



**What's health got to do with it? Testing marketing messages  
for clean cookstoves in Cambodia and Kenya**

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Cover photo: A girl in Cambodia uses one of the ACE-1 improved cookstoves chosen for the health promotion campaign © Fiona Lambe / SEI

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### **ABSTRACT**

This paper presents findings from studies in Cambodia and Kenya commissioned by SNV Netherlands Development Organisation to understand the impact of health messaging on the purchase of clean cookstoves. The Cambodia study took an action research approach to test the effects of positive and negative health messaging, as well as effects of more or less intense health messaging. Effectiveness was measured in terms of number of stoves sold. In Kenya, a randomized controlled trial was used to test the effect of three health-based interventions: SMS messages sent on five consecutive days, graphic imagery, and the combination of personal goal-setting and measures to remove barriers to the purchase of an improved stove. The campaign's impact was measured in terms of willingness to pay for stoves, score on a health awareness index, and whether people had switched stoves during the study. Both studies found that health messaging had a minimal effect on stove purchases, whereas price was a key factor. While in Cambodia, the campaign increased awareness of the health risks associated with traditional biomass cooking, in Kenya there was little improvement, as awareness was already high. In Cambodia, the efficacy of individual sales agents was the strongest factor affecting sales. Future studies should therefore carefully control for the sales agent factor. To overcome the price barrier, future studies could consider testing the efficacy of health messaging where innovative financing for cookstoves is made available to the participating households. In addition, future research could look at ways to design and deliver health messages within stove marketing campaigns so that they are better aligned with the needs of the end-user.

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The full citations for the two case studies are:

17 Triggers, TNS and Lighting Engineering Solutions (2015). *The Effects of Health Promotion Campaign on Purchase of ACE-1 Cookstove*. Phnom Penh.

Horn, S., and Jang, C. (2015). *Effects of Health Marketing Interventions on Cookstove Purchasing, Health Awareness and Willingness to Pay*. Busara Centre for Behavioural Economics, Nairobi.

## FOREWORD

Across the globe, SNV Netherlands Development Organisation is implementing clean cooking interventions, improving the livelihoods of the poor through multiple benefits. Such interventions (biogas, improved cookstoves and fuels) have been applied across 20 countries in Asia, Africa and Latin America, benefitting over 3 million people.



A common challenge faced by practitioners to scale access to clean cooking solutions is the limited investment by the public and private sector to support such interventions. The level of investment in the sector is not proportionate to the size of the problem that needs to be addressed. The daunting figure for those of us working in the clean cooking sector is over 4 million people dying prematurely every year from household air pollution related to cooking with solid biomass fuels, more than HIV/AIDS, tuberculosis and malaria combined.

Most of the households applying harmful cooking methods have not made the interrelated behaviour changes required to adopt clean biomass cookstoves and fuels. This may be partly due to lack of awareness and knowledge on the negative health impacts of their current cooking methods. Against this background, SNV decided to commission action research in Cambodia and Kenya in 2015 to collect more information on this issue.

The research in Cambodia was executed by the organizations 17 Triggers, TNS and Lighting Engineering Solutions, while the Busara Centre for Behavioural Economics was selected to undertake the work in Kenya. Large number of respondents were included in the randomized control trials. The Stockholm Environment Institute was commissioned to issue a consolidated report summarizing the research undertaken in both Cambodia and Kenya.

The report provides valuable insights about different drivers for the purchase of clean cookstoves, and about behavioural change communication. Though far from conclusive, we hope that the results of the research will add to the knowledge base required to make clean cooking interventions more effective and live-saving.

Andy Wehkamp  
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## EXECUTIVE SUMMARY

The health impacts of traditional biomass cooking are well known. An estimated 4 million premature deaths per year are attributed to smoke from inefficient biomass stoves, as are many respiratory and other ailments that affect the cooks, their children and other household members. Yet despite this knowledge, the extent to which health concerns influence decisions to purchase and use clean stoves is relatively unexplored.

This paper presents findings from two studies commissioned by SNV Netherlands Development Organisation to understand the impact of health messaging and campaigns on the purchase of clean cookstoves. One study, in Cambodia, lasted about 10 weeks and took an action research approach to test the effects of positive and negative health messaging, as well as effects of more or less intense health messaging in terms of amount of material and number of channels used. The study covered 381 households across five communes, including a control group, and included baseline and endline surveys. The effectiveness of the health campaign was measured in terms of number of clean cookstoves sold. Results were disaggregated to examine how different consumer segments responded to the different approaches, based on gender, socio-economic status and age.

The second study, in Kenya, used a randomized controlled trial over five weeks to test the effect of three different health-based interventions: SMS messages sent on five consecutive days, graphic imagery, and the combination of personal goal-setting and measures to remove barriers to the purchase of an improved stove. As in Cambodia, there was a control group to compare with the three treatment groups; a total of 965 individuals participated. Impact was measured in terms of willingness to pay for a clean cookstove, rating on the health awareness index, and whether respondents changed their cookstove between baseline and endline.

In each case, the campaign was based on a cookstove that has been shown to significantly reduce emissions from biomass fuel use and thus significantly reduce the health risks if used properly. In both studies, participants – including the control groups – were also exposed to the standard marketing materials activities used to promote the stoves, such as flyers and demonstrations.

The results of these studies contribute to a growing body of knowledge about behaviour change communication in the field of cooking. Key insights include:

- **Health messaging has a minimal effect on cookstove purchase.** Indeed, cookstove adoption is influenced by multiple factors linked in complex ways. This is a very important finding for public health workers, who need to think more broadly about how they achieve the public health goals associated with cleaner cooking through approaches that do not necessarily focus on individual health goals.
- **Price continues to be an important factor influencing the adoption of clean cookstoves.** In Cambodia, the main drivers of cookstove purchase were time and fuel saved with the improved cookstove, and availability of disposable income was a key factor enabling purchase. In both case studies, the price of the cookstove was shown to be a major barrier to purchasing. These findings are in line with the literature on drivers of improved-cookstove uptake.
- **Awareness of health issues related to cooking varies from place to place.** In Cambodia, the health campaign raised awareness about negative health impacts of cooking with traditional biomass, with positively toned messaging appearing to be most effective. In Kenya, the health awareness campaign did not really increase people's health awareness, since in most cases they were already fairly well aware of the health impacts of cooking with traditional biomass.

- **The skill and motivation of individual sales agents can greatly affect cookstove marketing campaigns.** In Cambodia, the efficacy of individual sales agents was the strongest factor affecting sales, with the most successful sales agent using a combination of messages, including health information, to convince households to purchase the stoves.

It is important to note that the studies focus on cookstove *acquisition*, not adoption and daily use of the stoves – the actual behaviour change that the campaigns aim to achieve. Still, the studies provide valuable insights on the role of health messages in cookstoves adoption, and fill an important knowledge gap. More studies of this kind are needed to fully understand the role of health awareness in cookstove adoption, and how to integrate health objectives into cookstove interventions. Given the holistic approach required to achieve successful adoption of cleaner cooking technologies and practices, any health-inspired interventions must take into account many other – potentially more significant – factors influencing cooking behaviour change. Some recommendations for future research are as follows:

- The personality, skill and motivation of sales agents in Cambodia were a crucial factor in convincing households to purchase the stove. Future studies assessing the role of health messaging on cookstoves uptake should therefore **carefully control for the sales agent factor** in the study design, as it can confound the study results.
- To overcome the cookstove affordability barrier, future studies could **consider testing the efficacy of health messaging where innovative financing for cookstoves is made available** to the participating households.
- Further research on the effect of health messaging on cookstove choice and adoption could look at ways to **design and deliver health messages within clean cookstove marketing campaigns so that they are better aligned with the needs of the end-user**. Household appliances such as cookstoves are deeply integrated into people's daily lives and as such have multiple functions, benefits and meanings for the user. Thus, it is vital that the user's needs and motivations are well understood, both when designing and implementing marketing campaigns, and in delivering the products.

### **SEI's role in the studies**

It should be noted that SEI was not part of either research team; rather, we provided advice on the research design and tools as well as comments on interim reports (baseline and end line reports). For compiling this Working Paper, SEI had access to the final reports produced by each research team and the analysed data from the Kenyan study. We also participated in workshops in Kenya and Cambodia where the preliminary findings were presented. We did not interview the researchers involved in the studies. The full study reports are available for download here: <https://www.sei-international.org/publications?pid=2951>.



## 1. INTRODUCTION

Over the past few years, SNV Netherlands Development Organisation has established a wide array of programmes in Asia and Africa designed to increase households' access to affordable clean cookstoves. These programmes bring together local and national stakeholders to develop markets for cleaner and more efficient cookstoves. By taking this approach, SNV seeks to strengthen the capacity of actors in the value chain, promote a choice of innovative technologies, and create an enabling environment to stimulate private-sector involvement.

