/or translation if the questions are not easily understood by pretest households. Responses from the pretesting day should be reviewed by all trainees and trainers, and modifications made as needed. If time allows, modifications should be pretested before the instruments are finalized.

Supervisors should be trained in maintaining consistency in completing the questionnaires, supervision techniques, data quality control, trouble shooting, and field management, including oversight of field workers. They must also be trained in reviewing completed surveys daily for completeness and correctness, especially coding for open-ended questions, and providing feedback to enumerators on how to improve their work. Data entry staff should participate in the first full day of the training in addition to being trained on technical elements of data entry.



# GUIDANCE ON CODING QUALITATIVE DATA

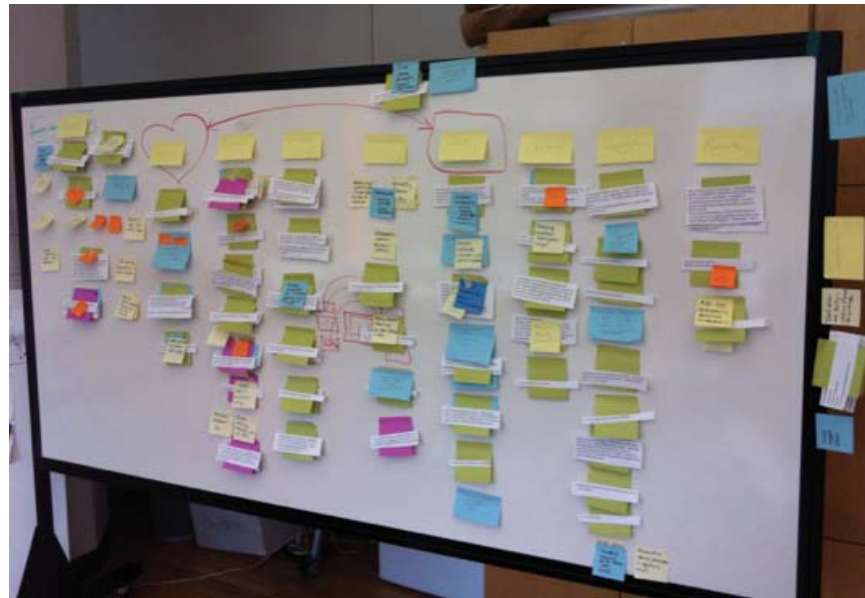
Because fewer people, including researchers, have extensive qualitative experience, coding and thematic analysis of open-ended questions and other qualitative data can be a challenging aspect of the TIPs methodology. This section provides guidance and pointers for undertaking qualitative analysis.

Researchers use thematic analysis as a way to organize qualitative data and distill it for insights and patterns relevant to research questions or goals. Coding and thematic analysis of open-ended questions are both an art and a science, but they always follow the systematic process outlined below.

Qualitative data analysis involves identifying and codifying themes that appear in text passages and open-ended answers to qualitative questions, and it is the interim step to processing “other” responses not covered in pre-coded response categories. Patterns are identified through a rigorous process of data familiarization, data coding, and theme development and revision. The coding may be done by hand, or by using various software packages that assist with the process.

Coding entails (1) making a list or inventory of all textual responses supplied by respondents to a given question, 2) creating a list of defined codes (the codebook) corresponding to themes observed in a text, and (3) sorting text into the various code categories.

Richard Boyatzis, a renowned behavioral psychologist, contrasts theory-driven codes derived from the researcher’s or other existing theories; inductive codes, derived “bottom-up” from the researcher’s reading of the data; and prior-research driven codes. He argues that all approaches have something to offer qualitative data analysis<sup>9</sup>.



*POST ITS: A CODER'S BEST FRIEND. Manual coding and thematic analysis  
Photo: Michi Komori, Design Research Techniques, thematic analysis*

Often a small team of analysts is responsible for sorting responses into coding categories; it is essential to monitor and maintain inter-coder reliability so that the responses are sorted in the same way by different analysts, with little variation in coding. Because multi-disciplinary teams (social scientists, household energy specialists, economists, etc.) often carry out TIPs research, it is useful to create and vet a **code book** with stakeholder organizations to reach agreement on codes before coding and analyzing the entire data set; examples are provided in Tables 3 and 4 below.

**Identifying and coding themes:** Open coding at the initial level breaks down the qualitative data collected into first-level concepts, or master headings, and second-level categories, or subheadings. This is done by looking through the **inventory** of responses for distinct concepts and categories in the data, which will form the basic units of the analysis.

