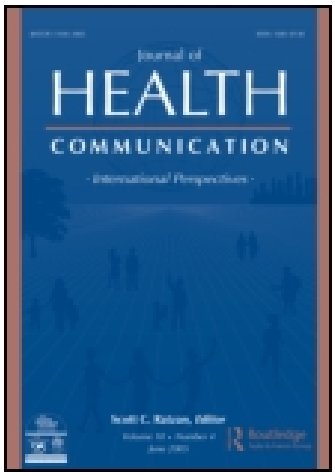

Journal of Health Communication: International Perspectives
Publication details, including instructions for authors and subscription information:
http://www.tandfonline.com/loi/uhcm20

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Published online: 03 Apr 2015.

To cite this article: Anita V. Shankar, MaryAlice Onyura & Jessica Alderman (2015) Agency-Based Empowerment Training Enhances Sales Capacity of Female Energy Entrepreneurs in Kenya, Journal of Health Communication: International Perspectives, 20:sup1, 67-75, DOI: 10.1080/10810730.2014.1002959

To link to this article: http://dx.doi.org/10.1080/10810730.2014.1002959

Journal of Health Communication, 20:67–75, 2015

ISSN: 1081-0730 print/1087-0415 online
DOI: 10.1080/10810730.2014.1002959

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Globally, women's involvement in clean cooking value chains has been minimal. This is partly because of the multiple challenges faced by women that impede their capacity to effectively engage in the energy sector. To better discern gender-specific differences in involvement in the energy sector, the authors conducted a randomized trial in Kenya to compare sales performance of newly trained male and female improved cookstove entrepreneurs and to test the effects of an agency-based empowerment training on business activity. A total of 257 entrepreneurs completed either a 4-day entrepreneurial training (control) or a 4-day empowerment training (intervention) and were followed for nearly 8 months documenting business activity and sales. The empowerment training led to more than doubling of sales for both genders. In addition, participants in the intervention group were significantly more likely to demonstrate business commitment over time and nearly three times more likely to be higher sellers (relative risk = 2.7, 95% CI [1.4, 5.4]), controlling for gender and rural/urban locale. Women outsold men by a margin of nearly 3 to 1 and were more likely to continue to pursue leads despite limited sales. Nonactive participants (those selling 1 improved cookstove or less) were a larger percentage of the control group (72%) than the intervention group (50%), and more men were nonactive participants (65% of men) compared with women (56% of women).These data show that women can serve as active improved cookstove entrepreneurs in both urban and rural settings and that targeted agency-based empowerment training can significantly increase women's capacity to engage effectively within the improved cookstove value chain.

There is growing evidence that women can play a critical role in the promotion and sales of improved cookstoves (ICSs) because of their roles and experience as primary cooks and household energy managers (Batliwalla & Reddy, 1996; Cecelski, 2000; Dutta, 2005; Köhlin, Sills, Pattanayak, & Wilfong, 2011; Smith & Dutta, 2011). As key beneficiaries of ICSs, women can drive demand as consumers and users, and they can catalyze more consistent ICS use and adoption. Moreover, women can leverage their existing networks to promote the adoption of these new technologies and use their firsthand experiences for marketing the ICS.

Despite early efforts to include women throughout the ICS value chain, the marketing and sales force remains dominated by men (Ramanathan & Carmichael, 2008). Efforts are lagging, as integration has been difficult because of sociocultural constraints on women and a lack of basic education and skills. Often overlooked is the role of individual agency and voice in fostering greater involvement of women as entrepreneurs. *Agency* can be defined as "an actor's or group's ability to make powerful choices" (Samman & Santos, 2009) and *voice* is referred to as "the capacity to speak up and be heard" (Klugman et al., 2014). Women disproportionally face psychosocial challenges that impede their self-efficacy, motivation, and drive to take on new endeavors (Chegini, 2010). A recent World Bank report highlights the need to address women's lack of agency and voice as fundamental for shared prosperity (Klugman et al., 2014).

Increasing women's engagement in the energy economy may have additional benefits for their family. In emerging markets, it is estimated that women reinvest nearly 90 cents of every additional dollar of income in their families' education, health, and nutrition as compared with 30–40% for men. If efforts to engage women in the clean energy sector are to be successful and if we are to leverage this opportunity to more broadly empower women, it is critical to evaluate innovative behavioral strategies that enhance women's intrinsic capacities and facilitate effective navigation of the local economic environment.

In this study, we examine two primary questions related to women's engagement in the ICS value chain: (a) "What is the relative capacity of women to become ICS sales agents as compared with men in urban and rural (last mile)

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environments and (b) "What is the relative effect of an agency-based empowerment training on the business capacity of both male and female entrepreneurs?" We investigate these questions using a randomized trial design conducted in two locations in Kenya, an urban slum and a rural mountain region.