Cookstoves and fuels that are cleaner – i.e. emit fewer harmful particles when used – have the potential to dramatically reduce exposure to indoor air pollution, and thus deliver substantial health benefits – a core goal of SNV's cookstove work. Yet to achieve those benefits, improved stoves typically rely on elaborate engineering that enables them to optimize fuel combustion and reduce emissions, but also increases their cost. In trying to gain market share, these stoves have to compete with established stove technologies that are both cheaper, and optimized for other important user needs, such as convenience, local fuel availability and suitability for preparing typical meals.

It is often assumed that the health benefits should be a key motivation for buying clean stoves despite their higher cost (Rehfuess et al. 2013). Yet among households, there is still very low awareness of those health benefits, and studies suggest that health is low on the list of priorities that influence the decision to purchase and use a clean cookstove (Mobarak et al. 2012; Beltramo et al. 2014; Jeuland et al. 2015). This suggests that stove manufacturers need to take a broader range of factors into account in designing and marketing clean stoves. At the same time, promoters of cleaner stoves and fuels must do a better job communicating the dangers of indoor air pollution and the benefits of improved cookstoves.

This paper presents the results of an action research project commissioned by SNV to develop and test health-focused cookstove promotion campaigns in rural Cambodia and peri-urban Kenya. The research aimed to draw on best practices, such as randomized control trials, in order to test the efficacy of the campaigns as robustly as possible. In line with findings from a recent World Health Organization (WHO) review of the most effective biomass cookstove technologies for reducing emissions of harmful pollutants (Bruce et al. 2015), only clean biomass stoves (tiers 3–4) as classified by the International Organization for Standardization (ISO 2012) were promoted in the campaigns, together with the fuels that used in those stoves.

The health campaigns were designed and implemented by the Busara Centre for Behavioural Economics in Kenya and 17 Triggers in Cambodia, which were selected through a competitive bidding process by SNV. The two institutions were also responsible for analysis and reporting of the case study findings. Also through a bidding process, SNV selected SEI as an academic/research partner to review the design of the two case studies and to synthesize the results of the two case studies.

The structure of this paper is as follows: Section 2 summarizes current knowledge on the health impacts of biomass fuel use on traditional cookstoves, the challenges of promoting cleaner fuels and stoves, and the potential role of behaviour change communication. Sections 3 and 4 summarize the context, methods and findings of the campaigns in Cambodia and Kenya, which serve as examples of behaviour change communication. Section 5 draws insights from each campaign and discusses the overall effects of the health messaging used in each case. Section 6 concludes with recommendations for policy and practice. The original country studies are available at <https://www.sei-international.org/publications?pid=2951>.

## 2. LINKING COOKING AND HEALTH

More than 2.6 billion people around the world depend on traditional biomass fuels – such as firewood, charcoal and dung – for cooking and heating (IEA 2012). These fuels are typically burned in simple, inefficient and smoky stoves, with negative effects on health (WHO 2014), livelihoods (Arnold et al. 2006) and the climate (UNEP and WMO 2011). More than 700 million Africans rely on traditional biomass cooking fuels – wood, charcoal, dung and agricultural residues – and with population growth, that number is expected to rise to 900 million by 2020 (Rysankova et al. 2014).

Traditional biomass cooking is of particular concern to public health officials at the local, national and international levels, many of whom have made it a priority to promote cleaner cooking technologies and fuels. Yet it is the stove users themselves who suffer the health impacts, relatively little is known about how they view those impacts, and how, if at all, they affect decisions about cooking practices. Below we review the literature on health effects of traditional biomass cooking, as well as the challenge of translating the scientific knowledge into public health messaging that will drive behaviour change within households.

### 2.1 The negative health impacts of traditional fuels and cookstoves

The use of solid biomass for cooking, typically in open fires, produces several harmful air pollutants. As shown in Table 1, this pollution is associated with severe respiratory diseases such as pneumonia, tuberculosis and chronic obstructive pulmonary disease (COPD), as well as cardiovascular disease and adverse pregnancy outcomes, among others.

**Table 1. Respiratory diseases associated with solid fuel use**

<b>Health outcome</b>	<b>Meta-analysis RR (95% CI)</b>
<i>Strong evidence</i> †	
Acute lower respiratory infection (ALRI) in children <5 years in developing countries	2.0–3.8
Chronic obstructive pulmonary disease (COPD) in women >30 years	2.30 (1.73, 2.06)
Lung cancer (coal smoke exposure) in women >30 years	1.98 (1.16, 3.36)
<i>Moderate evidence</i> ‡	
COPD in men >30 years	1.90 (1.15, 3.13)
Lung cancer (coal-smoke exposure) in men >30 years	1.31 (1.05, 1.76)
Lung cancer (biomass smoke exposure) in women >30 years	1.18 (1.03, 1.35)
Asthma in children 5–14 years	1.6 (1.0–2.5)
Asthma >15 years	1.2 (1.0–1.5)
Tuberculosis >15 years	1.5 (1.0–2.4)
<i>Insufficient evidence</i> §	
Upper airway cancer	
Low birth weight and perinatal mortality	
Cardiovascular diseases	

Source: Perez-Padilla et al. (2010, p.1082) and Smith et al. (2014).

† Strong evidence: Some 15–20 observational studies for each condition, from developing countries. Evidence is consistent (significantly elevated risk in most, although not in all, studies); the effects are sizable, plausible, and supported by evidence from outdoor air pollution and smoking.

‡ Small number of studies, not all consistent (especially for asthma, which may reflect variations in definitions and condition by age), but supported by studies of outdoor air pollution, smoking, and laboratory animals.

§ Insufficient for quantification based on available evidence.

RR = relative risk; CI = confidence interval.

The WHO measures the number of life years lost to ill health, disability or early deaths as disability-adjusted life years (DALYs), with one DALY being equivalent to the loss of one year of healthy life. By summing DALYs (or the burden of disease) across the population, it is possible to estimate the gap between current health status and an ideal health situation in which all individuals live to an advanced age, free from disease and disability. By that measure, the latest estimates of the global burden of disease show that household air pollution from burning solid fuels is responsible for 5.3% of global DALYs. This makes it the fourth leading risk factor for ill health globally, only exceeded by high blood pressure, tobacco smoking and alcohol use (Lim et al. 2012). It is now considered the top risk factor for ill health in developing countries: No. 1 in South Asia and No. 2 in sub-Saharan Africa (Lim et al., 2012; WHO, 2014). Globally, the WHO (2014) estimates that indoor air pollution from cooking with solid fuels causes about 4 million premature deaths per year.

Public health protection is therefore a central goal of development programmes that focus on improving access to modern energy sources and clean cooking. When improved-cookstove efforts first began in developing countries, their main aim was to reduce fuelwood use, which was perceived as an important driver of deforestation and of a “fuelwood crisis” in some regions. Later, after research on the health impacts of indoor air pollution in the 1960s and 1970s, particularly in India, Nigeria and Papua New Guinea (Ezzati and Kammen 2002), improved stoves began to be seen as a way to reduce indoor air pollution and its associated health impacts, thus offering a double dividend. Since then, cookstoves have received growing attention by researchers and practitioners alike, with public health concerns being a major factor, along with the climate and other environmental issues.

A key insight in recent years has been that for cookstoves to deliver real health benefits, they must reduce emissions and concentrations of indoor air pollutants to levels below certain thresholds. Without a good understanding of where the threshold lies for each pollutant and disease, it is difficult to ascertain exactly how clean a cookstove needs to be to achieve substantial positive health impacts (Clark et al. 2013). This is an area of active discussion and research, with evidence strengthening on some questions more than others (see Table 2).

The latest evidence from WHO research suggests that levels at or below  $35 \mu\text{g}/\text{m}^3$  of the smallest particulate matter ( $\text{PM}_{2.5}$ ) are needed to realize significant health benefits. Yet most improved solid fuel stoves result in  $\text{PM}_{2.5}$  levels well above that. The technologies with the largest potential in terms of improved health outcomes are advanced biomass cookstoves (e.g. gasifier stoves) and stoves that use clean-burning fuels such as biogas, liquefied petroleum gas (LPG) and ethanol (Bruce et al. 2015).

## **2.2 The role of health concerns in decisions to purchase and use stoves**

Despite the health benefits of using cleaner cookstoves, actual usage rates around the world, with some exceptions, are low. There is limited information available on the perceptions of biomass fuel users of the health risks of traditional cooking practices. A study by Mobarak et al. (2012) of cookstove adoption in rural Bangladesh found very little evidence that women perceived indoor air pollution as a significant health hazard. Similarly, it is not clear whether if people were aware of the health risks of traditional cooking practices, this would influence the adoption of cleaner cookstoves (Beltramo et al. 2014; Jeuland et al. 2015). Cookstove promoters typically highlight multiple benefits along with health when marketing stoves, such as fuel savings, speed of cooking, and safety.