After the code list is prepared for open-ended qualitative questions, responses are organized or sorted by the theme and subtheme. If responses don’t clearly and easily fit into a category, they should be “set aside” for later review with the analysis team. Together, the team will decide whether an ambiguous answer belongs in an existing theme/subtheme code, or whether it is necessary to create a new code. Eventually, all responses are coded into themes and subthemes, still tagged with their respondent unique identifier number to allow for additional analysis (for instance, to see whether the users of one type of stove had more difficulties overall, or

<sup>9</sup> Boyatzis. 1998. Transforming Qualitative Information: Thematic Analysis and Code Development. Thousand Oaks, London, & New Delhi: SAGE Publications.

in particular, than other types of stove users.) Examples of coding used in the WASHplus Bangladesh and Nepal studies are provided below in tables 4 and 5. The digitized or keyword codes are entered into the final database, e.g., CSPro, when using toolkit templates or EpiInfo.

**Dealing with unique responses that don't easily fall under codes and answers in the "other" category.**

A general rule of thumb is that when 10% or more of total responses fall into the "other" category, researchers should attempt to identify additional themes to which they might relate, in addition to verifying that other responses don't already fit into pre-existing codes. When "other" or non-categorized responses total less than 10%, they can be left as "other" for quantitative reporting and taken into consideration but not as a focal point of qualitative analysis.

*The approach to thematic analysis involves an iterative six-phase process:*

1. **Become familiar with the data:** Read and re-read the data from open-ended questions to become thoroughly familiar with its content.
2. **Code:** *Generate succinct labels (codes!) that identify important features of the data that appear most relevant to answering the research questions. After a code book is developed, the entire data set must be coded. Following this, all codes are collated for further contemplation and analysis. Relevant codes might be:*
  - Attributes
  - Problems
  - Enhanced features
  - Foods
  - Cultural supports
  - Etc.

*Codes need not be discrete, meaning there will be some overlap with codes (e.g., "problems" could overlap with "foods" if a certain food doesn't cook well on the stove).*

3. **Search for themes:** *Examine the codes and collated data to identify significant broader patterns and meaning (potential themes). Data then are often resorted by themes (still maintaining codes) so that the researcher can work with the data and review the viability of each candidate theme.*
4. **Review themes:** *Check the candidate themes against the dataset to determine that they tell a convincing story of the data that answers the research question. In this phase, themes are typically refined, which sometimes involves splitting, combining, or discarding them.*
5. **Define and name themes:** *Develop a detailed analysis of each theme to work out the scope and focus of each theme and determine the "story" of each. This also involves deciding on an informative name for each theme.*
6. **Write up the analysis:** *Weave together the analytic narrative and data extracts, and contextualize the analysis in relation to existing literature*

*Although these phases are sequential, and each builds on the previous phase, analysis is typically a recursive process, with movement back and forth between different phases. So it is not rigid, and with more experience (and smaller datasets), the analytic process can blur some of these phases together.*