The Need to Include Women in the Energy Sector

An estimated 1.3 billion people live in poverty globally, 70% of whom are women (Dutta, 2005). Since the 1970s, there have been significant efforts to foster women's engagement and include gender issues in development activities (Boserup, 1970; World Bank, 2005). Much of the focus has been on equalizing access to modern energy for women because it is recognized that men's energy needs tend to be prioritized (Celelski, 2004; Clancy, Skutsch, & Bachelor, 2003; Köhlin et al., 2011; Lambrou & Piana, 2006; Practical Action, 2010). Because women are the primary users and often producers of energy, without their direct involvement, renewable energy projects are at risk of not reaching their intended populations or being used at all (Cecelski, 2000; Clancy, 2011). Yet, many programs in the energy sector continue to be designed without consideration of their effects on women or of the role of women in their implementation strategy (Cecelski, 2000, 2004). There is limited gender disaggregated data available, a small percentage of projects incorporate a gender focus, and even fewer projects consider gender when establishing program design (World Bank, 2010).

Employment in the energy sector remains male dominated. On the basis of the 2012 *World Development Report*, female employment in the electricity, gas and steam, and water sectors is half the level of male employment (World Bank, 2012). This is due, in part, by the fact that the energy sector has been defined as industrial, high-tech and large-scale, requiring professional expertise and considerable capital to move ahead—all aspects of business in which women traditionally face considerable challenges.

Historically, women's engagement in the local economy has focused in the informal sector, running micro- or small-scale businesses generally based in or close to the home. Women often face financial constraints in terms of accessing capital to start their business and the lack of collateral to secure loans. Male entrepreneurs face similar constraints, but are more likely to overcome these challenges (Kariuki & Balla, 2011). Moreover, many women are faced with time poverty, which adds to their reluctance to participate in new business endeavors. There has been an expansion of country efforts to use women entrepreneurs to market and distributive clean cooking solutions through women's advocacy groups and women's networks to increase distribution and sales (Global Alliance for Clean Cookstoves, 2011). Despite this, there are indications that more involvement of women in this sector is needed and interventions that address the financial and time constraints while optimizing context specific opportunities are vital.

The Need for Agency-Based Empowerment Training

Data from the recent Global Entrepreneurship Monitor, Women's Report (2013) noted that in every economy sampled, women had lower capability perceptions and greater fear of failure compared with men. Likewise, in regions where women had the confidence, ability, and spirit to create a business, higher female entrepreneurial rates prevailed (Kelley, Brush, Green, Litovsky, and the Global Entrepreneurship Research Association, 2013). Most commonly, entrepreneurial training concentrates on skill building without much focus on the psychosocial challenges of taking on a new endeavor, especially those that requires some level of monetary risk and time commitment. While business skills are important, efforts to learn these skills are greatly enhanced if there is intrinsic motivation and drive to learn them. In addition, as any new endeavor is carried forward, the potential setbacks and challenges must be successfully overcome in order to succeed.

There are limited empirical data on interventions that use a targeted agency-based empowerment process in resource-poor settings, and no studies that have explored the effects of such training on entrepreneurial capacity. We posit that the fundamental tenets of agency-based interventions build upon Bandura's work on core properties of individual agency (Bandura, 2006) that include intentionality (creation of goals, visions), forethought (visualizing the consequences of ones plans), self-reactiveness (modulation and regulation of action) and self-reflectiveness (reflecting on thoughts and actions). The agency-based training used in this study is anchored in these core properties, draws from basic tenets of positive psychology, and is aimed at increasing self-knowledge and developing actionable growth strategies. The training has been culturally and locally adapted for the Kenyan entrepreneurial context and conducted in the local language.

This work builds upon earlier research in Kenya that demonstrated that following an agency-based training, there was a substantial increase in women's capacity and willingness to identify and pursue economic opportunities and build strong relationship skills (Shankar, Onyura, Ojode, & Milliam, 2015). This study examines the impacts that agency-based empowerment training can have to increase the motivation and capacity to develop a successful ICS business, for both men and women. It is hypothesized that if people are well-informed, motivated to act, and have the skills and confidence to take action, they are more likely to initiate and maintain behaviors that support a successful ICS business.

Method

A randomized controlled study design using intention-to-treat analysis was used to test the impacts of an agency-based empowerment training on the entrepreneurial activity of newly trained men and women ICS sellers. An intention-to-treat analysis was chosen as there was limited data to inform the likelihood of participants continuing with the entrepreneurial program once enrolled. The intention-to-treat analysis allows us to estimate the effect of the intervention (training) and include outcome data for all randomized

participants regardless of their level of adherence to the research and follow up assessments.