It is widely appreciated that getting households to adopt and make sustained use of clean cookstoves is a complex task. Cooking is a culturally embedded technology and practice, and

achieving sustained behaviour change requires addressing multiple factors, including cultures, habits, emotions, individual preferences and biases, traditions, perceptions, misconceptions, intra-household relations and societal influences, along with policies and markets (Johnson et al. 2015). As Ezzati and Kammen (2002, p.263) note:

...overlooking the complexities of individual and household behavior when public health is interconnected with household-level technology and daily life can result in well-intended programs that may either face resistance during implementation or not achieve their intended goals.

Lewis and Pattanayak (2012) did a systematic review of 32 studies and found they typically analysed 7–13 possible determinants of stove and fuel choice, such as income, education, urban location, fuel availability, price, and household size and composition. Not all were found to be important in influencing uptake of clean cookstoves. On the other hand, factors such as access to credit, supply-chain strengthening and social marketing, which are often ignored, have been shown to influence adoption (Simon et al. 2014; Goodwin et al. 2015). SEI's own work in this space has identified the need for a user-centred approach – driven by user needs and preferences, not by top-down policy or technology choices (see Lambe and Atteridge 2012; Lambe and Senyagwa 2015; Lambe and Ochieng 2015; Johnson et al. 2015).

This presents a dilemma. On the one hand, the health benefits of cleaner cookstoves and fuels are substantial and important to pursue. On the other hand, health concerns do not appear to be a major driver of clean-cooking technology adoption today. New knowledge about what constitutes effective health messaging on cookstoves, and how such messages might interact with other drivers of cookstove and fuel adoption, could be very useful for designers of cookstove promotion campaigns.

### **2.3 Behaviour change communication and health messaging**

Although knowledge on health messaging on cookstoves is limited, many studies on health messaging and behaviour change communication have been conducted focusing on other technologies, such as insecticide-treated bed nets, condoms, and smoking cessation. A systematic review of these studies by the Task Force on Community Preventive Services concluded that health communication campaigns work best when combined with product distribution, so people can try the products while the message is fresh in their minds, instead of having to wait for an opportunity to do so (Community Preventive Services Task Force 2014).

Whether combining a strong health messaging campaign with distribution of clean cookstoves would prove effective remains to be seen. There has been some research on this question (see, e.g., Beltramo et al. 2014), but most stove programmes to date have not incorporated explicit health campaigns in their promotion efforts. Whether knowledge of the health risks, communicated in a proper manner, would lead people to internalize the health risks of traditional cooking and make a lasting change in their behaviour is therefore an important research and policy question.

### 3. CASE STUDY 1: CAMBODIA<sup>1</sup>

Roughly 92% of Cambodia's 15.1 million people still rely on solid biomass fuels for cooking and heating. Charcoal is the most common fuel among the 63% of urban dwellers without access to modern energy services, while firewood is most common among the 98.5% of rural dwellers who have no access to modern cooking services (Energypedia 2016; Buysman and Mol 2013). According to the WHO Global Burden of Disease Report (IHME 2010), household air pollution from cooking with solid fuels is the second leading risk factor for disease and premature death in Cambodia, leading to an estimated 11,876 deaths per year (IHME 2010).<sup>2</sup>

SNV Cambodia's Advanced Clean Cooking Solutions (ACCS) project aims to bring to scale the distribution of clean biomass cookstoves and cleaner fuels that are efficient and safe and significantly reduce household air pollution. One of the key technologies being market-tested under ACCS is the ACE-1 cookstove, a forced-draft biomass cookstove considered to be best in class in terms of emission reduction capability. The technology has the potential to significantly reduce household air pollution and improve health. However, this potential can only be realized if households use stove correctly and consistently – which is challenging, as it requires them to overcome significant behavioural and cultural barriers.

One hypothesis for why adoption of improved cookstoves such as the ACE-1 is so challenging is that consumers are largely unaware of the negative health impacts of indoor air pollution from traditional biomass cooking. To explore the extent to which this is the case in Cambodia, SNV, together with partners 17 Triggers, TNS and Lighting Engineering Solutions (LES), conducted an action research project to assess the effect of aggressive health promotion campaigns on the sale of ACE-1 cookstoves.

Specifically, the study aimed to generate insights on:

1. The most effective health promotion campaigns, including messages, tactics and communication channels to drive adoption of clean biomass cookstoves.
2. How different consumer segments – e.g. people of different socio-economic status, ages and genders respond to different messages, tactics and communication channels related to clean biomass cookstoves.

#### 3.1 Research design

The province Kampong Chhnang, 90 km from Phnom Penh, was selected as the study site due to its relative proximity to the capital (allowing for ease of data collection), and because LES is active in this area. Five communes within the province were selected: four where we made our interventions, and one control commune. The study included four sequential phases of research: a baseline survey; development and testing of health campaigns; in-depth interviews with sales agents and focus group discussions with consumers, and a final survey.

##### **Baseline study**

We surveyed a total of 381 households across the five communes. Data collected during the baseline study were used to understand what differences, if any, existed across the five communes, with particular interest in ACE-1 purchase intent. The baseline study was also used to inform the development and testing of the health campaign.

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<sup>1</sup> The original country study can be downloaded at <https://www.sei-international.org/publications?pid=2951>.

<sup>2</sup> See WHO Global Health Observatory Data Repository, <http://apps.who.int/gho/data/node.main>.

**Developing and testing health campaigns**

Both positive and negative health messaging concepts for the campaign were developed and tested through a series of workshops with sales agents and consumers. The negative messaging centred on smoke being harmful to health (see Figure 1); the positive messaging focused on the benefits of the ACE-1 as a “healthy” cookstove (see Figure 2).

**Figure 1: Negative health messaging concept (outside and inside spread of leaflet)**



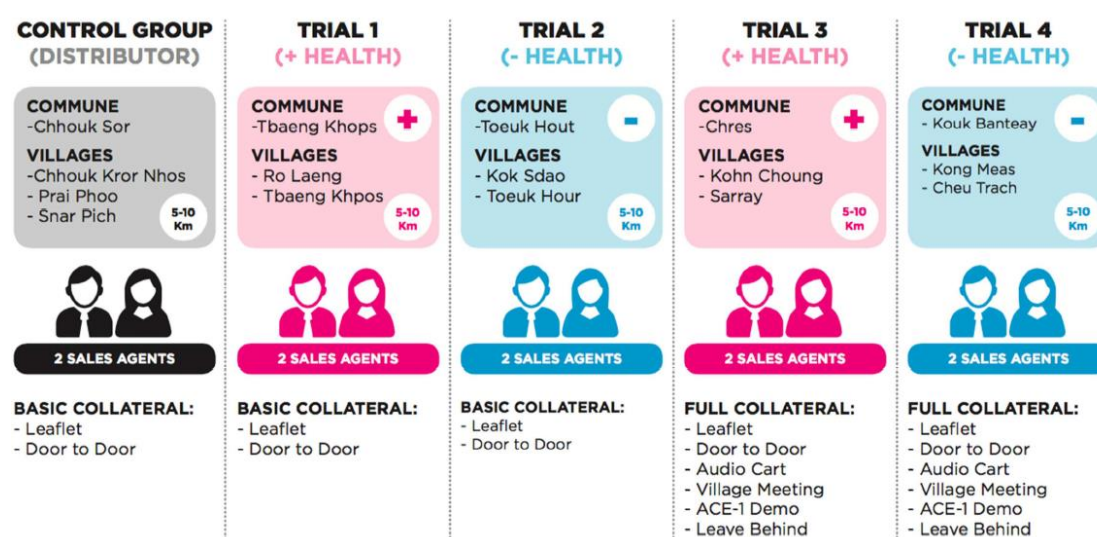
**Figure 2: Positive health messaging concept (outside and inside spread of leaflet)**



To test the impact of the different messages, the study employed a 2x2 factorial design, with two independent variables, each with two levels:

1. Health message **tone**: positive or negative
2. Level of **collateral** (extent of materials used): basic (just an information leaflet) or full (leaflet combined with other activities, such as village meetings, loudspeaker announcements, and/or materials left behind in households following a visit).

The dependent variable was ACE-1 stove sales. Among the four intervention communes, two were given positive health messaging, and the other two received negative health messaging. For each tone (+/-), we used basic collateral in one commune and full collateral in the other. The control commune used only basic collateral and no health messaging. (See Figure 3 for a summary of the campaign design.) The health promotion campaign ran for just under 10 weeks, during which time sales agents working in each commune were tasked with applying the various campaign approaches in their sales pitch for the ACE-1 stove.