**Table 4. Example of Themes and Subthemes**

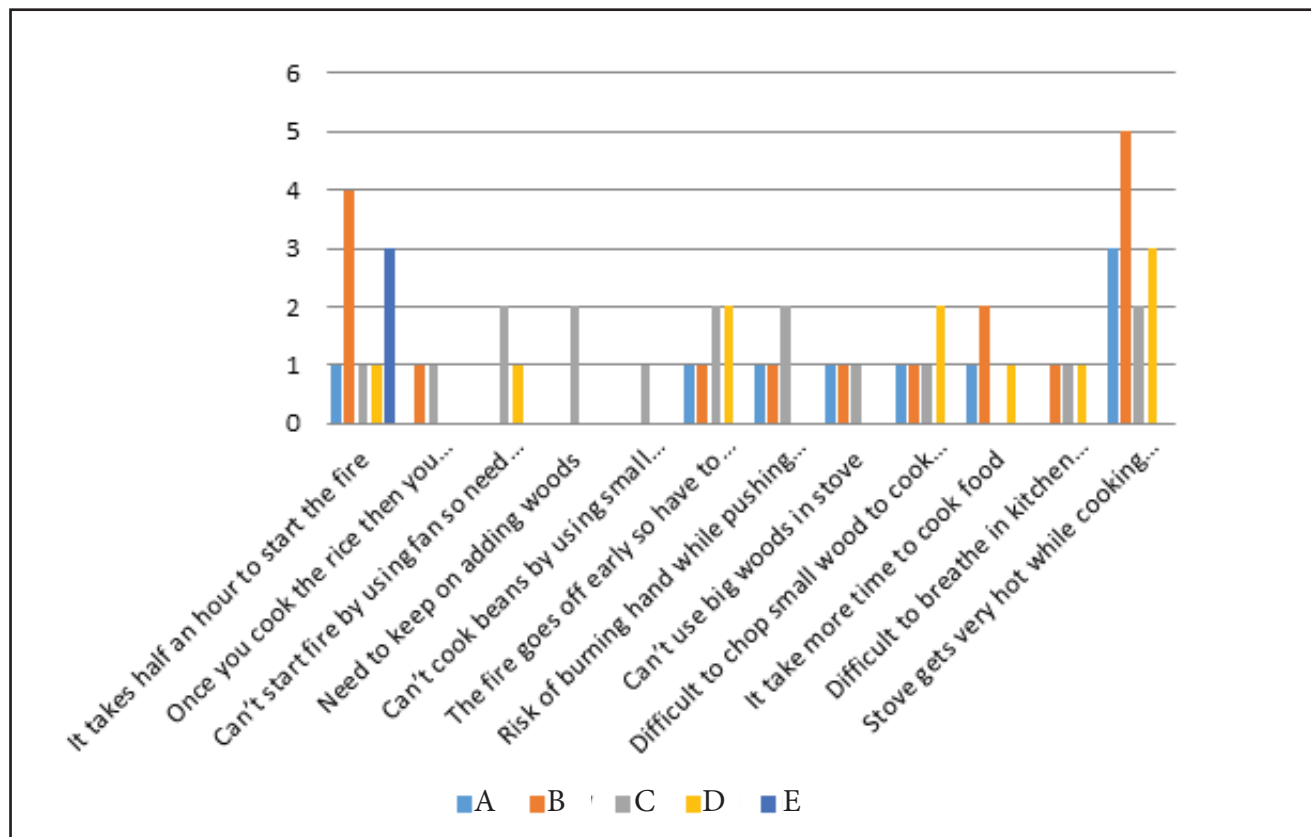
CODE	THEME	SUBTHEME	FREQUENCY (unique identifier numbers noted in database)
<b>Q. Please describe changes in how you cook on the new stove (as compared to the old).</b>			
A/ Start problems	Difficult to start fire	A1. It takes half an hour to start the fire	
		A2. Cannot start fire with plastic; starting fire with paper takes time	
		A3. Once you cook the rice then you have to start fire again to cook dal.	
		A4. Need dry grass to start fire.	
		A5. Can't start fire by using fan so need to blow air from mouth.	
B/ Social	Social aspects	B1. Neighbors like to stop by to visit and see new stove.	
C/ Fire power for cooking	Fuel issues/ inadequate for cooking	C1. Difficult to cook chapatti because stove can't produce enough coal.	
		C2. Can't cook beans by using small pieces of wood.	
		C3. Need to keep adding wood.	
		C4. Can't use big wood in stove.	
		C5. Difficult to chop small wood to cook food.	
		C6. It takes more time to cook food.	
		C7. Can't use big logs, only small chopped pieces of wood. (less convenient)	
		C8. With previous stove it was possible to dry wet woods for use by keeping them near the stove, whereas for new stove only dry woods can be used. (less convenient)	
		C9. Need to go to the kitchen garden for the search of small pieces of wood.	
D/ Burns	Burns from hot stove/ lighting fire	D1. When first using the new stove, I would burn my hand while starting fire, now used to it.	
		D2. Risk of burning hand while pushing wood inside the stove.	
		D3. Stove gets very hot while cooking food, which can be dangerous.	
E/ Cooking problems	Changes in cooking patterns (less convenient)	E1. With previous stove I could do outdoor work while the food was cooking, whereas in new stove the fire would go off early so have to remain in the kitchen, cannot do outside work.	
		E2. We have to prepare the food to be cooked before starting the fire; otherwise, the fire would go to waste.	
		E3. With previous stove I used to clean the ashes once a month, whereas I have to remove ashes every day from the new stove.	
		E4. Difficult to breathe in kitchen because of smoke.	
F/ Cooking easier	Easier cooking	F1. Don't need to apply mud guard at the bottom of the pot with new stove.	
		F2. We can stay close to the stove due to lack of heat.	
		F3. Easy to put pot in the stove.	
		F4. The fire flame spreads evenly.	
		F5. The pot doesn't tilt.	
		F6. The stove is portable; therefore, we can cook in any place we feel convenient.	
G/ Time savings from new stoves	Easier cooking-specifically time savings	G1. With the use of new stove we are able to save time.	
		G2. Simultaneously we can cook two foods at a time.	
		G3. With previous stove I use to cook rice first and then vegetables whereas with new stove I can cook both of them simultaneously.	



