



## **Identifying behavioural drivers of cookstove use: a household study in Kibera, Nairobi**

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**STOCKHOLM ENVIRONMENT INSTITUTE**  
**WORKING PAPER NO. 2015-06**

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## SUMMARY

Almost three billion people, mostly in low- and middle-income countries, continue to rely on solid fuels (wood, animal dung, charcoal, crop wastes, and coal) burned in inefficient and highly polluting stoves for cooking and heating. The myriad negative impacts of relying on traditional biomass for cooking have been well documented. Although governments, international donors and private companies have made numerous attempts over the years to address this problem, little progress has been made. One key reason for the lack of progress is that cookstove technology and programme developers often fail to properly take account of key drivers of behaviour related to cookstove and fuel choice, most notably the needs and preferences of the end-users.

Understanding these drivers is challenging because individual behaviour is influenced by a combination of factors linked to culture, values, tradition, psychology, aesthetic preferences and emotions. It is also difficult to understand the role of these drivers, partly because people often have trouble verbalising their thoughts and feelings around them. Researchers at SEI have, in recent years, been working to develop and test tools and methods to help access this information and better understand the processes that shape individual behaviour and choice.

This paper presents findings from the first phase of an ongoing case study to identify some key influences on behaviour related to energy use and the uptake of alternatives in households in Kibera, the largest slum area in Nairobi. We used a generative approach, in which cultural probes – in this case disposable cameras – were used in combination with open-ended interviews in 26 households to learn about the socio-cultural context in Kibera.<sup>1</sup> Based on the insights gathered, we identified obstacles to and opportunities for shifting to clean, safe, household cooking alternatives. In the second phase, we will further investigate these barriers and opportunities in a laboratory experiment. Finally, we reflect on the usefulness of cultural probes for eliciting highly contextual socio-cultural information in a setting like Kibera.

### Key insights

- Few households have an accurate overview of their monthly spending on cooking fuel; most underestimate how much they are spending on charcoal and kerosene.
- Despite acute health- and safety-related concerns about the use of charcoal for cooking, few households are aware that highly efficient charcoal cookstoves are currently available in Nairobi.
- Aspiration appears to be an important factor influencing decision-making on purchasing products such as cleaner cookstoves.
- Certain personality traits, in particular risk-taking, appear to play a role in the uptake of new or innovative products.
- Cultural probes are useful tools not only for capturing data in sensitive social settings, but also for enhancing the interview process, because they emphasize the role of the respondent as the expert and help to build trust.

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<sup>1</sup> The validity of these insights will be further investigated in a behavioural economics-based laboratory experiment.

## 1 INTRODUCTION

### 1.1 Scope of the problem: household energy access globally

The human cost of relying on traditional biomass energy for household cooking is well documented. Recently published data from the World Health Organization show that 4.3 million people died in 2012 due to cardiovascular and respiratory diseases linked to household air pollution, almost all in low- and middle-income countries (WHO 2014). Furthermore, the evidence shows that household use of kerosene can lead to levels of particulate matter and other pollutants that exceed WHO guidelines (WHO 2014). In addition, the risk of burns, fires and poisonings associated with the use of kerosene in developing countries is a cause for concern (WHO 2014).

For those who have to collect traditional biomass fuels, such as firewood, charcoal and dung, the task can be hazardous and time-consuming, precluding income-earning work or school attendance. The developing world also faces the challenges of coping with global climate change, which is linked with both energy production and use, and deforestation. At the regional and global scales, biomass burned in inefficient household stoves releases large amounts of black carbon (or soot), contributing to air pollution and short-term global warming (UNEP and WMO 2011).

Large-scale adoption of improved cookstoves<sup>2</sup> that use fuels more efficiently, produce less smoke, or both, is crucial to addressing these problems. However, although governments and development agencies have been working to achieve this for decades, progress has been limited. It has become clear that in order to make a substantial and long-term impact, cookstove initiatives need to transform local stove markets in a way that is self-sustaining and demand-driven. Although there have been success stories, such as the New Lao stove in Cambodia (Simon et al. 2012; Rehfuess et al. 2014) which transformed markets and led to large woodfuel and charcoal savings, these remain the exception rather than the rule.

### 1.2 Gaps in understanding drivers of behaviour

A systematic review of 32 studies identified 13 determinants of cookstove choice, including income, household size, social structure, age, gender, occupation, ethnicity, location (i.e. adoption higher in urban areas) and price of fuel (Lewis and Pattanayak 2012). These analyses were typically conducted using standard household survey tools as a starting point, often combined with a qualitative element such as focus group discussions (Lewis and Pattanayak 2012). However, this review concludes that evaluative studies on clean energy are scarce, of differential quality with no consensus on socio-demographic determinants, and lacking in good qualitative research. A recent study for the UK's Department for International Development (DFID) similarly concludes that there is a lack of credible evidence of behaviour change effectiveness in this field, and recommends interdisciplinary research to advance understanding and build new models of behaviour change for clean cooking (Goodwin et al. 2015)

### 1.3 Gaps in policy and implementation

Despite decades of financing by international donor communities, many projects aiming to scale up adoption of improved cookstoves have failed to gain acceptance among users and often get no further than the pilot project phase. In order to make a lasting impact, policies, interventions and products which aim to change individual or household behaviour need to be based on an understanding of people's needs and motivations (Datta and Mullainathan 2014), and their decision

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2 There is no universally accepted definition of "improved cookstove", and designs and stove performance vary greatly. However, fuel-efficiency and reduced air pollution compared with traditional stoves or three-stone fires are widely regarded as the two key qualities (Akbar et al. 2011). See also [www.cleancookstoves.org/our-work/the-solutions/cookstove-technology.html](http://www.cleancookstoves.org/our-work/the-solutions/cookstove-technology.html). Cookstoves can be rated and compared based on the International Workshop Agreement tiers: see [www.iso.org/iso/catalogue\\_detail?csnumber=61975](http://www.iso.org/iso/catalogue_detail?csnumber=61975).

making processes. Although development actors and policy-makers are increasingly aware of the importance of psychological and cultural factors in the design of effective policies, this awareness has generally not been reflected in or translated into practice in policy and implementation, largely because it is so difficult to predict and measure human behaviour.

This is supported in the literature on cookstove adoption, which argues that achieving this “switch” is difficult precisely because so little is known about the factors that influence individual behaviour and how they affect technology uptake (Ruiz-Mercado et al. 2011). Implementers often follow a standard process when developing and disseminating technologies in developing countries, whereby a technology is developed (often in laboratory-like settings), pilot tested in households, possibly refined to better fit a target market and then “introduced”, using various channels depending on the approach from private sector to donor-led to public-private partnership. In this context, individual behaviour is often framed in a negative way to explain why technologies are not adopted at the household level; for example, they were “used incorrectly” or “not maintained properly” (Lambe and Atteridge 2012). By failing to focus on the user, product manufacturers and programme designers miss out on key insights which are essential for designing products and interventions that users need, desire, and will adopt in the long term (Shankar et al. 2014; Jeuland et al. 2014)

#### 1.4 Urban energy access

Africa’s urban population is set to increase from 414 million to over 1.2 billion by 2050.<sup>3</sup> Around 863 million urban dwellers in low- and middle-income nations worldwide live in poor-quality, overcrowded housing with inadequate provision of basic services (UN HABITAT 2014). Household energy use in low income urban zones is said to be influenced primarily by the price and availability of fuel, with households typically relying on the cheapest available fuels and energy-using equipment, including inefficient biomass cookstoves that have particularly negative impacts on health and safety when used in poorly ventilated, overcrowded dwellings. Furthermore, the rapid growth of informal urban settlements that lack adequately planned energy infrastructure is resulting in soaring demand for biomass fuels, in particular charcoal, to meet household energy needs. This demand for biomass in urban centres is driving rural deforestation rates that, together with the inefficient production of charcoal, have negative local and global environmental consequences (Johnson and Jumbe 2013)