**Figure 3: Design of the health messaging test across the five communes*****In-depth interviews and focus group discussions***

In-depth interviews with sales agents and focus group discussions with consumers were conducted to gather insights about the sales approach, assess consumer attitudes towards the health campaign, and understand the purchase drivers and barriers from the perspectives of both consumers and sales agents. In total, 10 sales agents were interviewed and 10 focus group discussions with consumers were conducted: two in each commune.

***Final survey***

A final survey was conducted to measure the impact of the campaign on awareness of the health impact of cooking with traditional biomass and attitudes towards the ACE-1 cookstove.

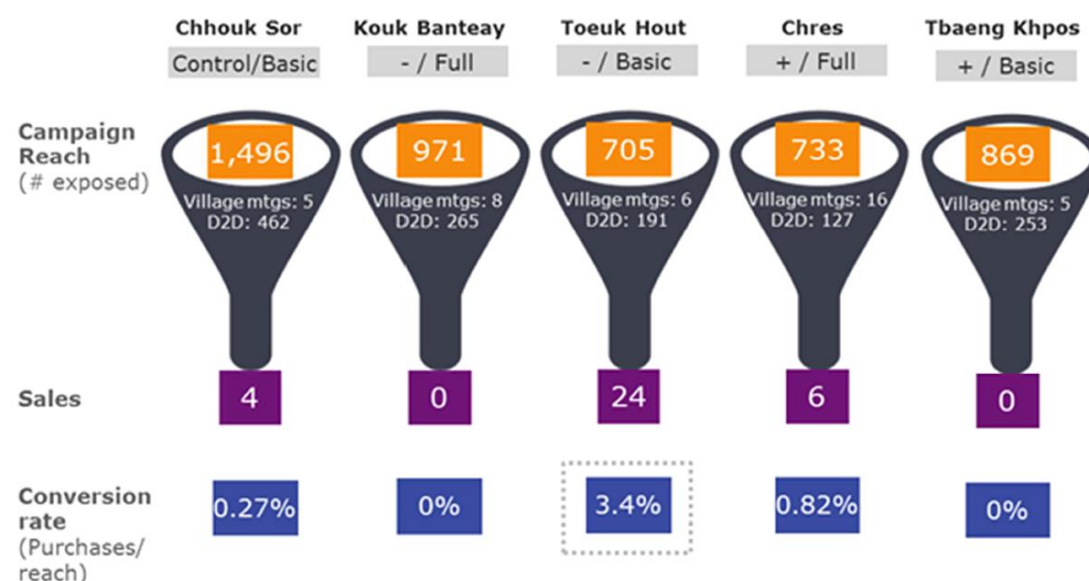
**3.3 Results**

As shown in Figure 4, the control commune had the largest number of people (1,496) exposed to the health campaign, and four ACE-1 stoves were purchased there. Toeuk Hout (negative tone and basic collateral) had only 705 exposed consumers, but 24 ACE-1 buyers – the most sales across communes (3.4% conversion rate). Figure 5 also shows the two variables tested (tone and level of collateral) did not have a clear impact on sales: there was no pattern of positive-tone communes over- or under-performing against negative, or basic collateral communes over- or under-performing against full collateral. Not only did neither variable seem to affect sales, but the number of people exposed also had no impact: Kouk Banteay and Tbaeng Khpos had the second and third highest exposure levels, yet no ACE-1 sales.

Instead, the most important factors cited by ACE-1 stove buyers across communes were the sales agents, the stoves' functionality (fuel savings, ability to charge phones on the stove fan battery), and health benefits. Non-buyers also identified reduced fuel consumption and phone charging as the top two benefits of the ACE-1 stoves. Having access to electricity was found to be an important factor affecting the decision to purchase the ACE-1 stove, which has an electric fan. The top two purchase barriers among non-buyers across communes were economic: lack of money and the stoves' high price (US\$100 upfront or US\$115 on installments, high in a country with gross national income per capita of just \$1,020 in 2014.<sup>3</sup>

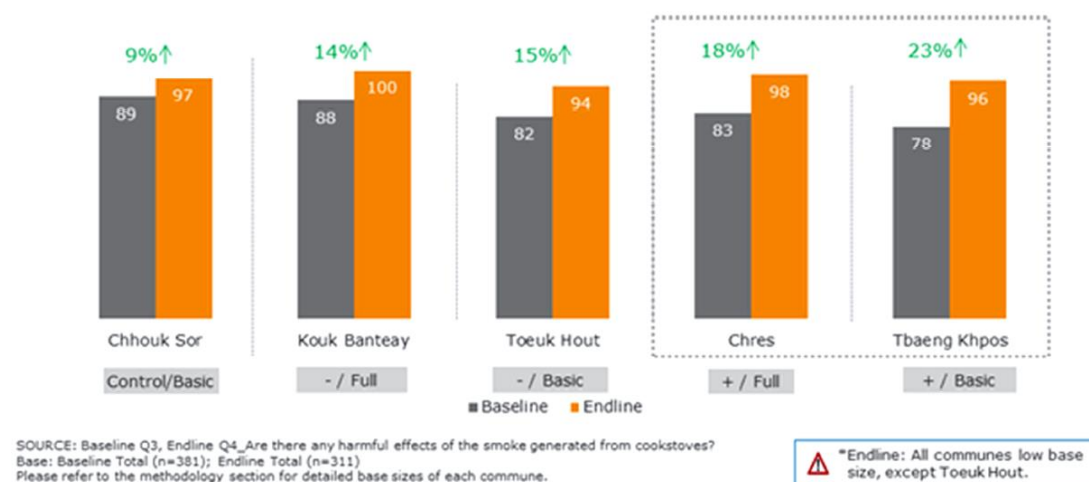
<sup>3</sup> See World DataBank, <http://data.worldbank.org/country/cambodia>.

**Figure 4: ‘Conversion funnel’ showing sales resulting from each approach**



The campaign was successful in shifting attitudes about the health implications of cookstoves. As shown in Figure 5, after the health campaign, more people across communes were aware of the harmful effects of smoke generated from cookstoves. The greatest lift (% change) from baseline to endline was among positive-tone communes (Chres and Tbaeng Khpos).

**Figure 5: Share of households who believe that smoke from cookstoves is harmful to health – baseline and endline**



In terms of demographics, both ACE-1 buyers (76%) and non-buyers (81%) skew female, as in most rural Cambodian households, women cook more often than men, and using a cookstove daily was one of the criteria for target respondents. However, men made up a disproportionately larger share of the buyers (24%) than non-buyers (19%). One plausible explanation for this disparity could be that men typically take part in decisions about large household purchases, such as a modern, expensive cookstove.

Additionally, compared with non-buyers, ACE-1 buyers were:



- **Younger:** While 38% of ACE-1 buyers were less than 35 years old, only 28% of non-buyers were under 35.
- **Wealthier:** More than half of buyers (52%) had household incomes above US\$200 per month, compared with only 32% of non-buyers.
- **More highly educated:** While 28% of buyers had completed lower secondary school, a third of non-buyers (32%) had no formal education.

### 3.4 Summary conclusions

Neither the tone (positive/negative) nor the level of collateral used in the health campaigns had a significant impact on stove sales.

Sales results show no pattern in either variable, and sales in the control commune were not lower than in communes where health campaigns were used. These findings suggest that health messaging is not a particularly effective driver of cookstove purchase. However, it should be noted that implementation of the health campaigns was inconsistent across the four communes, with sales agents either not using the pre-assigned campaign material or going “off script” in their sales pitch,



A woman cooks with her ACE-1 stove (front). Photo by Fiona Lambe.

making it difficult to assess the impact of each campaign approach. The efficacy of individual sales agents appears to be the strongest factor affecting sales; one sales agent alone sold 24 of the total of 34 stoves sold during the campaign period. That sales agent was highly proactive, adapted her marketing to the needs of different households, and used a combination of selling points, including fuel savings, health benefits and speed of cooking.

**Although health messaging did not affect stove sales, it did increase awareness about health impacts of cooking with traditional biomass.** For almost all communes, in particular those that received positive-tone messages, we saw an increase in awareness about the health impact of cooking with traditional biomass. Interestingly, the commune with the highest stove sales recorded the smallest increase in awareness about the negative health impacts of cooking with traditional biomass compared with the baseline. A likely explanation is that the sales agent did not use the pre-assigned health messaging material, but rather highlighted the other benefits of the stove (fuel savings, speed of cooking, etc.) in her sales pitch.

**Decisions to purchase the stoves were driven by a combination of factors, including functional, health and aspirational aspects.** The main factors contributing to a household’s decision to purchase include availability of disposable income, time and fuel saved cooking with the ACE-1, the relative scarcity of fuelwood, and availability of electricity (the ACE-1 stove requires electricity to charge the battery which drives the fan). Key barriers to

purchasing the stove include the high price of the stove, a lack of disposable income, previous negative experience of being deceived by door-to-door sales agents, and concerns about the product, including the lack of a service contact to cover after-sales maintenance of the stove.