**Table 5. Output of Responses to Problems with Stove, Sorted by Stove Type**

RESPONSE CATEGORIES	STOVE TYPES				
	A	B	C	D	E
It takes half an hour to start the fire.	1	4	1	1	3
Once you cook the rice then you have to start fire again to cook dal.		1	1		
Can't start fire by using fan so need to blow air from mouth.			2	1	
Need to keep on adding wood.			2		
Can't cook beans by using small pieces of wood.			1		
The fire goes off early so have to remain in the kitchen, cannot do outside work.	1	1	2	2	
Risk of burning hand while pushing wood inside the stove.	1	1	2		
Can't use big wood in stove.	1	1	1		
Difficult to chop small wood to cook food.	1	1	1	2	
It take more time to cook food.	1	2		1	
Difficult to breathe in kitchen because of smoke.		1	1	1	
Stove gets very hot while cooking food, which can be dangerous.	3	5	2	3	

Figure 2. Output of sorted responses to problems encountered by stove type





# REPORT WRITING AND DISSEMINATION

Organizations undertake consumer research to answer information needs that guide decision-making and strategic planning. Therefore, the information gained through the research should be reported in a way that makes it accessible and impactful for the intended audience.

Below is a recommended outline for a report based on WASHplus's Bangladesh and Nepal final report from 2013 and 2016. Listing figures, charts, and tables in the table of contents can help readers find specific elements of interest quickly. Including images and description of the different stoves in an annex is also highly recommended.

## TABLE OF CONTENTS

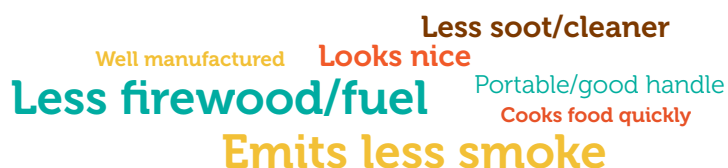
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<b>Annex A:</b> <i>NGO, Village, and Household Selection Criteria</i>	
<b>Annex B:</b> <i>Willingness-to-Pay Worksheets</i>	
<b>Annex C:</b> <i>Stove Profile Sheets (with photos)</i>	

Selected data could also be presented in a brief and more visual way in a powerpoint presentation.

**Present data in impactful way.** There are many ways to present data: tables/charts and graphs are the main ways besides descriptive words themselves. Different people process data differently; some prefer words, others prefer numbers (in tables), and others process best when information is presented visually with charts and graphs. For quantitative data important to decision-makers, it's a good idea to include tables, charts, and graphs with accompanying explanatory text to accommodate the different ways in which readers process information.

Qualitative data are represented less often as descriptive statistics because samples are not random and tend to be small. Words like all, most, many, some, and few best describe frequency of response for qualitative data, rather than percentages. Selected verbatim quotes are another illustrative way to display qualitative data. If quotes are short, several different ones can be listed sequentially to illustrate a summary statement. For the longer ones—or a mini-case study—it's a good idea to put them in a text box. Relevant information from the notes and observations reported by the data collectors should also be included as qualitative results.

Barriers and benefits to accepting a behavior are largely expressed as qualitative data but are summarized and analyzed using frequencies. These findings come from responses to questions about what the person liked or didn't like, what made it easy or hard, perceptions of who would approve/disapprove of the stove, as well as who the respondent talked to about the stoves. This is also true for desired stove attributes and perceptions of people who use improved stoves. These data can be presented any number of ways, including graphs, pie charts, or a “word cloud” (at right) that shows frequency of response by text size, with frequent responses in large text and less frequent ones in smaller text. The following word cloud shows reasons given by respondents for preferring the new stove to their usual stove.



A table or graph can be used to highlight key data presented in the text, and data tables for each question can be included in the back of report. The explanation text should describe not only the most frequent responses in a table but also whatever is interesting and relevant. The text need not be comprehensive, however, particularly if a chart presents a complete set of responses.