##### *Energy access in Kibera*

Currently Kenya’s urban population is approximately 12.5 million, 70% of whom live in informal settlements, and Kibera houses a significant proportion of Nairobi’s urban population in a land area of approximately 2.5 square kilometres (Global Network on Energy for Sustainable Development 2013). Population estimates for Kibera range from 200,000 to 1 million people with the majority of households living below the USD 1.25 poverty threshold (Karekezi and Kimani 2008). The majority of Kibera residents live in one-room, mud-walled or timber houses and do not have access to basic services such as safe water, sanitation systems and health services. The population of Kibera is growing due to increasing rural to urban migration; it is estimated that Kenyan cities are growing by 750,000 people per year (World Bank 2012). Providing access to electricity for growing urban populations has not been prioritised in the Kenyan development agenda, as most government finance and international development aid tends to focus on developing modern energy infrastructure to serve commerce, industry and high-income residents in urban centres (Global Network on Energy for Sustainable Development 2013).

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3 See: [www.un.org/apps/news/story.asp?NewsID=41722#.VGnE9md0zIU](http://www.un.org/apps/news/story.asp?NewsID=41722#.VGnE9md0zIU)

*Background and objectives of the case study*

The findings presented in this report result from the first of two phases of a case study on the drivers of behaviour related to the use and choice of household energy in Kibera, Nairobi. Phase one, the *generative phase*, aimed to provide a deeper understanding of some of the key barriers to and opportunities for a shift to cleaner and safer household energy practices, that is, the uptake by households of high-efficiency biomass cookstoves and Liquid Petroleum Gas (LPG).

The overarching objective of the study is to identify the key factors influencing individual behaviour related to household energy choice and use in Kibera, in order to generate useful insights for policymakers, health practitioners, and private sector actors seeking to effectively deliver improved household energy interventions. The main policy objective is to identify concrete opportunities for households in Kibera to shift to cleaner and safer cooking practices. Our research objective is to contribute new knowledge on what determines household behaviour by applying an interdisciplinary approach that tests cultural probes as a method for eliciting information on the socio-cultural context. In so doing we hope to help to fill the gaps in understanding outlined above, in particular related to the dearth of qualitative and interdisciplinary research on household choice of cookstoves and fuels. A secondary objective of the case study is to explore whether probes are a useful tool for gathering socio-cultural contextual data in a setting like Kibera.

## 2 THEORETICAL FRAMEWORK

Given the complexity of the factors that underpin behaviour, it is impossible to summarise concisely what is known about those factors and how they interact. Influences on behaviour can, however, be characterised broadly as genetics, individual thoughts and feelings, the physical environment, social interaction with other individuals, social identity, or interaction within and between groups, and the macro-social environment. Not surprisingly, the literature on behaviour and behaviour change is vast and draws on disciplines including psychology, anthropology, sociology and economics (UK Parliament 2011). While there are many ways to conceptualise or define theories of behaviour and behaviour change, most theories can be categorised as focused on either the individual as the key agent in behavioural change, or the relationships between behaviour, individuals, and the social and physical environments in which they occur.

The Kibera case study aimed to identify important factors influencing individual behaviour related to the choice and use of cookstoves. To do this, we took an interdisciplinary approach, drawing on the overlapping academic fields of anthropology and behavioural economics (Ibid.; World Bank 2014).

### 2.1 Anthropology and ethnography

Anthropology seeks to explain both diversity and similarity in human behaviour around the world. Cultural anthropology is the comparative study of the ways in which people make sense of the world around them, while social anthropology is the study of relationships among persons and groups, including the binding rules and norms which shape society and govern how people behave and interact with one another. Anthropological study historically involved western academics studying “other” often distant cultures using an “immersive” approach whereby they lived for extended periods in the environment or field of interest (Somekh and Lewin 2011). Anthropological fieldwork typically employs ethnographic methods such as extended participant observation, interviews and the gathering of a wide range of artefacts, which are pieced together by the researcher to derive meaning from the culture or society being studied. A key premise of anthropology and ethnography is that we can only understand why people behave in the way they do if we view their actions and words as entangled with other worlds and words that we cannot see or hear, but to which we must gain access (Somekh and Lewin 2011).

### 2.2 Behavioural economics

Insights from the fields of cognitive psychology and behavioural economics tell us that individuals typically make decisions based on *other (i.e. non-economic) rationales, acting to the best of their knowledge, influenced by other norms or emotional responses* and unconsciously employing mental short cuts – heuristics (rules of thumb) to make sense of the world (Kahneman 2013). Behavioural economics seeks to complement traditional approaches to economics by incorporating insights from psychology and human behaviour. Although the field is vast, there are a number of key underpinning principles which have been shown to be important for explaining decision-making and choice. These include *thinking automatically* (Kahneman 2013), the *use of mental models* and *thinking socially* (World Bank 2014), and are outlined below.

Thinking automatically: Kahneman (2013) describes individuals as having two systems of thinking – the automatic system and the deliberative system. Although most of us believe ourselves to be deliberative thinkers, the automatic system influences nearly all our judgments and decisions (Kahneman 2013; Kahneman et al. 1982). Automatic thinking causes us to simplify problems and see them through *narrow frames*. We fill in missing information based on our assumptions about the world and evaluate situations based on associations that automatically come to mind, rather than on objective information. The fact that this is our predominant mode of thinking can

have wide-ranging implications for the everyday choices made by people living in poverty. For example, people do not objectively weigh up options when financial decisions are being made, often opting for small, short-term gains over larger gains further in the future (Kahneman 2013).

**Mental models:** Mental models are concepts, categories, identities, prototypes, and so on, that we all use to interpret the world around us. They are learned from our experiences, from parents or others in our communities or from collective beliefs or social conventions developed over generations (Bisin and Verdier 2014). Although many mental models are useful to us in complex decision making processes, others are less helpful and can contribute to reinforcing biases (e.g. stereotypes about certain cultural groups) or beliefs about the possibility of achieving future goals (World Bank 2014).

**Thinking socially:** Humans are inherently social beings. As such we are influenced by social preferences, social networks, social norms and social identities; most people care deeply about what others think and about how they fit into their social group, and have a tendency to imitate the behaviour of others (World Bank 2014). Thus, the wider social context is a critical element to consider when studying how individuals behave and make choices.

Although the principles of thinking automatically and employing mental models are universal, deprived people face the psychological stresses of poverty and scarcity, which have been shown to decrease cognitive capacity, exacerbate cognitive biases and lead to decisions that contribute to poverty persistence (Mani et al. 2013). Although many development policies and programmes are still based on the traditional economic model that emphasizes rational choices, there is a growing awareness among development actors and policymakers about the need to account for cognitive and socio-cultural factors in order to design effective policies that achieve development goals. Indeed, the focus of World Bank's World Development Report for 2015 is behaviour. Drawing on numerous examples, the report builds a strong case for development interventions based on a more realistic understanding of human behaviour that takes human factors into account (World Bank 2014).

### **2.3 Research questions**

**The research questions we sought to answer during the generative phase were:**

1. What are the barriers to households in Kibera shifting to cleaner and safer cookstoves and fuels?
2. Which behavioural drivers might influence the uptake of cleaner cookstoves and fuels?