**A combination of sales approaches works best.** The focus group discussions and interviews with sales agents showed that while door-to-door sales alone were not effective for selling stoves, the approach worked well when combined with village group events. This is because village group events are generally viewed as being trustworthy, since they require approval of a local authority, allow for group discussions, and have an element of social expectation/pressure that can expedite the individual decision-making process. Door-to-door sales on their own were less successful for two reasons: first, many households had been deceived by sales agents in the past, and second, they tended to delay the decision-making process, as individuals needed to consult with other household members before making a purchase. When door-to-door sales were more targeted, such as following up with villagers who showed interest during village meetings, there was higher success in terms of sales.

### 3.5 Study limitations

In considering the conclusions presented above, it is important to recognize certain limitations of this study:

**Inconsistency in implementation by sales agents:** The study relied on sales agents to deliver pre-assigned health messages. However, implementation was highly inconsistent. Some sales agents did not follow instructions (e.g. did not use the campaign material provided), and others were not motivated to conduct their duties (many quit during the study, forcing the study team to work with LES to identify, hire and train new staff at various points). This made it difficult to compare the efficacy of the different campaign approaches. Future studies could include more extensive training of sales agents, and possibly higher incentives to ensure that they remain committed to their duties.

**Seasonality:** Income fluctuates throughout the year for many Cambodian consumers, especially farmers. Participants in the focus group discussions reported lower disposable income during the months in which the campaign ran, as it was planting season and many had already spent their money on farming supplies. Therefore, launching a campaign after harvest season, when consumers have more money, would increase the likelihood of ACE-1 sales.

**Campaign duration:** The campaign ran for less than 10 weeks, which may not have been long enough to see an impact on sales, particularly for a product viewed as expensive for the average consumer. Often decisions to purchase a new product require multiple consultations within and beyond the household, and the study may not have allowed time for such discussion, particularly given that the study was implemented during a busy farming period where many households have other priorities. Future studies could consider testing whether a longer campaign can bring about a higher rate of sales.

## 4. CASE STUDY 2: KENYA<sup>4</sup>

Kenya is at the forefront of cookstove development, marketing and distribution, with more than 30 years of activity in the sector (Winrock International 2011). It has one of the largest improved wood stove programmes in Africa, built around the Kenya Ceramic Jiko, which was designed in the mid-1980s through a collaboration between donors and local artisans, and the Maendeleo stove, developed in 1990s by ITDG (now Practical Action) and GTZ (now GIZ). Both are still widely used and are often regarded as the baseline stoves in Kenya.

SNV Kenya's clean cookstove programme has centred on its Clean and Efficient Cook Stove Project, a two-year, SNV-funded pilot aimed at building a market supply chain for advanced gasifier stoves. For this study, the Philips gasifier stove was used, which is almost identical to the ACE-1 cookstove used in Cambodia.

It is estimated that around 29 million people in Kenya (one third of the population) are affected by indoor air pollution, largely the result of using inefficient and smoke-producing biomass cookstoves (GVEP International 2012). Yet there has been no systematic research to understand how health aspects might play a role in determining stove uptake.

In order to fill this gap, SNV Kenya collaborated with The Busara Centre for Behavioural Economics to test the impact of three health-based interventions. These interventions were combined with a broader marketing campaign aimed at driving cookstove purchases and raising awareness of the negative health impacts of exposure to indoor air pollution from certain cookstoves.

### 4.1 Research design

The study was conducted between June and September 2015. Three health interventions were tested in eight villages in Kiambu County, Kenya. Individuals were randomly assigned to the three treatment groups and control within each village; one village was selected as a pure control village, where everyone was in the control group.

#### **Baseline study**

The baseline survey's main aim was to gather demographic information and information on cooking practices and preferences among respondents. The endline survey focused on willingness to pay and on questions for the health awareness index; these were also included in the baseline to try to increase the likelihood of seeing statistically significant results.

#### **Developing and testing health campaigns**

Health messaging concepts informed by behavioural science were developed and pilot-tested through an initial set of focus group discussions, and the three best-performing interventions were chosen for wider testing. As shown in Table 3, one campaign used text messages to highlight the health risks of smoke exposure (Treatment 1, labelled as "negative"); another used graphics to convey similar messages (Treatment 2), similar to images used in many anti-smoking campaigns (see Hammond 2009). The third, "positive" campaign used a goal-setting exercise in which obstacles to purchase were reduced (Treatment 3).

All four groups – including the control – were exposed to the same general marketing campaign as well: flyers advertising the Philips stove were given to all; after completion of the baseline survey, they were read a short account of the health risks of smoke from inefficient cookstoves; and a market demonstration of the stove was done in each village.

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<sup>4</sup> The original country study can be downloaded at <https://www.sei-international.org/publications?pid=2951>.

**Table 3: Design of health messaging study**

	Treatment 1	Treatment 2	Treatment 3	Control group
<b>Intervention</b>	SMS messages (5 days) on health risks of smoke exposure and benefits of improved cookstoves	Graphic image showing effect of smoke on lungs	Goal-setting, combined with making obstacles to ICS purchase more surmountable	–
<b>General marketing</b>	Flyers advertising the stove Information about health risks of smoke read after baseline survey Market demonstration in each village			

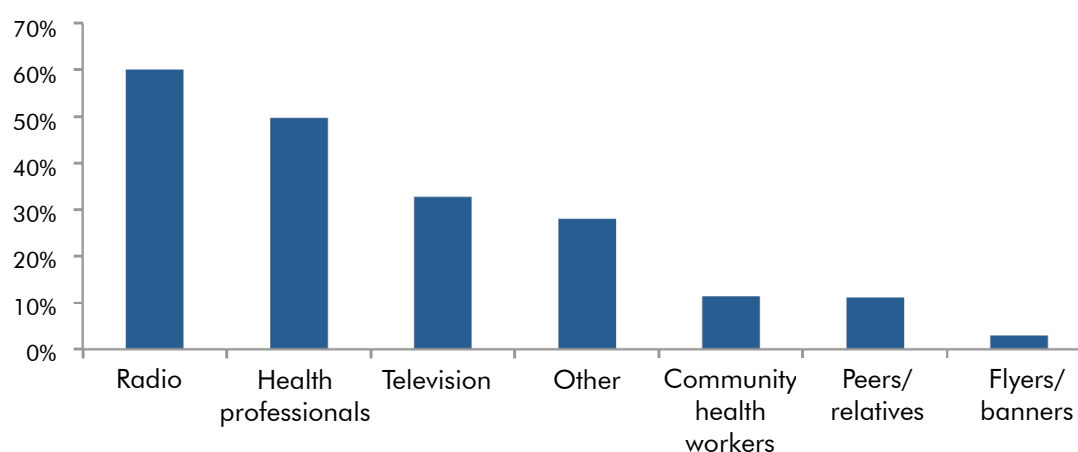
### Endline survey

Roughly five weeks after the baseline survey had been completed, an endline survey was completed to measure the impact of the campaign on 1) willingness to pay for an improved cookstove, 2) awareness of the health risks of cooking with traditional biomass, and 3) number of participants who had switched stoves.

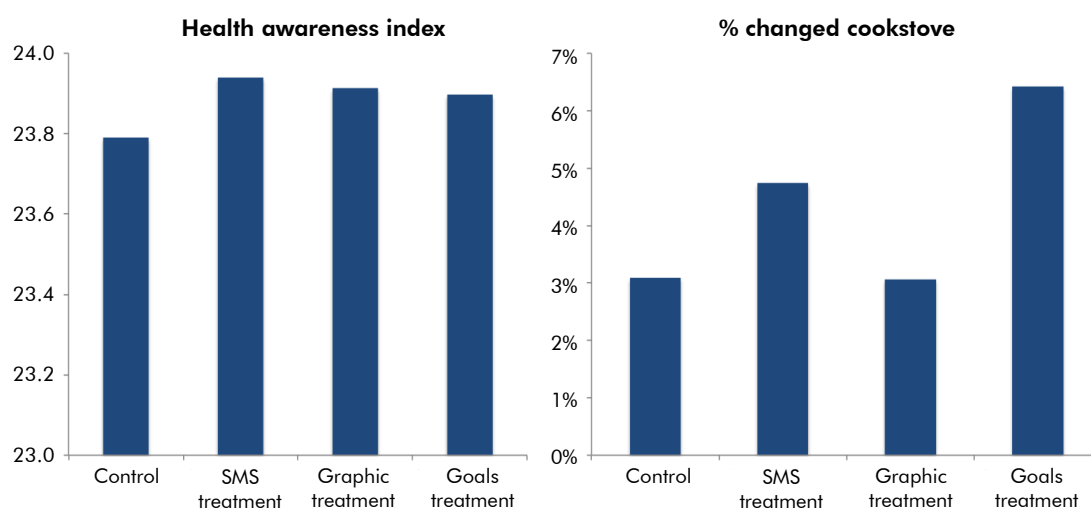
### 4.2 Results

None of the treatments was found to have a significant impact on willingness to pay for a new cookstove. Taking into account village fixed effects,<sup>5</sup> the greatest impact was from the goal-setting treatment, which led to a small increase in the likelihood of changing cookstove (see Figure 7). There were small increases in willingness to pay and in health awareness across all treatments, but not at statistically significant levels. In interviews with study participants, the most commonly mentioned factors in stove purchases were cooking time, whether or not a stove emits smoke, the price of the stove, and the type of fuel used. In the baseline survey, stove cost and lack of financing were cited as key obstacles to purchasing an improved stove.