Selectively include photos, as possible, in the report. These could include photos of the cooks using their stoves, of modifications of the stoves, problems (such as large pots on small stove burners), SUMS placement, etc. Agreement must be obtained from the people being photographed before including their photos in the report.

**Address the 4Ps of Marketing: Product, Place, Price, and Promotion.** The findings can be organized in a compelling way around the 4Ps concept, drawing overarching findings as well as quotes around each of the elements of product, place, price, and promotion. Describe the attributes of the stove consumers want, relating

Qualitative data is best represented in words not numbers  
Most = 90% or above  
Many = 40% or more  
Some = 15-39%  
Few = less than 15%

how well the stoves put to trial meet those criteria. Drawing from the willingness-to-pay and qualitative findings from the trials, what is the range of price consumers are willing to pay, and is financing important in making the stoves accessible? What venues or places are both convenient and trustworthy as sales outlets for ICS? Lastly, what kinds of promotional appeals will be most persuasive to target consumers? Are they fuel savings, their family's health, or appearing modern to the neighbors? It is important to present key results by stove type for comparison to understand the perceived benefits, problems, and suggested modifications for each stove.

**Illustrative lists of figures and charts.** A list of graphs and tables included in the Bangladesh study report appears below, along with illustrative examples of graphs and tables to highlight key findings.

---

## List of Figures

1. Cooking Fuels
2. Gather or Buy Wood Fuel
3. Number of People Normally Cooked for in Home
4. Husband's Main Occupation/Source of Income
5. Women's Occupation
6. Preferred Stove (Traditional vs. ICS)
7. Number Preferring ICS over Traditional Stove (3 day vs. 3 week)
8. Number Preferring ICS by Stove Type
9. Number Preferring ICS by District
10. Improved Cookstove is Good
11. "Word Cloud" representing attributes named by all consumers trying ICS
12. Cooking Problems
13. Changes to Make Stove Better
14. Estimated Monetary Value as a Proportion of Anticipated Sales Price (Aggregate)
15. Estimated Monetary Value as a Proportion of Anticipated Sales Price (by stove type)
16. Stove Usage During and Following the KPT Study
17. Monitored vs. Reported Stove Usage
18. Box plot showing fuel consumption by stove group
19. Percentage of Women Respondents Reporting Independent Decision Making on Household Purchases

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## Charts

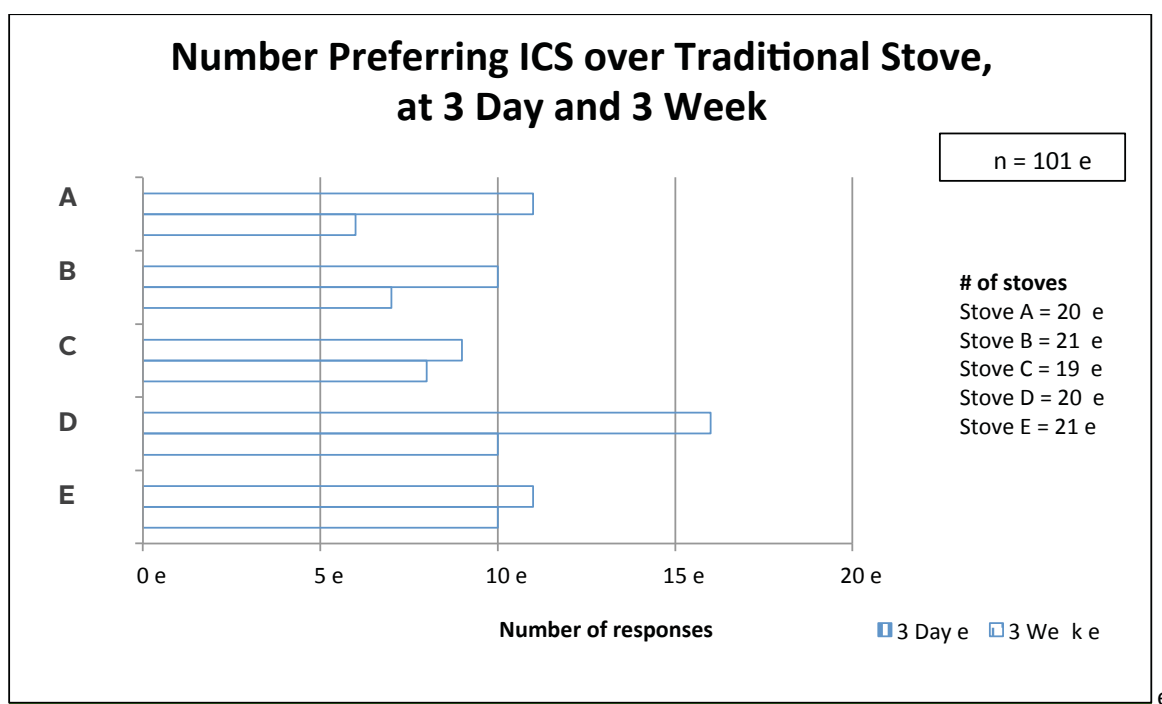
1. Description of People Who Would Use ICS
2. Changes in Cooking Pattern
3. Perception of People Who Would Use These New Stoves
4. Willingness to Pay for ICS – Method 1
5. Willingness to Pay Pricing Scenarios – Methods 1 & 2
6. Proportion of All Recorded Cooking Events Performed by the Intervention Stove
7. Mean Daily Fuel Consumption Estimates
8. Mean 24-hour Air Pollutant Concentrations in the Kitchen