### 3 METHODOLOGY

In recent years researchers from SEI have been experimenting with generative methods borrowed from design research methods to better understand individual- and household-level decision-making related to cookstoves and fuels (Atteridge et al. 2013; Lambe and Atteridge 2012). Generative methods focus on drawing both overt and tacit knowledge from users, in this case cooks, to shed light on people's needs and desires (Hannington 2007). Sometimes an earlier "exploratory" research phase is considered separately, which focuses on obtaining an in-depth understanding of people and the context in which they live. Both exploratory and generative methods "are typically ethnographic in nature, and may include participant observation, artifact analysis, photo and diary studies, contextual inquiry, cultural probes, and other methods designed to sample human experience" (ibid.). This approach has proved useful for eliciting a better understanding of the wider socio-cultural context in which households are situated and for gathering insights about individual preferences, beliefs and emotions which impact on the choice and use of cookstoves. Since design-led methods often require the researcher to become embedded, if only for a short time, in the lives of the people they are learning about, they allow us to observe people's day-to-day experiences and, from there, to understand their needs. As (Brown and Wyatt 2010) point out, "traditional ways of doing this, such as focus groups and surveys, rarely yield important insights".

#### 3.1 Drawing on design research methods

In the past two decades, design research – the study of people as users of products, services and environments – has emerged as a distinct area of study with its own set of research approaches and methods. Approaches to design research typically come from either a research-led or a design-led perspective. The research-led perspective has been driven largely by applied psychologists, anthropologists, sociologists and engineers, and is characterized by an "expert mindset", where researchers consider themselves to be experts, designing products and services for service-users or consumers. The design-led perspective, on the other hand, regards people as the true experts in their contexts (of living, working, learning, etc.) (Sanders and Stappers 2013). Design-led researchers are more participatory in their mindset and tend to value people as co-creators in the design process. As an approach, design research draws on human capacities that are often overlooked by more conventional problem-solving practices, such as the ability to be intuitive, to recognize patterns and to construct ideas that have emotional meaning as well as being functional (Brown and Wyatt 2010). Design-led research is highly ethnographic in nature, offering reference material on people's everyday lives – their practices, motivations, dreams and concerns (Stickdorn and Schneider 2012)

##### *Applying the design research approach to development problems*

Designers have traditionally focused on developing visually appealing, functional products. More recently, however, they have begun to apply their design tools to solve more complex systemic problems. Insights and methods from design research are increasingly being applied to support new strategies for designing, implementing and evaluating development programmes in more innovative ways. IDEO's human-centred design toolkit and the literature on meeting the needs of "base of the pyramid" consumers are just two examples (Zhang and Dong 2009; Brown 2008). Indeed, the *World Bank World Development Report 2015: Mind, Society and Behaviour* highlights these perspectives alongside those of behavioural economics and cognitive psychology as important for incorporating an understanding of human behaviour into the design of effective development interventions (World Bank 2014).

### 3.2 Developing an approach for the Kibera interviews

In designing the approach to this study, SEI researchers consulted with industrial designers – both product and service designers as well as academics in the field of design research – to gather ideas and inspiration for the methods to use to gather insights into Kibera. The recommendation resulting from this consultation was to build on previous generative approaches taken by SEI research teams in India and Zambia by applying photo-elicitation as a self-documentation design probe to support and deepen the qualitative interviews. Design probes are an approach to user-centred design used to understand human phenomena and explore design opportunities (Mattelmäki 2005). Like cultural probes (Gaver et al. 1999), design probes are collections of evocative tasks intended to elicit inspirational responses from people that provide insights into their lives and thoughts. It is a method for conducting ethnographic research in contexts that are typically difficult for researchers to access without influencing the data, for example, inside people’s homes or workplaces. However, an important difference between cultural and design probes is in how the material generated during the probe exercise is analysed. Gaver et al. (1999) insist that the material must be interpreted directly by the researchers without the involvement of the participants. However, in the application of design probes, material is generally analysed jointly by the participant and the researcher (Mattelmäki 2005). Cultural probes have become an established method in the field of design research (see e.g. Crabtree et al. 2003; Sejer Iversen and Nielsen 2003) and have been adapted to and appropriated for a range of purposes in a variety of technology projects. Cultural probes are generally said to encompass a number of key features:

Key features of cultural probes:

1. Probes are based on *user participation* by means of *self-documentation*. The users or potential users collect and document the material, working as active participants in the user-centred design process. Probes are a collection of assignments through which or inspired by which the users can record their experiences, and express their thoughts and ideas.
2. Probes examine *the user’s personal context and perceptions*. The purpose is to outline human phenomena, and introduce the user’s perspective to enrich design. The assignments focus the users’ attention and record their daily lives, including their social, aesthetic and cultural environment, and needs, feelings, values and attitudes.
3. Probes are participatory, but they redefine the traditional researcher-participant roles by *allowing the participant to become the expert*. In responding to the probe, users become more active contributors, rather than passive sources of data (Graham et al. 2007). As Graham et al. highlight, this reflects the fundamental commitment to the view that people are “experts” in their own lives.
4. All probes are meant to *start a dialogue* between the participant and the researcher. This conversation begins when the probe is handed to the participant and continues when the outputs of the probe are explored jointly by participant and researcher. Key to this dialogue, as Gaver points out, is the establishment of trust between participant and researcher.

### 3.3 Using photo-elicitation in Kibera

Probes appeared to be a potentially useful tool for gathering household-level data in the context of Kibera, where conducting research presents particular challenges. We needed a way to allow people to tell their own stories in their own words, and to access their everyday lives and the broader socio-cultural context without our presence as outsiders compromising the data-gathering process. Since security issues in Kibera make it impossible for outsiders to walk around freely or spend extended periods of time there, especially after dark, the cameras provided a window into Kibera that would not have otherwise been possible. Furthermore, there is a high degree of “re-

search fatigue” among Kibera residents (Karekezi and Kimani 2008), many of whom have been the subject of numerous studies over the years by researchers and NGOs conducting household surveys. As a result, researchers find that interviewees are often demotivated or bored during interviews, which can compromise the quality of the data. For example, a respondent may just give any answer or the answer they think the researcher wants to hear just to speed up the interview process. A key motivation for using this method was its potential, demonstrated in other contexts, to generate a creative and inspiring dynamic between researcher and respondent. In this way we hoped to limit the effect of research fatigue among interviewees. There is a high level of mistrust among Kibera residents: of the government, which is seen as largely ignoring the plight of Kibera households; of outsiders, including non-Kenyans who many Kibera residents feel have a skewed perception of life in the slum; of foreigners, who are increasingly associated with “slum tourism” which many feel to be exploitative; and even of some local NGOs. The issue of access to electricity is particularly sensitive given that the majority of residents have illegal connections. We were advised by our local partner to take particular care in asking questions associated with the use of electricity. We hoped that by allowing us to shift the traditional researcher-participant roles, and give a more proactive, “expert” role and increased agency to the respondent, the use of cultural probes would help us to overcome issues of mistrust which could otherwise hinder the data-gathering process.