The survey data also indicate that households get health information from a number of sources, with radio, health professionals and television cited most commonly (see Figure 6).

**Figure 6: Baseline data on typical mediums of health education**

<sup>5</sup> Fixed effects are needed as it is important to check that the treatment effects being seen are not the result of unobservable characteristics that differ between villages. Without compensating for the presence of these unobservable characteristics, we would end up with omitted variable bias, and misleading results.

**Figure 7: Changes in health awareness and purchase of new stove, by treatment**

### 4.3 Summary conclusions

**Treatments did not have a significant impact on people’s health awareness,**<sup>6</sup> when village fixed effects and control variables were taken into account. This is mainly because awareness was so high at baseline. However, we did see modest gains. Qualitative feedback on all treatments suggested that the treatments were useful in improving health awareness of the damaging impact of smoke on health. Notably, survey data showed that health information is acquired through a number of different channels. Feedback in the follow-up survey from respondents in the graphic treatment included suggestions to use the imagery more broadly through posters, ads and community-based activities.

**Health messaging seemed to have very little effect on cookstove purchase or willingness to pay.** Across all four groups, very few people decided to purchase a cookstove between the baseline and endline surveys. It should be noted that the study only lasted five weeks (half as long as the Cambodia study), which may be too short a time to see an impact on sales. Only the goal-setting treatment had a significant impact on cookstove sales.

**The role of health awareness in cookstove adoption remains complex and unclear.** Several other factors are at play. First, improved stoves are costly, and this is widely cited as an obstacle to purchase. Only half the respondents had savings, and the cost of the stove would represent a significant portion of current savings, which are likely put aside with other investments in mind, or earmarked for use as a safety net. Understanding how purchasing a new cookstove can be more affordable for low-income households is therefore essential in ensuring that improvements in health awareness can lead to cookstove adoption.

Second, given the financial constraints that households face, the purchase of a new cookstove may well take more time than the study’s duration, to enable people to save up for the purchase and discuss it with other household members. Further research could investigate whether there is a longer time lag between increased awareness of the health risks of cooking smoke and the purchase of a cleaner stove – compared with, say, how long it takes for people

<sup>6</sup> A number of health related questions were designed with answers given on a Likert scale from 1 to 5. These questions were piloted to ensure sufficient heterogeneity in responses and were designed to be compiled into a health awareness index, which would serve as a further outcome of interest between baseline and endline.

who have become aware of the benefits of bednets to adopt them. This would help establish optimal impact evaluation procedures for similar campaigns.

Third, the study focused on health awareness at the individual level. As 47.5% of the respondents did not classify themselves as the sole decision-maker within the household, it may well be the case that a broader approach to health awareness that targets not just individuals, but entire households, would be more effective at driving behaviour change in relation to cooking practices and cookstove uptake.

#### 4.4 Study limitations

**Sample size:** The sample size may not have been big enough to test how broader community based interventions can affect health awareness and drive behaviour change. The improvements in health awareness, although not statistically significant, do suggest that with a larger sample size, the interventions might demonstrate significant positive effects. It would be useful to investigate how community-based and broader marketing campaigns, including the use of media such as television and radio, can drive improvements in health awareness.

**Market segmentation:** We conducted correlational analysis on the use of open or surrounded fire stoves that suggests there are differences in the types of respondents who are likelier to use such a stove. Better understanding of how stove use varies across demographics, and how best to target these different market segments, is crucial for triggering wider transition towards more efficient cookstoves.

**Complexity of cookstove adoption:** It was not within the remit of this study to assess other factors effecting cookstove purchases, such as intra-household relations, socio-cultural norms, etc. However, that would be a fruitful area of further research and enable policy-makers to better tailor health awareness campaigns directed at behaviour change and the adoption of improved cookstoves.



A woman cooks with her Philips stove in Kiambu County, Kenya. Photo by Fiona Lambe.

## 5. DRAWING INSIGHTS FROM THE CAMBODIA AND KENYA STUDIES

This section discusses the implication of the findings of the two case studies. The implications take into account how the studies are designed and the methodology applied to arrive at the conclusions.

### 5.1 Cambodia study

The study set out a very clear question: whether health messaging is an effective purchase driver for the ACE-1 cookstove. A key outcome measure is therefore the number of stoves purchased following the exposure to the health message. The study was conducted in a rural setting and involved two treatments – a negative health message and positive health message – as well as a control group. The negative messages used imagery that depicts smoke as deadly, while the positive ones depicted the stove as healthy and used health staff in the promotion campaign at village meetings. All participants were also exposed to traditional stove marketing, such as flyers and home visits. Sales agents are recruited in the villages and trained to then pass on the health message to the community while selling the stoves.

The study found that the campaigns significantly raised awareness of the negative impacts of traditional cooking methods – which was not the case in the Kenya study. The authors observed, however, that this awareness was not associated with a likelihood of buying a new stove. The Cambodia sales data need to be interpreted with caution as well, because a single agent was responsible for 24 of the 34 total sales. Without counting this agent, the total of 10 stoves sold is too low to be able to draw any meaningful conclusion. Furthermore, the seller used attributes beyond the health aspects to sell the stoves. It is therefore not known how many stoves sales she would have achieved if she had only marketed the stoves according to the health messages the agents had been trained to use.

Overall, the Cambodia study shows that the sales agent, the functional attributes of the stove, and the price were key variables that determined whether a stove was purchased. The role of the sales agent in particular stands out in this study. It is clear that the personality of the sales agent and his/her ability to build trust was especially important in this setting, where people said they had previously been duped with products that do not perform as well as described.

The study also highlighted questions about the design and appropriateness of the health message, including how it is being delivered. The image of the snake emerging from smoke (Figure 1) was difficult to interpret, even for the sellers. If trust is an important issue for the households, then a seller using an image he or she cannot explain to sell a stove raises questions about the efficacy of this treatment, and makes it difficult to assess its effectiveness. The positive health visuals seemed to work better. Of course, the effectiveness of any graphic depends on the capacity of the sales agent to understand and utilize it.

### 5.2 Kenya study

The Kenya study used three treatments: a set of SMS messages on the health risks of smoke sent on five consecutive days; graphic imagery depicting the health impact of smoke on the lungs shown to respondents in their homes; and a goal-setting exercise focused on health concerns. Like in Cambodia, all the study groups were also exposed to the traditional methods of stove advertising (e.g. flyers), but this was done at the beginning rather than at the end of the intervention. The overall results show no statistically significant effect of the messages, but follow-up interviews suggest some positive impacts may have been achieved.

The three main outcomes of interest were willingness to pay for an improved stove, rating on the health awareness index, and whether respondents changed their cookstove between

baseline and endline. It should be noted that willingness to pay was measured by asking people directly, but their *actual* willingness to pay might be different. The results show a decrease **in the amount of money** that participants in the SMS and graphic images group were willing to pay for improved stoves, and a decrease among participants in the goal-setting treatment group. However, although those changes are statistically significant, they disappear once village-level effects are accounted for, and are not very useful for informing practice.

As measured by the health awareness index, all treatment groups showed improvements. It is important to note here that similar to Cambodia study, the control group was also exposed to health messages, but less explicit ones; this could have attenuated the observed effects of the treatments on health awareness. Only the goal-setting treatment showed a statistically significant impact on cookstove change; there was no significant impact with the SMS or graphic imagery treatments. However, this result is based on a very small sample size, and may not be conclusive.

As mentioned previously, awareness about the health risks from cookstove smoke was already high at baseline, which is partly why it was so hard to see improvements following the treatment. However, it should also be noted that explaining the health effects of cooking smoke is complex. It is thus possible that even though study participants understood that there are health risks, they did not grasp the seriousness of those risks. This is particularly the case when the messages were conveyed through SMS, which requires very succinct messages and provides no opportunity for seeking clarifications and receiving feedback (as opposed to face-to-face communication). Successful uses of SMS for health promotion have involved sending reminders, for example, of clinic appointments, or reinforcing messages already provided through other channels. The study did take these limitations into account by first reading the health script to respondents in their homes before following up with SMS messages. Furthermore, the SMS messages were tested in focus group discussions with respondents, and follow-up interviews with respondents showed that the message content was understood.