**Sample graphical representations of data.** Below we have provide examples of different types of graphs and charts that can be used. As mentioned earlier, it's important to have a mix as well as textual explanations of the visual data for those who have trouble reading graphs/charts.

Some graphs can be very complicated, even for those who have good visual interpretation skills. In these cases, it might be better to find simpler ways to display the data, even if it will require two graphs or charts to make the same analysis points.

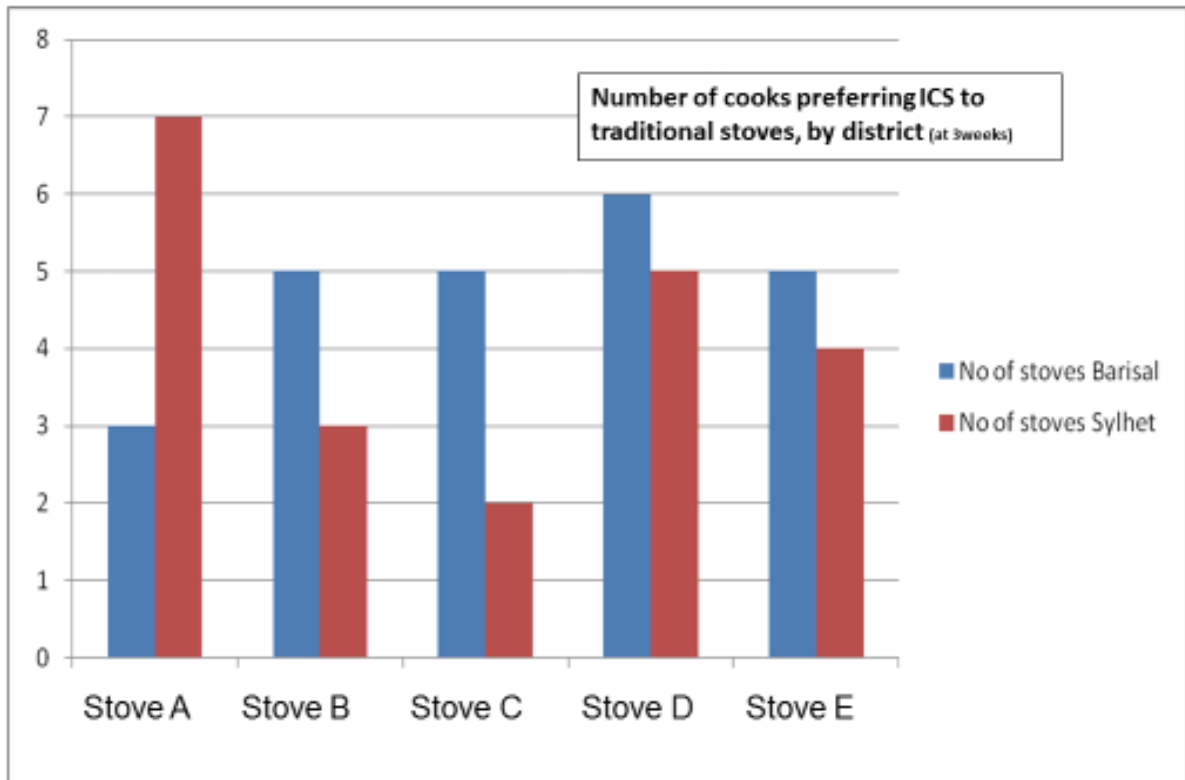
It's also important to make sure that the tables/graphs are large enough to see, especially those that present multiple timeframes or the results for multiple stoves. It is recommended that charts use at least a size 11 font and that graphs are at least one-third of a page in height and at least two-thirds of a page in width.