This study was implemented in conjunction with ESVAK, Kenya, a community-based nongovernmental organization with ongoing health and development projects throughout Kenya. The study was designed to inform ESVAK's program activities with the ultimate goal of selecting and training ICS entrepreneurs to serve within their newly developing business wing. The study was conducted in two sites in Kenya, one was an urban slum in Kayole, Nairobi, and the other was in Tigania East in Meru County in central Kenya. Kayole is a densely populated area where biomass is the primary fuel source. Tigania East is located 5 hours from Nairobi and consists of a mixture of forested areas and clearings with smaller towns, villages, and rural farms.

ESVAK was supported by Envirofit International, an industry leader in cookstove development and manufacturing. By 2015, Envirofit will have sold 1 million stoves in more than 45 countries. Envirofit has a local production and distribution plant in Nairobi and they supplied ESVAK with three brands of ICS: an M-5000 wood burning rocket stove, a CH-2200 charcoal burning stove and a larger CH-5200 charcoal burning stove (see Figure 1). Envirofit assisted ESVAK with the recruitment and selection procedure for potential entrepreneurs and supported the training of implementation staff.

This study has undergone ethical review and was approved by the ethical review boards at the Kenya Medical Research Institute in Nairobi, Kenya, and the Committee on Human Research of The Johns Hopkins University Bloomberg School of Public Health, Baltimore, Maryland, United States.

Recruitment and Selection Procedures

There was a general call in the community for participation in the research/program activity led by ESVAK to sell ICS. More than 600 individuals expressed interest in participating in the program from both the rural and urban locations. Envirofit and ESVAK focused on identifying individuals with prior business experience in selling, a current interest in pursuing additional entrepreneurial activity, and a basic level of interpersonal interaction skills. Interested applicants were given a demonstration of the ICS and were told about the study. During the initial screening and selection, the field team found many challenges in identifying men who expressed interest and were willing to participate in the study. Despite earlier studies that indicate that men dominate the sales and marketing efforts in the cookstove industry, many men in the study communities reflected that ICS were associated with women's work and therefore did not believe it was a viable entrepreneurial activity for a man or that they did not have sufficient social networks to sell the ICS.

Fig. 1. The three stoves used in the study: an M-5000 wood burning rocket stove, a CH-2200 charcoal burning stove, and a larger CH-5200 charcoal burning stove. © Envirofit, 2014. Reproduced by permission of Envirofit. Permission to reuse must be obtained from the rightsholder.

Among the individuals invited to participate, a total of 310 from both sites (106 men and 204 women) ultimately agreed to partake in the study and were randomly selected to obtain training in either the intervention (agency-based empowerment) or the control (entrepreneurial training). After randomization, individuals were placed into their respective trainings, the entrepreneurial training and the agency-based empowerment training, which ran in parallel and the participants were expected to attend each of the four days of training as well as a half day focused training on each of the Envirofit cookstove models. Both the entrepreneurial and the agency-based training consisted of mixed gender groups. Figure 2 displays the trial flowchart. We experienced some drop out after individuals were randomized, first at the beginning of the training and second through the noncompletion of the training. For women in the control group, 20% did not continue with the training whereas 9% of women in the intervention group chose not to continue. Approximately 15% of men in both the intervention and control group did not complete the training. Data from a sample of dropouts suggest that time constraints were the primary reason for withdrawal. There were a total of 257 trained entrepreneurs for the final follow-up. This included 118 in the control group and 139 in the intervention group.

Once trained, individual entrepreneurs were allowed to identify and pursue any type of sales techniques and processes they felt were effective. For example, they could choose to sell door-to-door, visit self-help groups, or announce their wares at community or religious functions. There were no restrictions as to whom in the household they could approach or where (geographically) they could sell their product. During the half-day Envirofit training, which everyone received, individuals were provided with the basic skeleton of a sales pitch that focused on the benefits of fuel and time savings as well as reduction of smoke with regular ICS use.