The second treatment, graphic imagery on health effects (“fear appeal”) has been shown to be very effective in promoting smoking cessation. In this study, the graphic imagery treatment was shown to increase health awareness as measured by the index, though this was not statistically significant. Indeed, exposure to the imagery led to a decrease in the amount of money participants were willing to pay for an improved stove, but this effect was also not statistically significant. Critical to note here is that such campaigns, when being rolled out on a large scale, should be accompanied by a means to change the behaviour, which in this case the clean cookstove. The stove should be available for purchase and affordable.

Finally, it is important to take into account the study context. The Kenya case study was conducted in peri-urban areas of the Central province, where 64% of the households used charcoal on an improved stove (the Kenya Ceramic Jiko). The study does not report what the remaining 36% of the 965 respondents used as fuel: wood or a clean option such as LPG. Charcoal is a cleaner form of biomass and produces considerably less smoke when cooking. A smoke reduction campaign that targets charcoal or LPG users would thus be potentially less effective compared with one that targets firewood users, who see the smoke and feel its health effects (cough, teary eyes, runny nose). However, since charcoal users purchase both the stove and fuel, they might be more receptive to purchasing a fuel-efficient stove, whereas firewood users do not typically purchase their stove or fuel and would likely have a lower willingness to pay for a more efficient stove. This would theoretically make health messaging more important in persuading households to adopt improved stoves. Because the study was randomized, differences in fuel type are less likely to inform the results of the study; however,



the inclusion of clean fuel groups could have reduced the power of the study considerably, and could explain why many of the findings were not statistically significant.

### 5.3 Summary of discussion

Both studies have demonstrated the feasibility of using health messages in cookstove promotion campaigns. The treatments used – graphic images, SMS and a goal-setting exercise – were well received by study participants, but it is difficult to draw firm conclusions on the effectiveness of health messages in influencing the adoption of cleaner stoves. This is partly due to the methodological challenges and limitations highlighted above. Taken together, however, and combined with available literature, one can conclude that the effect of health messaging on stove adoption would be minimal. Both stoves were very expensive; in Cambodia less than a tenth of participants said they could afford to purchase the stove. This means that price would overshadow nearly all other determinants of the stove purchase, which is not the case with bednets, condoms and other low-cost health interventions. Another concern is the time it would take to purchase a new stove after a health message is received. Some lag time would be required before measuring uptake, due to the high cost of the stove (households may need to save for several months). However, participants in the Cambodia study said they would not purchase the stove if it cost more than US\$50. It is therefore unlikely that repeating the health campaign several months later would greatly increase sales.

## 6. CONCLUSIONS AND RECOMMENDATIONS

The studies summarized in this paper were developed separately and cannot be easily compared, but the insights they provide will contribute to a growing body of knowledge about behaviour change communication in the context of cooking.

### 6.1 Key research insights

The studies pioneered methods such as SMS, graphic images and goal-setting exercises as means of communicating messages about the health risks of cooking smoke and the benefits of improved cookstoves. The results show some positive effects for most of the treatments, although the overall conclusions are not very strong due to limitations in study design and unforeseen circumstances. The studies' value lies in their ability to offer important lessons and guidance for future campaigns and research linking health and cookstoves:

- In both cases, **health messaging was shown to have minimal effect on cookstove purchase**. Indeed, cookstove adoption is influenced by multiple factors linked in complex ways. This is a very important finding for public health workers, who need to think more broadly about how they achieve the goals associated with cleaner cooking through approaches that do not necessarily focus on individual health goals.
- **Price continues to be an important factor influencing the adoption of clean cookstoves**. In Cambodia, the main drivers of cookstove purchase (beside the sales agent) were availability of disposable income, time, and fuel saved. In both studies the price of the cookstove was shown to be a major barrier to purchasing. These findings are in line with the literature on drivers of improved cookstove uptake.
- **Awareness of health issues related to cooking varies from place to place**. In Cambodia, the health awareness campaign raised awareness about negative health impacts of cooking with traditional biomass, with positively toned messaging appearing to be most effective. In Kenya the health awareness campaign did not

really increase people's health awareness, but this was not surprising – and perhaps not important – since in most cases they were already aware of the health risks. These contrasting findings are a reminder of the importance of tailoring marketing campaigns to each target audience to match the existing level of awareness.

- **The skill and motivation of individual sales agents can greatly affect cookstove marketing campaigns.** In Cambodia, the efficacy of individual sales agents appears to have been the strongest factor affecting sales, with the most successful sales agent using a combination of messages, including health information, to convince households to purchase the stoves. This warrants further study; designers of stove promotion campaigns might be able to learn from highly effective sales agents.
- **The channels used for delivering health messages are important.** The Kenya study suggests that community health workers may not be the most effective channel for health promotion campaigns; it may be beneficial to include other options as well, such as radio and television.

## 6.2 Key methodological insights

The gold standard for health studies is the randomized-control trial (RCT). While the studies summarized in this paper aimed to achieve the rigour of RCTs, there were funding and time constraints. Some methodological insights that could inform future research include:

- **For studies to be considered acceptable to academic and policy communities, it is important they follow RCT best practice.** This includes the development of a detailed protocol for peer review during preparation phase of the project, so that design problems are identified and addressed upfront. Furthermore, such protocols should be submitted for ethics approval if there is a plan to publish the results. Study site selection should be done carefully, and piloting of the planned interventions is also important to identify and address potential implementation challenges.
- **Pursuing best practice takes considerable time.** Beyond the time required to plan and pilot the study, sufficient time is also needed for data collection and analysis. Given that behaviour change takes time, sufficient time lag should be allowed for measuring the effectiveness of the campaigns. This is compounded by the high cost of the stoves; it may take several months of savings before study participants can buy a stove. One possible way to ensure studies are long enough without being too costly would be to nest these studies within other ongoing trials (see below).
- **It is necessary to define clear and manageable roles for groups/members of the study team.** The local consultants had to perform multiple roles in this project: designing the marketing campaigns, designing and executing the research, and monitoring results. For a more comprehensive study, it might have been better to have joint teams, each specialized in one area. For instance, a cookstove health campaign could have been designed by a research group and added to an ongoing cookstove promotion campaign or another health promotion campaign (e.g. on water and sanitation, maternal and child health, HIV, etc.) run by an NGO or the government. Then an independent monitoring and evaluation expert could be tasked with evaluating how the cookstove health campaign has worked. It is also important to partner with health professionals. In Kenya, household visits were conducted by trained field officers, alongside community health workers. In the Cambodia instance, the presence of a nurse in health meetings helped a lot in getting the message through. But when it came to household visits, it was the stove sellers passing on the health message, and in some cases, they themselves could not explain the message (e.g. what was meant by the snake image). Perhaps in the future, stove sellers could try to

coordinate more closely with community health workers to raise awareness about the health impacts of cooking with traditional biomass. It is important to ensure that sales agents are well trained, properly incentivized, and continuously monitored to ensure they deliver the health messages as instructed – or if the messages are not working well, to make adjustments in coordination with health experts.

- **The timing of the study matters.** It is important to ensure that studies do not coincide with critical farming activities, for example.
- **A health promotion campaign will only lead to stove sales if the stoves are accessible.** For health promotion to work, the means for changing behaviour should be there – at an affordable cost. It is pointless to use health messages about cookstoves if people cannot afford the stoves (or at least believe they are too costly). This is why other marketing approaches, such as highlighting fuel savings, appear to make a greater impact on sales.

### 6.3 Recommendations for future research

Based on the two case studies, it is clear that much more action research is needed to fully understand the role of health awareness in cookstove adoption and how to integrate health objectives into cookstove interventions. Given the holistic approach required to achieve successful adoption of cleaner cooking technologies and practices, any health-inspired interventions must take into account many other – potentially more significant – factors influencing cooking behaviour change.

Some recommendations for future research are as follows:

- **A systematic review of evidence may be necessary before any cookstove health campaign can be designed.** A review of evidence – on cookstoves and other health issues – may help to identify whether it is better to use positive or negative messaging. For instance, past HIV campaigns in Kenya that used graphic images only led to stigma and drove infections underground; more positive messages, e.g. on the value of testing, have been found to be more effective.
- The personality, skill and motivation of sales agents in Cambodia were a crucial factor in convincing households to purchase the stove. It would be interesting to further explore the **role of personality of key actors in behaviour change communication** efforts.
- To overcome the cookstove affordability barrier, future studies could **consider testing the efficacy of health messaging where innovative financing for cookstoves is made available** to the participating households.
- Further research on the effect of health messaging on cookstove choice and adoption could look at ways to **design health campaigns so that they are aligned with the needs of the end-user.** Household appliances such as cookstoves are deeply integrated into people's daily lives and as such have multiple functions, benefits and meanings for the user. Thus, it is vital that the user's needs and motivations are well understood when designing the marketing campaigns and delivery mechanisms for such products.