Graphs can be used to represent cross-tabulations of differences by stove type or geographic areas, for instance, or to represent complex analyses.

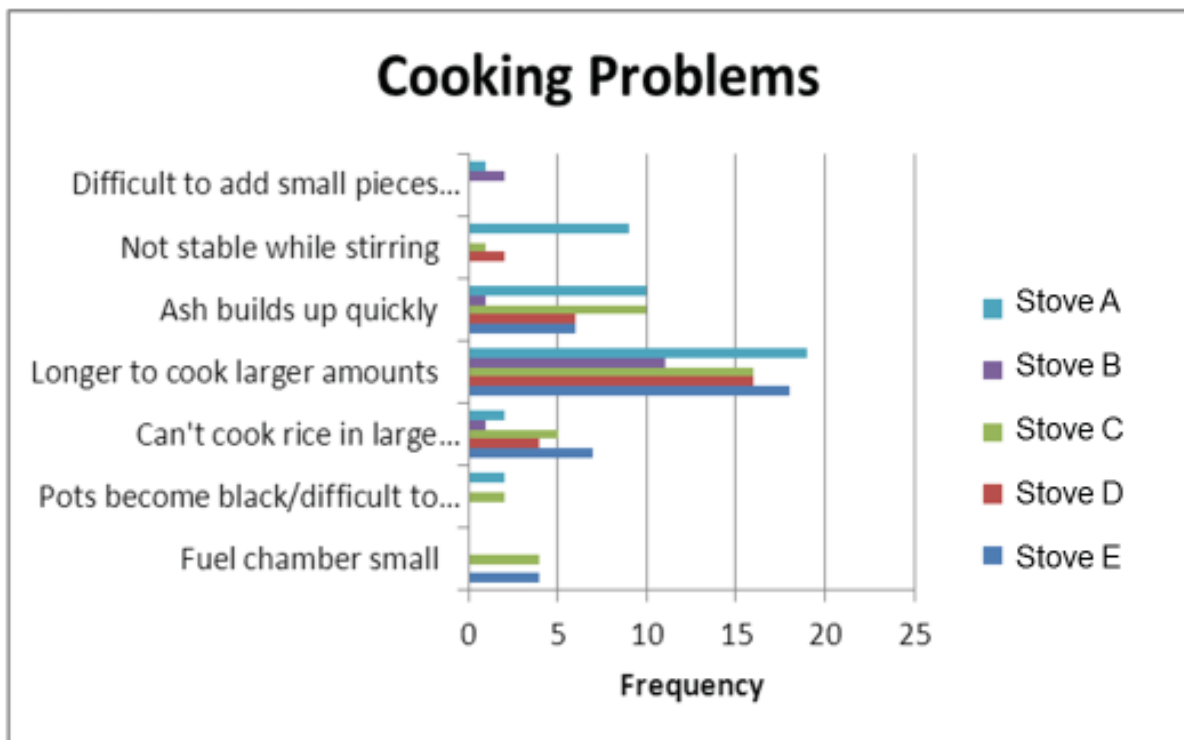


Preference for new and traditional stove, by stove type over time. e

## Preferences by District



The bar chart of cooking problems, by stove, shows clearly the frequency of stove use problems, and their variation by stove type.





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## SUMS Annex

The most common SUMS option is the solid-state, data-logging iButton thermometer, such as the Maxim iButton. These devices are commercially available in large quantities for US\$35-70 per sensor, depending on data storage capacity and maximum temperature; have a maximum temperature of up to 125°C; and have a one-year life with a built-in battery, which can be switched on/off to increase life of the sensor. The iButton is easy to place on some stoves (harder for open fires) and allows for rapid (physical, not remote) download of recorded data, which must take place periodically. For example, the SUMS may log temperatures every 6-10 minutes and fill up with data after 4-6 weeks, at which time the data must be downloaded and the SUMS re-launched to collect new data. One iButton must be affixed to each stove being monitored.