#### *Photo-elicitation as a research method*

The use of visual methods in research has its origins in ethnography, anthropology and sociology (Harper 2002; Pink 2004; Mannay 2010). Photo-elicitation is based on the simple idea of inserting a photograph into a research interview. As Harper describes, the effect of using visual material in interviews differs to using words only because of how we respond to images; the parts of the brain that process visual information are evolutionarily older than the parts that process verbal information (Harper 2002). For this reason, images can tap into deeper elements of human consciousness, which may explain why photo-elicitation interviews typically evoke different information to verbal interviews (Harper 2002). The academic purpose of self-documentation is to examine the daily factors of human lives, and the most typical forms of traditional self-documentation are diaries and camera studies (Mattelmäki 2005). Although photo-elicitation is frequently used as a research method by designers, sociologists, and to some extent anthropologists, the authors had difficulty finding examples of self-documentation camera studies used in the context of developing countries.

Design or cultural probes are often delivered as a “kit” containing multiple tasks (Mattelmäki 2005; Gaver et al. 1999). However, due to time and budget constraints we chose to apply photo-elicitation as a single probe, in combination with open-ended, in-context interviews and observations. The probe used in the Kibera case study took the form of a disposable camera distributed to each household one week prior to the interviews. Disposable rather than digital cameras were chosen because we did not want the household to review or edit its photographs prior to the interview session. The research was conducted in two rounds: 11 households participated in April and 15 in May of 2014. The households were randomly selected by our local partner, the Busara Centre for Behavioural Economics. In each round, households were divided into two groups. One group, the “treatment group”, was told to take photographs related to “cooking/eating”. The other group was told to take photographs “about their lives”.

The respondent in each household was the person primarily responsible for cooking. All the participants were shown how to use the cameras and asked to use all of the shots in the camera. Participants used the cameras for approximately one week, after which they were collected and the photographs developed. The photographs were brought to the interview sessions with the

households, and the first part of the session was used to review the photographs together with the participant who described the content of the photographs and guided us through the shots. There was no particular structure imposed by the research team for exploring the photographs. Instead, the process was led by the respondent who decided which photographs to begin with and which order to take in reviewing them. At the end of each interview, respondents were given a copy of the photographs to keep.

#### *Semi-structured interviews and observation*

The photo-review was used as a lead-in to the semi-structured interview, which focused on each household's experience of using different cookstoves and fuels, including attitudes and preferences, and opportunities for change linked to access to finance, willingness to pay, awareness of alternatives and access to information about cleaner or safer options. An interview guide was designed which covered these main topic areas but the opening questions were intentionally broad in nature – not focused on cooking or household energy but designed to get a sense of where cooking fits into daily life. These more general questions served as a useful bridge between the photo-review and the more household energy-focused part of the interview.

Efforts were made to interview respondents “in-context”, that is, in their homes and, where possible, while they were cooking to allow observation of the living space and how the household members interacted with their cooking device. We learned the value of making these observations during earlier work interviewing households in India and Zambia (Lambe and Atteridge 2012; Atteridge et al. 2013) where what respondents told us about their cooking practices often differed greatly from what they actually did. In addition, our presence in people's homes allowed us to observe some of the other possessions owned by the household, which items they choose to display, and so on, and to ask questions about how and why these possessions were acquired. These observations provide important insights into what the households value and why, what they are willing to save or borrow money for, as well as existing marketing and information channels for various items.

### **3.4 Data capture and analysis**

A team of two researchers (one from SEI and one from Busara) was present for all the interviews, with the Busara researcher acting as interpreter. (Although some respondents spoke English, the main language was Swahili.) Interview data were recorded using notes taken by both researchers. During the first round of interviews, (11 household interviews) the photographs were not independently analysed. All the content analysis is based on the respondents' own explanations, which took place during the interview sessions. During the second round, (15 households) the researchers reviewed the photographs prior to conducting the interviews. The initial data analysis was conducted directly after the interviews with each researcher independently reviewing the interview notes to identify emerging themes. The author then sorted all the field notes and transcripts using a two-step process of “initial” and “focused” coding (Snow et al. 2003). During the initial coding, the authors identified data categories relevant to the everyday lives of the respondents, perceptions of current stove and fuel use, decision-making on household expenditures and knowledge of alternative stoves and fuels. These categories were compared with the initial themes and where there were gaps or disagreements, the data were revisited and categories revised. Through an inductive and iterative process of focused coding, emerging themes about behavioural drivers were identified. The data coding was done manually, and the coding was cross-checked by the research team – a process which also resulted in the emergence of additional themes.

## 4 RESULTS FROM THE INTERVIEWS

### 4.1 Demographics

One-third of the respondents represented women-headed households. The average age of the respondents was 35 years. The average size of household was five persons and on average households had two children between the age of five and 16. More than half (14) the households earned income primarily from running a small business, six from a small business in combination with casual labour, two from casual labour only, and five from salaries or wages.

### 4.2 Trends in household energy use

Perhaps not surprisingly, cooking/food preparation appears to be at the heart of life in Kibera. It was striking that of the 14 respondents who received no instructions about what to take pictures of, almost all (12) included several photographs depicting some part of the cooking process, from food preparation to cooking or eating together with their families. Indeed, when looking at the photographs without reference to the interview notes it is impossible to tell which respondents had been asked to focus on cooking. Early on in the interview – before asking any specific questions about cooking or energy – we asked respondents to describe an average day in their lives. The most frequently mentioned tasks were the planning of meals, the purchase of food and fuel, food preparation and eating.

All the interviewees reported using a combination of stoves and fuels in their daily cooking. Most rely on a charcoal-burning, either metal or ceramic, jiko and a kerosene wick stove. Most interviewees used kerosene for “quick tasks” like making tea or reheating food and charcoal for slower tasks that required simmering, such as githiri – the bean and maize stew that is a local staple. Respondents also reported the need for a “back-up stove”. For most this was the kerosene stove, which they would use if they ran out of charcoal. Most interviewees noted that they used kerosene sparingly since it is expensive in terms of cooking output. However, when asked whether they would switch to kerosene for all their cooking needs if they could afford it, all the interviewees replied that this would not be feasible since kerosene gives the food a bad taste, and that kerosene was particularly unsuitable for cooking certain meat dishes that require grilling. Similarly, one interviewee who uses an electric stove for most cooking tasks explained that she could not cook chicken or chapatti on the electric coil stove as the food would “look and taste bad”. Several others noted that ugali, a daily staple dish for most households, does not taste good when cooked on a kerosene stove.

The majority (22 of 26) of the interviewees we spoke to reported having access to electricity, which was mostly used for lighting. Electricity in Kibera is often provided through illegal connections (Global Network on Energy for Sustainable Development 2013) for which households usually pay a flat rate of approximately KES 500 per month (the average price reported by the interviewees). Despite the low cost, the majority of households are reluctant to use electricity for cooking – just three households were doing so. Ten interviewees expressed great concern about safety when using electricity for cooking, due to the high risk of electrocution or electrical fires, which they reported are a common occurrence in Kibera. Several interviewees explained that frequent power cuts – often several times per day – as well as low power output during peak times (morning and evening) make it impossible to rely on electricity for cooking. In addition, it has been estimated that power surges occur in Kibera on average five times per month, and these surges can damage electrical appliances (Figueroa 2014).

### 4.3 Acute health and safety concerns related to charcoal and kerosene

All the respondents reported having serious health- and safety-related concerns about the regular use of charcoal for cooking. These included concerns about the health risks linked to exposure

to carbon monoxide emissions from the charcoal jiko. It is notable that most of the households referred to carbon monoxide rather than smoke or fumes, which indicates a high level of awareness about the risk. More than half the respondents we spoke to (16) reported knowing someone who had either died or become very ill as a result of prolonged exposure to carbon monoxide in poorly ventilated spaces: *“My brother in-law’s son was killed in a jiko accident. He slept with a jiko inside the house and the house caught fire; he could not ask for help because he was drowsy and helpless from the carbon monoxide he had inhaled from the charcoal”* (HH114).