## REFERENCES

- Arnold, J. E. M., Köhlin, G. and Persson, R. (2006). Woodfuels, livelihoods, and policy interventions: Changing Perspectives. *World Development*, 34(3). 596–611. DOI:10.1016/j.worlddev.2005.08.008.
- Beltramo, T., Levine, D. I. and Blalock, G. (2014). *The Effect of Marketing Messages, Liquidity Constraints, and Household Bargaining on Willingness to Pay for a Nontraditional Cookstove*. CEGA Working Paper. The Center for Effective Global Action, Berkeley, CA, US. <https://escholarship.org/uc/item/4cq705v3>.
- Bruce, N., Pope, D., Rehfuess, E., Balakrishnan, K., Adair-Rohani, H. and Dora, C. (2015). WHO indoor air quality guidelines on household fuel combustion: Strategy implications of new evidence on interventions and exposure–risk functions. *Atmospheric Environment*, 106. 451–57. DOI:10.1016/j.atmosenv.2014.08.064.
- Buysman, E. and Mol, A. P. J. (2013). Market-based biogas sector development in least developed countries – the case of Cambodia. *Energy Policy*, 63. 44–51. DOI:10.1016/j.enpol.2013.05.071.
- Clark, M. L., Peel, J. L., Balakrishnan, K., Breysse, P. N., Chillrud, S. N., Naeher, L. P., Rodes, C. E., Vette, A. F. and Balbus, J. M. (2013). Health and household air pollution from solid fuel use: the need for improved exposure assessment. *Environmental Health Perspectives*, 121(10). DOI:10.1289/ehp.1206429.
- Community Preventive Services Task Force (2014). Combination of mass media health campaigns and health-related product distribution is recommended to improve healthy behaviors. *American Journal of Preventive Medicine*, 47(3). 372–74. DOI:10.1016/j.amepre.2014.05.032.
- Energypedia (2016). Cambodia energy situation. 28 January. [https://energypedia.info/wiki/Cambodia\\_Energy\\_Situation](https://energypedia.info/wiki/Cambodia_Energy_Situation).
- Ezzati, M. and Kammen, D. M. (2002). Household energy, indoor air pollution, and health in developing countries: knowledge base for effective interventions. *Annual Review of Energy and the Environment*, 27(1). 233–70. DOI:10.1146/annurev.energy.27.1.22001.083440.
- Goodwin, N. J., O’Farrell, S. E., Jagoe, K., Rouse, J., Roma, E., Biran, A. and Finkelstein, E. A. (2015). Use of behavior change techniques in clean cooking interventions: a review of the evidence and scorecard of effectiveness. *Journal of Health Communication*, 20 Suppl 1. 43–54. DOI:10.1080/10810730.2014.1002958.
- GVEP International (2012). *Accelerating Access to Energy: Global Alliance for Clean Cookstoves, Kenya Market Assessment, Sector Mapping*. GVEP International.
- IEA (2012). *Tracking Clean Energy Progress*. Energy Technology Perspectives 2012 excerpt as IEA input to the Clean Energy Ministerial. International Energy Agency, Paris. <http://www.iea.org/publications/freepublications/publication/name,26624,en.html>.
- IHME (2010). GBD Profile: Cambodia. In *Global Burden of Diseases, Injuries, and Risk Factors Study 2010*. Institute for Health Metrics and Evaluation, Seattle, WA, US. [http://www.healthdata.org/sites/default/files/files/country\\_profiles/GBD/ihme\\_gbd\\_country\\_report\\_cambodia.pdf](http://www.healthdata.org/sites/default/files/files/country_profiles/GBD/ihme_gbd_country_report_cambodia.pdf).
- ISO (2012). *Guidelines for Evaluating Cookstove Performance*. IWA 11:2012. International Organization for Standardization, Geneva. [http://www.iso.org/iso/catalogue\\_detail?csnumber=61975](http://www.iso.org/iso/catalogue_detail?csnumber=61975).
- Jeuland, M. A., Bhojvaid, V., Kar, A., Lewis, J. J., Patange, O., et al. (2015). Preferences for improved cook stoves: Evidence from rural villages in north India. *Energy Economics*, 52, Part B. 287–98. DOI:10.1016/j.eneco.2015.11.010.

- Johnson, O., Wanjiru, H., Muhoza, C., Lambe, F., Jürisoo, M., Amatayakul, W. and Chenevoy, A. (2015). *From Theory to Practice of Change: Lessons from SNV's Improved Cookstoves and Fuel Projects in Cambodia, Kenya, Nepal and Rwanda*. SEI Working Paper No. 2015-09. Stockholm Environment Institute, Nairobi and Stockholm. <http://www.sei-international.org/publications?pid=2787>.
- Lambe, F. and Atteridge, A. (2012). *Putting the Cook before the Stove: A User-Centred Approach to Understanding Household Energy Decision-Making – A Case Study of Haryana State, Northern India*. SEI Working Paper No. 2012-03. Stockholm Environment Institute, Stockholm. <http://www.sei-international.org/publications?pid=2106>.
- Lambe, F. and Ochieng, C. (2015). *Improved Cookstoves in Central America: Health Impacts and Uptake*. SEI discussion brief. Stockholm Environment Institute, Stockholm. <https://www.sei-international.org/publications?pid=2822>.
- Lambe, F. and Senyagwa, J. (2015). *Identifying Behavioural Drivers of Cookstove Use: A Household Study in Kibera, Nairobi*. SEI Working Paper No. 2015-06. Stockholm Environment Institute, Stockholm. <https://www.sei-international.org/publications?pid=2767>.
- Lewis, J. J. and Pattanayak, S. K. (2012). Who adopts improved fuels and cookstoves? A systematic review. *Environmental Health Perspectives*, 120(5). 637–45. DOI:10.1289/ehp.1104194.
- Lim, S. S., Vos, T., Flaxman, A. D., Danaei, G., Shibuya, K., et al. (2012). A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. *The Lancet*, 380(9859). 2224–60. DOI:10.1016/S0140-6736(12)61766-8.
- Mobarak, A. M., Dwivedi, P., Bailis, R., Hildemann, L. and Miller, G. (2012). Low demand for nontraditional cookstove technologies. *Proceedings of the National Academy of Sciences*, 109(27). 10815–20. DOI:10.1073/pnas.1115571109.
- Perez-Padilla, R., Schilman, A. and Riojas-Rodriguez, H. (2010). Respiratory health effects of indoor air pollution. *The International Journal of Tuberculosis and Lung Disease*, 14(9). 1079–86. <http://www.ncbi.nlm.nih.gov/pubmed/20819250>.
- Rehfuess, E. A., Puzzolo, E., Stanistreet, D., Pope, D. and Bruce, N. G. (2013). Enablers and barriers to large-scale uptake of improved solid fuel stoves: a systematic review. *Environmental Health Perspectives*, . DOI:10.1289/ehp.1306639.
- Rysankova, D., Putti, V. R., Hyseni, B., Kammila, S. and Kappen, J. F. (2014). *Clean and Improved Cooking in Sub-Saharan Africa: A Landscape Report*. Report No. 98664. Africa Clean Cooking Solutions Initiative. The World Bank, Washington, DC. <http://documents.worldbank.org/curated/en/2015/07/24853349/clean-improved-cooking-sub-saharan-africa-landscape-report>.
- Simon, G. L., Bailis, R., Baumgartner, J., Hyman, J. and Laurent, A. (2014). Current debates and future research needs in the clean cookstove sector. *Energy for Sustainable Development*, 20. 49–57. DOI:10.1016/j.esd.2014.02.006.
- Smith, K. R., Bruce, N., Balakrishnan, K., Adair-Rohani, H., Balmes, J., et al. (2014). Millions dead: how do we know and what does it mean? Methods used in the comparative risk assessment of household air pollution. *Annual Review of Public Health*, 35(1). 185–206. DOI:10.1146/annurev-publhealth-032013-182356.
- UNEP and WMO (2011). *Integrated Assessment of Black Carbon and Tropospheric Ozone: Summary for Decision Makers*. United Nations Environment Programme and World Meteorological Organization, Bonn. [http://www.unep.org/dewa/Portals/67/pdf/BlackCarbon\\_SDM.pdf](http://www.unep.org/dewa/Portals/67/pdf/BlackCarbon_SDM.pdf).

- WHO (2014). *Burden of Disease from Household Air Pollution for 2012*. World Health Organization, Geneva. <http://www.who.int/mediacentre/news/releases/2014/air-pollution/en/>.
- Winrock International (2011). *The Kenyan Household Cookstove Sector: Current State and Future Opportunities*. Report to the U.S. Agency for International Development. Winrock International, Washington, DC. <http://www.relwa.org/sites/default/files/Kenya-Stoves-Assessment-web.pdf>.



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