Data-logging infrared thermometers are commercially available for US\$100-150 and have a maximum temperature of 250°C and replaceable batteries. The electronics box is connected to a wire, which is positioned near the stove being tested, so it may be mounted in homes near open fires.

kSUMS has a data-logging thermocouple with a maximum temperature of 1250°C, which makes it especially versatile for stoves that run hot and for three-stone fires. It is commercially available for US\$150 and can also be rented. It features a rechargeable LiPo battery with a 2-3 month battery life. The kSUMS is programmable and can monitor multiple stoves simultaneously (up to three plus ambient temperature tracking).

The Nexleaf StoveTrace is a wireless temperature monitoring system that automatically logs and transmits real-time stove-use data that are then uploaded to a central website. It is commercially available for US\$100-130, has a maximum temperature of 300°C, and has a rechargeable lithium battery that can last five days without a power source. The StoveTrace is easy to place on some stoves and allows for remote configuration.

The SWEETSense sensor is a wireless temperature monitoring system that uses four thermocouples and automatically logs and transmits real-time stove-use data via a cellular network to a specialized database. It is commercially available for US\$400 per sensor, and the required data service costs \$50 per year. It uses AA batteries lasting up to 6-18 months. The technology sends raw data to the cloud, where data are analyzed, and summary statistics are presented through a standard web browser; summary data include frequency of use and performance of each sensor and the technology it monitors.

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## IRB Annex

The United States government has strict procedures to protect the rights and welfare of research study participants to ensure that their participation is both informed and voluntary. These procedures require study staff to clearly explain the risks and benefits of participation before any research activity begins. To monitor adherence to ethical standards, many US institutions as well as international ones have established Institutional Review Boards (IRBs) that administer review processes, including a template for creating an IRB Review Package. The review package includes a description of objectives and procedures, as well as inclusion of data collection instruments and informed consent scripts.

For research being conducted by a US-based organization in another country, standards require IRB review and approval both in the US and the country where the research is to be conducted. It is often possible to obtain a list of country-specific IRBs from the Ministry of Health, USAID, or market research companies. If organizations are conducting research through an in-country research vendor, the vendor can assist or completely manage the IRB review procedure in the country where research is to be conducted.

From a practical standpoint, IRB review by US and host-country review boards can require up to 4–6 months and so becomes a key part of a research timeline. How soon IRB approval is granted depends on many factors, most notably how often the IRB meets. Frequently, IRB Committees review IRB packages on a scheduled basis (monthly or quarterly), with committees requesting clarification and/or modifications, which a subset of the committee reviews on an ad hoc schedule. This procedure continues until the IRB Committee is satisfied, at which point approval is granted and research may commence. The US and in-country IRB review packages can be submitted simultaneously; if revisions are required by one board, researchers must then inform the other of changes.

Research studies fall into three IRB categories: full, expedited, or exempt. Expedited reviews are granted for research deemed “of minimal risk” to participants and are carried out by the IRB chairperson or a designee. Market research on cookstoves may or may not be considered exempt; this can only be determined by the IRB. The fact that consumers will be using cookstoves in homes, with the potential for emissions and burns may require IRB Committee reviews.

Even an exemption requires extensive paperwork and review by a committee representative. Many of the preparatory tasks for the study can be carried out while preparing the IRB review package and awaiting comment.

The following tips will make the IRB process more efficient:

**Early on, determine IRB submission requirements for the implementing agency and country, and plan timing and budget accordingly.**

Determine timing of the board meetings.

- a. Obtain specific documents and forms needed for each board.
- b. Plan for translation, as needed, of key documents: protocol, informed consents, instruments and summary document.
- c. Determine and organize needed funds – and staff – for preparation of each IRB submission.
- d. Decide whether to submit both US and local IRB packages for review at the same time or whether to submit them sequentially. Submitting at the same time can reduce the total amount of time needed for IRB review and approval. However, if requests of each IRB are significantly different and the informed consent form and/or protocol must be redone, it may be necessary to resubmit a revision to the other before continuing.
- e. Plan time/effort to obtain technical approval, as necessary, for the study methodology *prior* to IRB submission. Some organizations may require this additional formal approval step.

**Follow instructions exactly for each IRB submission, including formatting, if specified.**

Complete, if necessary, the process to obtain a certificate of “protection of human subjects” educational requirement for the principal investigator and other key researchers.

- f. Ensure that appropriate training on informed consent and human subject protection is a key part of the data collector training.

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