Disturbingly, 10 interviewees reported using the charcoal jiko as a space heater in the rainy season (roughly May to September), often using the stove for several hours per day. All the interviewees complained about the smoke produced when lighting the jiko; some saying it irritated their eyes, others that it made them or their children cough. Lighting the jiko can take up to 10 minutes, and requires burning pieces of paper which produce a lot of smoke. Many reported taking the stove outside during lighting to keep the smoke out of the house. Cooking outside the house is not an option for any of the interviewees we spoke to, even if it reduces exposure to smoke and carbon monoxide. Most explained that it is too dusty and unhygienic, while some noted that they would find it humiliating for their neighbours to see them eating the same simple dish every day. Staggeringly, 17 of the 26 interviewees we spoke to reported having had an accident caused either by the jiko or the kerosene stove that resulted in injury. One respondent told us that poor quality charcoal can cause sparks, which can lead to fires: *“some charcoal produces sparks which can cause fire or injure your eyes. I have heard of many houses catching on fire, and many deaths because of sparks from charcoal stoves. My neighbour’s house burned down due to a fire caused by sparks from the jiko”* (HH11).

#### 4.4 Price misperceptions and willingness to pay for efficiency

Although it is less expensive to purchase charcoal in bulk, all but two of the households we spoke to typically purchase fuel (kerosene and/or charcoal) in small quantities on a day-to-day basis, which is typical purchasing behaviour in low-income households (Johnson and Takama 2012; Yonemitsu et al. 2015). Our findings show that most households had no clear overview of their spending on household energy. When asked to list their most significant monthly expenditures, most households unless prompted neglected to mention expenditure on fuel. During the interview, we asked households whether they would be willing to pay KES 3000 for an efficient jiko that would save 50% on fuel.<sup>4</sup> In cases where fuel expenditure had not been discussed earlier in the interview, households were more likely to respond that they would not be willing to pay more for such a stove. Where the question was asked in the context of fuel expenditure, the interviewee was more likely to express a willingness to pay KES 3000 for a more efficient jiko. In total, 10 households said that they would be willing to pay KES 3000 for a highly efficient charcoal cookstove. Of these 10, four said that they would be able to pay the full price if they could pay in instalments.

**Table 1. Monthly expenditure on charcoal and kerosene by household size**

Households of 2–3 members:	1230 on charcoal	475 on kerosene
Households of 4–5 members:	1725 on charcoal	476 on kerosene
Households of 6–7 members:	2100 on charcoal	450 on kerosene
Households of 8–9 members:	3525 on charcoal	642 on kerosene

<sup>4</sup> We used this price point as this is the market price of an improved charcoal jiko available in Nairobi, which uses 50% less charcoal than the most commonly used traditional charcoal stove.

#### 4.5 Knowledge and perceptions about alternative stoves and fuels

When asked which stove and fuel they would use if money were not an issue, all but two of the interviewees said that a Liquefied Petroleum Gas stove would be their first choice in terms of safety, cleanliness, ease of use (turning on and off and regulating the temperature), speed of cooking and low impact on the taste of the food compared to kerosene. However, all the households complained that LPG is too expensive to use for all cooking tasks and that the supply of LPG is often unreliable. Two households expressed fears about using LPG as they had heard about explosions caused by gas leaks in the neighbourhood. As described above, few (four) households had heard about an improved charcoal stove that could save 50% on fuel. Many had heard about efficient briquettes and had a generally positive view of them, although some interviewees mentioned that while the briquettes are more efficient than charcoal, they produce a lot of smoke when lighting them.

#### 4.6 Sources of information on new and innovative products

Most interviewees listed friends, family, television and radio, in that order, as their main sources of information about new products and ideas. Interviewees who had heard about improved cookstoves had either received this information directly from a friend or family member, or witnessed someone using the stove first-hand. Community-based organisations such as youth volunteers and women's cooperatives also appear to be trusted sources of information about innovations and new ideas. Interestingly, respondents tended to mention certain individuals, rather than organisations or NGOs, as being important transmitters of ideas and information. A number of interviewees described how they had been introduced to an idea first-hand, for example when a community mobiliser had come to their home or they had visited a friend or neighbour. This personal interaction seems to be very important for building the trust and support required for people to take the step of actually trying new technologies or products. For example, we observed that two households had installed "water bottle lamps" for lighting, one had installed a small solar lighting system and several were growing vegetables outside their homes in burlap sacks. In all cases, the innovation was introduced by a community-based organisation that they knew and trusted. Twelve households noted that there are certain "trendsetters" in the community who can influence others to test a new product or practice and are often important community mobilisers for new projects. A number of respondents put themselves in this "early adopter" category, saying that they themselves take risks and like to be the first ones in their neighbourhood to try new products or technologies and then demonstrate these for friends and neighbours.

#### 4.7 Hope and aspirational thinking

During the first round of interviews we found that aspiration appears to play a role in influencing people's decisions to purchase certain items. Aspiration can be broadly defined as forward-looking goals or targets (Locke and Latham 2002). Nine households had made a significant investment in a new household appliance over the preceding six months, such as an electrical hotplate, a fridge, a solar home system or an LPG cookstove. When asked to describe the decision-making process linked to the purchase of the new item, in particular the key qualities of the product that made it desirable, all but one household described the product as being "new" or "modern" and somehow representing an improvement in their life. For example, when asked why she decided to purchase an electric hot plate, one respondent remarked: *"They are stylish, the 'in thing'. The well-off people use them. I feel like I could be in their class if I had one."*

For the second round (15 respondents), we designed some specific open-ended questions focused on aspiration and hopes for the future. These questions were included towards the end of the interview, after we had discussed a range of other issues related to household energy use. We asked respondents to describe in as much detail as possible what an "improved quality of life" would mean for them. Most interviewees mentioned being comfortable and secure, and having a larger

house as key elements of a “better life”. Some mentioned that achieving these improvements would only be possible outside of Kibera, but the majority said that improvements to quality of life would be possible and indeed more achievable in Kibera due to the close community ties and low cost of living compared to other parts of Nairobi. As in the first round of interviews, almost all the households listed LPG or a “cleaner” cookstove alongside a television and a fridge as an item associated with an enhanced quality of life.

The photographs also provided a platform for inquiring generally about aspirations and hopes for the future. By asking questions about the subjects of the photographs, we were able to gain a deeper understanding about underlying motivations and the driving forces that play a key role in day-to-day decision-making as well as longer term planning. Many respondents (10) took at least one photograph of their own children or of children/young people they are responsible for. A number of these respondents chose to take photographs of their children reading or doing homework. When asked why they chose to take these photographs, the respondents replied that they were proud of their children, that they have high hopes for their children’s future, and that they were making a significant investment in educating them, even if it meant making sacrifices at home in terms of spending less on other items. In all cases, the largest monthly expenditure reported by all households was on school fees and school supplies such as uniforms and books. Several respondents reported taking loans with high interest rates to cover these costs. There was a general consensus among respondents that they would normally only take loans for productive purposes such as investing in a business, and never for consumption, indicating that investments in education are in the same category as business investments.

Interestingly, in cases where children featured in the photographs, households were more likely to relate cookstove/fuel use to their children later in the interview, often in terms of perceived risks to health and safety concerns. These households were also more likely than those who did not take photographs of children to mention a desire to shift to a cleaner or safer cookstove and fuel, and more willing to pay up to KES 3000 for an improved charcoal cookstove.

#### **4.8 Access to finance**

All but two households we spoke to reported saving regularly, either through a “merry-go-round”<sup>5</sup> scheme or by regularly putting money in a jar. Eight interviewees reported having saved for a big item, such as a television, a radio or a fridge, at least once in the past three years, and several interviewees described making sacrifices such as eating less in order to put more money aside for the item they were saving for. All but three households reported having access to loans from a micro-lending facility, from their employer or from family and friends. The most commonly reported reason for taking a loan was to cover school expenses. A majority of the interviewees who were accessing loans reported that they would only ever take out a loan for a “productive purpose”, never for a consumer item, as they were afraid of being in debt. In addition, because interest rates on loans are so high (10–30% per month), the loan must be for a wise investment to justify the interest paid. Borrowing and lending items such as cooking fuel is a common practice between friends and neighbours, and three households described how they personally knew a charcoal vendor who would allow them to buy small quantities of fuel on credit or large amounts paid for in instalments.

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<sup>5</sup> A savings club where all members contribute to a pot on a regular basis, e.g. once per month, and the members take it in turns to receive the full amount.

## 4.9 The effect of using cultural probes as an interview tool

### *Understanding the wider context: making the invisible visible*

The use of the cultural probe method allowed us to gather information about life in Kibera beyond the immediate household setting, and provided unique access to Kibera that we would not otherwise have had. The general discourse on Kibera, in both the academic literature and media coverage, as is the case for most slums, tends to be rather negative, focusing on the high rates of poverty, crime and disease, and the lack of access to basic amenities such as water, sanitation and electricity (Ekdale 2014). Where our research filled an important gap is in understanding the social fabric of Kibera from the perspective of individual households, and how this social setting influences behaviour and decision-making within the household. One result of having this access was that it allowed us to observe many of the very positive aspects of living in Kibera which are not typically highlighted in the literature (see e.g. Ekdale 2014). Almost every interviewee who had photographs to share had taken several pictures of scenes in the neighborhood – of vendors selling goods, children playing, community centres, community washing facilities, and so on. When asked about these photographs, households often explained that they wanted to show the positive side of life in Kibera and that they were proud to live there. In several cases, this led on to a discussion about satisfaction with life in Kibera, perceptions of life elsewhere, and hopes and aspirations.

### *Supporting respondents to share their personal stories*

Although it is difficult to pinpoint for each interview whether the perceived state of trust and empathy between interviewer and interviewee was a direct result of the use of the cultural probes, we detected clear differences in the level of openness of respondents where the probes were used compared with those interviews where the cameras had been damaged and there were no photographs (see below). Importantly, in the interviews where photographs were used, the respondent was more likely to share a personal or sensitive story than in cases where only open-ended interviews were used. For example, one respondent had taken a series of photographs of her and a group of women preparing food, cooking and eating together. She began by describing what was happening in the photographs, but went on to explain that this women's group worked as an income-generating cooperative, making crafts to sell. The group meets once a week after church to eat lunch together. She spoke at length about how the women support each other, by offering advice but also by lending each other money if needed. When asked if she had received support from the group, she became emotional and described how her husband was ill and how she had received comfort and support from the group. Later in the interview we discussed household energy use patterns and specific preferences when it comes to specific stoves and fuels. At that point, the respondent told us that both she and her husband are HIV positive, that her husband was currently "bedridden" and that the smoke produced when lighting the charcoal jiko, as well as the heat that builds up inside the house when it is in use, caused her husband acute respiratory problems. We were told by our local partners that this type of information is highly sensitive and rarely shared with strangers.

As is mentioned above, access to electricity is a sensitive subject in Kibera and not an easy one to broach with respondents. Most households have illegal connections to the grid and live in fear of the authorities finding out and imposing fines. The photographs were a useful tool for finding indirect entry points into discussing household energy use more broadly. For example, most households included photographs of at least one electrical household appliance – a radio, television, fridge or lamp – either as the main subject or in the background. This allowed us an entry point to ask about their use and, in turn, the use of electricity.

During a discussion about electricity access in Kibera, one respondent described in a hushed voice how access to amenities in Kibera, even illegal electricity connections, was linked to ethnic ties since many of the individuals who perform the illegal connections are from a particular ethnic tribe and give preferential treatment to members of the same tribe.

Generally, where photographs were used (in 21 of the 26 interviews) respondents opened up more quickly and found it easy to begin talking about their everyday lives, using the photographs as a prop or visual aid for sharing information with us. We noted that where photographs were used as a part of the interview process, the interviews lasted on average 40 minutes longer than in instances where only open-ended interview questions were asked. Generally speaking, the conversation flowed much more easily too, with the respondent doing most of the talking. Where we did not have photographs, the interviews were generally less relaxed and we found ourselves relying on our interview guide to generate discussion. However, this observation is based on a very small sub-sample of just five households, so there is a high degree of uncertainty about the observed effect.

*Shifting the dynamic: allowing the participant to become the expert*

In cases where there were no photographs to discuss, we noted that it was more difficult to build a rapport with the interviewee. Understandably, households are often very reserved, shy or self-conscious in the presence of an interviewer and the accompanying translator and facilitators. Furthermore, since the houses that we visited were typically one-room dwellings, the physical space often felt crowded during the interview, with researchers sitting close to the respondent which undoubtedly contributed to the unease of the interviewee. The photographs served as a way to shift the physical focus away from the respondent, relieving some of the pressure on them to “perform” or say the right thing. This had the effect of lightening the atmosphere during the interview. Crucially, the use of the photographs allowed the respondent to take on a more assertive role during the interview – they decided what to say about each photograph and which stories to tell. In the interviews where there were no photographs, the dynamic was entirely different; it was then up to us to ask the questions and drive the interview forward. In these cases, even though we aimed for a semi-structured interview process, the interview inevitably took on a more structured form where respondents were less likely to spontaneously share stories or personal experiences.

It is important to note that although we relied on the interviewees to guide us through the photographs, we did ask follow-up questions occasionally – often very open-ended questions such as why a certain photograph had been taken. In this way, the process of analysing the content of the photographs was highly participatory and one in which both parties were equally engaged in discovering meaning.



**Figure 1: Respondent guiding the interviewers through her photographs**

## 5 DISCUSSION

### 5.1 Opportunities for change: synthesis of findings

We suggest that a number of insights can be gained from the results described above about the possible determinants of behaviour related to the choice and use of cookstoves and fuels in Kibera. Some of these factors reside at the individual level and are related to the mental shortcuts that we apply when making decisions, or personality as a factor that influences certain behaviour such as risk-taking. Others have to do with the mental models we construct to make sense of the world around us. Based on these insights, we suggest that a number of behavioural barriers prevent households shifting to cleaner and safer fuels and stoves, but there are also some potential opportunities to support such a shift.

Our findings demonstrate a clear pattern of cookstove and fuel use among Kibera households. Households generally stack stoves (i.e. use of multiple stoves simultaneously), using different stoves for different tasks in order to maximize efficiency and ensure that traditional dishes are cooked properly in terms of taste and appearance, and use certain practices to cope with the negative impacts of using charcoal and kerosene stoves in confined spaces. It could be said that these households have developed a cooking system that, on the surface, works for them in their particular contexts.

At the same time, however, our results clearly show that respondents are generally dissatisfied with their current cooking fuels and stoves. All the interviewees complained to some extent about the negative health- and safety-related problems linked to the use of charcoal and kerosene. Households are acutely aware of the danger of prolonged exposure to carbon monoxide from burning charcoal in poorly ventilated spaces, as evidenced by their familiarity with the term “carbon monoxide poisoning” and by the fact that so many (17) had knowledge of a serious accident resulting from exposure to household air pollution from charcoal burning. Although a majority of households have access to cheap electricity, low power output and the unreliability of supply, as well as fear of electrocution, result in very few of them using it for cooking. Furthermore, it is not possible to prepare all the local dishes properly using an electric stove.

Our results also demonstrate a capacity and willingness to pay for items deemed desirable or useful, with a majority of interviewees reporting that they save regularly and that they have access to either formal or informal lending facilities, albeit at a relatively high interest rate. Ten of those interviewed stated a willingness to pay up to KES 3000 for an improved cookstove, particularly if there was an innovative financing mechanism in place such as the possibility of paying for it in installments. We acknowledge, however, that this is only a “stated preference” and may not accurately reflect an actual willingness to pay.

Thus, if households are very dissatisfied with their current cookstoves, have some financial means to purchase an improved stove *and*, in some cases, are willing to pay for a clean, safe and efficient stove: why have they not done so? What are the barriers to actually making such a purchase?

#### *Lack of information*

Our interview data suggest that a lack of awareness and information about the potential benefits of an efficient cookstove – especially the economic savings due to improved efficiency and the health benefits in terms of reduced household pollution – could be one reason why none of the interviewees we met had purchased a more efficient charcoal stove. Not surprisingly, since high-efficiency charcoal cookstoves are not available in Kibera, households are not familiar with them. Only four households had seen or heard of a 50% more efficient charcoal cookstove, which is significant given the needs expressed by most households to witness first-hand or try out a product prior to purchasing it. As one household put it: “*If there was such a stove, of course I would go for*

*it, but I have never seen this stove here in Kibera, and nobody I know is using it. How do I know it is real?"(HH 5).*

Our data also demonstrate that many households do not have an accurate overview of their monthly spending on fuel. Most households purchase charcoal and kerosene in small quantities, either on a daily basis or every other day. The three households that bought charcoal in bulk were either charcoal vendors or friends with the vendor they purchased from. They therefore had access to information on the relative prices of different quantities of fuel, and received preferential treatment by, for example, being able to buy on credit or pay for bulk purchases in installments. When asked about spending on charcoal or kerosene, most interviewees described how much they spent per purchase rather than the total monthly cost. When asked to list their biggest monthly costs, most households failed to mention fuel expenditure. Again, this suggests that since charcoal is purchased in small quantities, awareness of total monthly expenditure is somewhat reduced. This finding seems to be in line with the well-established behavioural economics insight that people do not objectively weigh up options when financial decisions are being made, often opting for small short-term gains over larger gains further in the future. This raises the question of whether lack of information or awareness could be a key barrier to households adopting more efficient charcoal cookstoves. If people were aware of what they are actually spending on cooking fuel on a monthly basis and had information about the health and economic benefits of a 50% more efficient charcoal cookstove: would this affect their willingness to pay for and use such a stove?

#### *The role of aspiration*

Our results indicate that the respondents who said that they aspired to a better life, and/or that they were actively working towards a particular goal – by saving, planning or engaging in education – that they felt would enhance their quality of life, were more likely to have made an investment in either an LPG stove or an electric hot plate, or another innovation to enhance their quality of life such as a solar system, water bottle light or vegetable-growing sack. This was true of 10 of the 26 households interviewed. This came through very strongly in the photographs taken and how these were explained by the respondents. As mentioned above, many households included photographs of their children, their businesses or the possessions they were particularly proud of. When asked why these images were chosen, most households referred to: “hope”, when talking about their children and the investments they are making in their education; “pride”, in terms of being proud of their children or of their own businesses; and a “better” or “modern” life, often when explaining why they had purchased a certain item such as a fridge or a television. Importantly, our interview data suggest that the purchase of LPG and electric cookstoves might be linked to aspirational thinking – that the few households that had made such purchases associate modern, clean cookstoves with an improved quality of life and higher status.

There is evidence that low aspirations among poor people can reduce the likelihood that they will make investments that could enhance their quality of life (Tanguy et al. 2014), and that influencing people to think in a more aspirational way could induce them to make investments in their future well-being (Tanguy et al. 2014). This is based on an understanding of the “mental models” or small-scale models of reality that we all rely on to interpret information and make decisions about the world (Jones et al. 2011). Mental models have also been shown to lead to cognitive biases, neglect of relevant information and under-investment (Hoff and Stiglitz 2010; Hanna et al. 2014). In an experiment designed to understand the role played by deprived people’s understanding of their opportunities, Tanguy et al. (2014) showed a group of farmers in rural Ethiopia a documentary film depicting people from similar backgrounds to themselves improving their socio-economic situation from poor to relatively successful. They demonstrated that the intervention had changed aspirations and future-oriented behaviour, such as saving, the use of credit and investment in education, six months after the screening.

Our data would suggest that aspiration may be a driver of behaviour related to the uptake of cleaner cooking technologies by households in Kibera and that it should be investigated further, possibly in a similar experimental design to the that used by Tanguy et al., that is, testing the saliency of changing mental models (aspiration) to bringing about behaviour change.

### *The role of personality*

Our data indicate that personality traits such as risk-taking may play a role in influencing behaviour related to the uptake of cleaner cookstoves. For a poor household in Kibera, investing money in a new product, such as a cookstove, that few if any other households are using entails a large element of risk. There is a risk that the product may not work and, if it breaks, there is a risk that it cannot easily be repaired since the value chain for the product, including knowledge and materials for repairs, may not yet exist in the community. Other gaps in the value chain can increase the risk. For example, the adoption of LPG cookstoves is seen as risky since the price and availability of LPG is widely perceived to be unreliable. Many of the interviewees we spoke to who had purchased such a product described themselves risk-takers, as well as a “leader” or trendsetter, and spoke of these as being positive traits. As one interviewee put it, *“I was the first one in my neighborhood to get one [an LPG stove]... some of my neighbours wanted to try it out. I was happy to show them how it works”*(HH 11).

Several households mentioned trendsetters and community mobilisers as important channels for introducing new ideas and products to households. These individuals were often referred to as “entrepreneurs” or leaders who were more “open to innovation” and involved in demonstrating new products or transmitting ideas within the community. Although personality may play a role in determining clean cookstove adoption, insofar as it is an important factor in the transmission of knowledge and ideas, it would also be crucial to study the social setting and interlinkages between peers to understand how different individuals in a neighbourhood influence one another and to identify important nodes for the diffusion of ideas.

## **5.2 Limitations of the study**

- It should be acknowledged that this was a small qualitative study and further research is needed to investigate the emerging insights about behavioural drivers.
- Although we made efforts to shift the research-participant role, primarily by having the respondent guide us through their photographs rather than structuring the exercise with our own questions, it must be acknowledged that it was impossible to remove ourselves and our inherent biases from the process. Undoubtedly, our role in facilitating interactions with respondents, as well as extracting meaning from the gathered data, contributes a degree of uncertainty to the findings.
- Uncertainty regarding the effect of cultural probes: our findings are based on observed trends in the interviews and our intuition about the effect that using the cultural probes had on the process. We did not conduct a controlled study of the effect. The fact that we did not have photographs for a number of interviews due to technical problems allowed us to make intuitive comparisons between interviews where photographs were used and those where they were not (see above for a discussion of these differences).
- Trust: as is mentioned above, trust is a major issue in Kibera, in particular in relation to the issue of electricity access, and there is a widespread fear among residents of being caught and penalized for illegally accessing electricity. We acknowledge that there is a risk that this fear and mistrust may have resulted in untruthful responses to questions about electricity use.

- It was discovered at the time of the interviews that several of the cameras had been damaged in transit from Stockholm to Nairobi. (Disposable cameras are not available in Nairobi.) This resulted in no photographs being developed in five cases.
- A terrorist bombing in central Nairobi coincided with the second round of interviews in May 2014. We had conducted six interviews at the time the attack took place. This resulted in security restrictions that prohibited us from entering Kibera for several weeks. In order not to delay the study, we conducted the remaining nine interviews at the Busara offices, which are located close to Kibera. Conducting the interviews away from people's homes and natural contexts undoubtedly had an impact on the findings. For example, we were unable to make first-hand observations in people's homes related to their possessions, type of stove, and so on, which might have provided important sources of data and means of cross-checking the respondents' answers. Furthermore, interviewees were less comfortable being interviewed away from their homes, and the need to travel to the interview location limited the time available. This may have compromised the quality of the answers provided. It should be noted that in these cases the photographs were an invaluable additional source of information to draw on during the interviews.

## 6 CONCLUSIONS

This paper presents findings from a qualitative study on understanding the barriers to and opportunities for households in Kibera switching to cleaner and safer forms of energy for cooking.

The households we interviewed have a strong desire to switch to cleaner, safer stoves and fuels but few have done so thus far. For most households, LPG is the benchmark for clean cooking, but few can afford to pay the fuel costs and the supply of LPG is unreliable. Although most households have access to electricity, few use it for cooking because of the low output and concerns about accidents and damage to appliances caused by frequent power surges and outages. The particular cooking requirements for various staple dishes, in particular the need to simmer stews for long periods and to grill meat and chapatti, mean that charcoal, readily available, familiar and affordable, is the cornerstone of the household energy system in Kibera. However, we found that there are widespread health- and safety-related concerns about using charcoal and kerosene regularly in poorly ventilated, overcrowded dwellings. These concerns are backed up by health studies which link the prevalence of acute lower respiratory infections among children in Kibera to exposure to indoor air pollution from biomass cookstoves, as well as recently published guidelines from the World Health Organisation on the use of charcoal and kerosene for cooking (WHO 2014).

In terms of the opportunities available for households to shift to cleaner and safer stoves and fuels, our data indicate that there is a willingness among households to pay for a high-efficiency charcoal cookstove, with ten stating that they would pay up to KES 3000 for a stove that could save 50% on fuel and reduce smoke and carbon monoxide emissions by half. Many others stated they would purchase such a stove if they had the opportunity to pay in instalments. However, most of the households we spoke to were not aware of the existence of such cookstoves prior to the interview.

The respondents we spoke to generally do not have an accurate overview of their monthly expenditure on cooking fuel. Most underestimated how much they were spending. Few interviewees ranked spending on cooking fuels as a major monthly cost. Lack of basic information or awareness, both on the actual monthly cost of fuels, and about the existence and benefits of high-efficiency charcoal stoves, is likely to be a key barrier to households adopting such stoves, but not the only factor.

Our data suggest that aspiration could be an important factor in influencing behaviour related to the uptake of products that can enhance the quality of life, such as high-efficiency cookstoves. Households that had already made an investment in such a product described the decision-making process very much in terms of moving towards an improved, modern life – and this seemed to be a key motivating factor in their decision.

Finally, we saw indications in the interview data that certain personality traits, in particular risk-taking but also leadership or entrepreneurial qualities, seem to strongly drive the uptake of new products at the individual level. Respondents who had adopted a new technology or innovation tended to describe themselves as risk-takers. Most respondents referred to key individuals in the community who were trendsetters as key to spreading new ideas.

### 6.1 Policy relevant insights

From a policy perspective the findings presented above could be highly relevant for the design of interventions or policy mechanisms intended to serve the residents of Kibera. The insights we gathered can be seen as a snapshot or summary of people's attitudes, preferences, hopes, desires and fears related to household energy use, and may provide important clues about the kind of interventions that might work. For example, there have been calls for government reform of the electricity sector to expand electricity access to urban slum dwellers by tightening regulation of

the LPG supply and developing subsidies to make legal electricity access affordable to low income households (Global Network on Energy for Sustainable Development 2013). To some extent these would seem to be welcome measures but they do not appear to fully address the household energy preferences and needs of the residents of Kibera. For the interviewees we spoke to, charcoal is an important cooking fuel for reasons linked to culture and taste. Even if these households had access to LPG or electricity for all their cooking needs, they would still rely on charcoal to prepare certain staple dishes. It would be useful for policymakers to acknowledge the importance of taste when designing interventions to shift households to cleaner cookstoves and fuels.

Given the level of mistrust and fear of the national power utility among Kibera residents, as well as the deep-rooted fears about accidents and fires caused by the use of electricity, any measures to reform the sector will need to be designed, communicated and implemented with great care, and with the active involvement of trusted community mobilisers at every stage.

There appears to be a market for high-efficiency charcoal cookstoves in Kibera, provided that innovative financing mechanisms can be developed, for example, that allow customers to pay for a stove in instalments. Awareness of these products is currently low but using the right channels, for example, working with well-established community mobilisers, and crafting careful messages highlighting the health and economic benefits of the products, could be a first step towards boosting this market. The high level of concern among interviewees about the health impacts of using charcoal and kerosene for cooking suggests that there could be the potential for an educational campaign on the health risks to children of current cooking practices and the options for reducing these risks.

## 6.2 Next steps

We plan to further examine some of the key insights emerging from this study in a subsequent randomised controlled laboratory experiment involving low-income residents in Kibera. Respondents will be invited to participate in structured surveys of their attitudes and preferences and to participate in a random assignment experiment that will test how economic or aspirational priming affects the purchasing decisions of households. A combination of short questionnaires and games will be used to build up a picture of respondents' characteristics and preferences, demographic and livelihood data, economic preferences (time, risk, etc.), cognitive ability and personality. Respondents will then be divided into groups to receive different treatments, such as marketing information about improved cookstoves, and aspirational priming. There will also be a control group. Aspirational priming will be carried out by encouraging participants to visualise and articulate goals that they hope to achieve in the near future and by presenting stories about people from the same neighbourhood who have become successful. We plan to run a lottery<sup>6</sup> to measure the effect of the various treatments on actual willingness to pay for an improved cookstove.

In a tight-knit social setting such as Kibera with a high prevalence of poverty and low level of access to basic services, community ties serve a particularly important function in terms of providing material as well as psychological support. Understanding the complex social linkages that support livelihoods is a crucial first step in designing solutions to address problems in such communities. Further research is needed to investigate the role that social networks, rules and norms play in influencing and reinforcing behaviour.

Approximately 863 million people worldwide are thought to live in informal urban settlements, or slums, and to face similar challenges in terms of accessing basic services such as clean and safe

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6 For the lottery, participants are told that one person will be randomly selected to win KES 2500. From that amount they will have the chance to purchase the cookstove and will get to keep the remainder of the money. All the participants indicate the price they would be willing to pay for the cookstove out of the KES 2500. A random number will be generated by the computer. If the amount the lottery winner says they would pay is higher than the random number generated, they will buy the cookstove at that price.

household energy (UN-HABITAT 2013). Ethnographic approaches such as those applied in the study presented here can provide a way for researchers to access these hard to reach communities and gain a deeper understanding of the complex socio-cultural contexts in which individual and household decisions are made.

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