Contents of the Entrepreneurial Training

The entrepreneurial training was designed to support individuals taking on new business endeavors and has been used by ESVAK in their other community programs. It included 4 days of instruction (approximately 32 hours of training) and covered the following topic areas: (a) starting a viable business as well as aspects of business growth; (b) a refresher introduction to basic business skills, including effective record keeping and basic accounting skills and cash management; (c) business planning, creation of action plans;

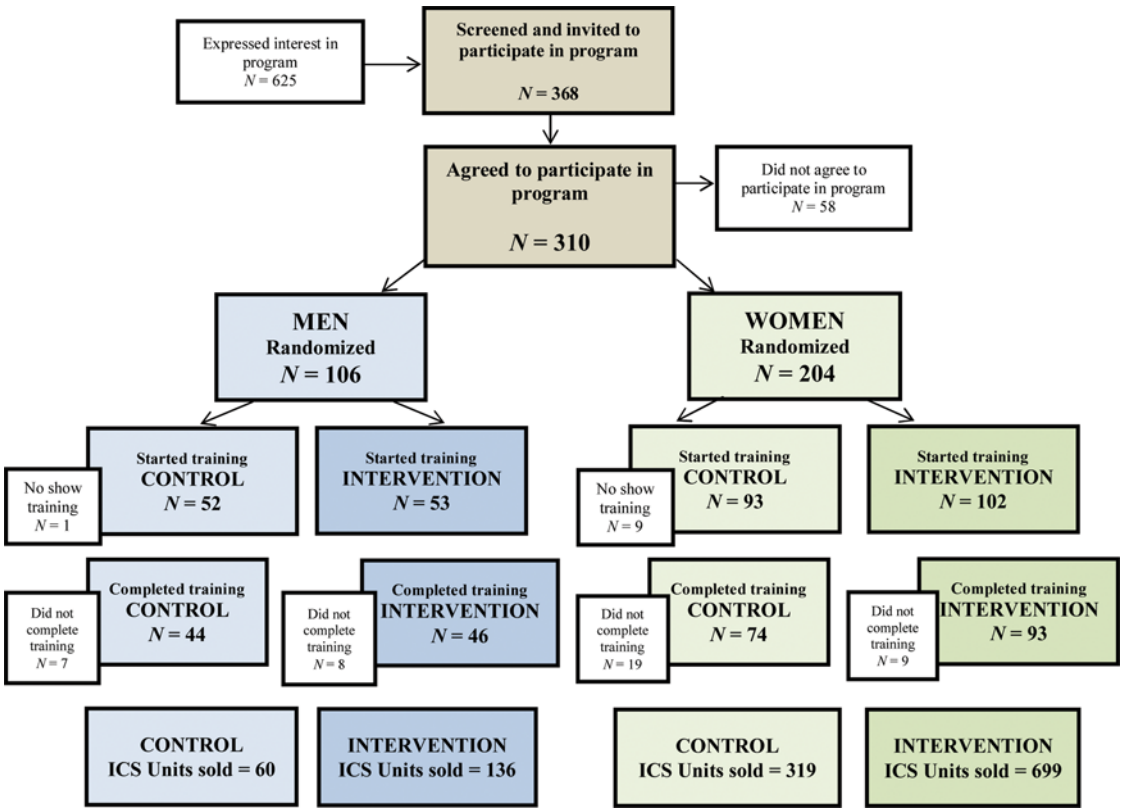

Fig. 2. Flow of selection, screening, and randomization for the study.

(d) basic financial management skills; and (e) understanding the customer and review of group action plans.

Contents of the Agency-Based Empowerment Training

The agency-based empowerment training builds upon a 4-day workshop developed by the Empowerment Institute, based in New York, where individuals participate in an introspective examination of key areas of their life drawing from basic tenets of positive psychology and incorporating exercises that address Bandura's core properties of individual agency. Each exercise is culturally adapted to the local context and crafted to reflect existing social norms and values by a local certified trainer. The training focuses on the following competencies: (a) exercises are relevant and meaningful to the individual; (b) the locus of control sits firmly within the individual rather than on external forces; (c) a simple process of cognitive reframing is adapted; and (d) participants self-reflect to assess progress toward their goals. Over the course of the workshop, through individual and interactive exercises, participants examine aspects of their emotions, relationships, their health/body, money, and work. In this training, exercises and examples were designed to support specific challenges faced in new entrepreneurial endeavors.

Follow-up Process

The cohort of 257 male and female entrepreneurs was assigned to intervention-specific follow-up groups. The groups generally met bimonthly in the urban site and every 3 weeks in the rural site along with a key staff member who would facilitate the meetings. These follow-up meetings were designed to help entrepreneurs build their ICS business, address any challenges they were facing, and review best practices in ICS sales. Monitoring of ICS sales and follow-up was done from December 7, 2013, to July 31, 2014.

Statistical Analysis

All analyses were conducted using SAS 9.3. Complete case analysis was undertaken using an intention-to-treat approach (excluding those randomized but who did not enter the protocol) and adjusted for potential confounding factors. Basic univariate statistics were run to identify the mean, median, and range of sales. Dichotomous outcomes were compared using chi-square tests or Fisher's exact test, as needed. The business activity of entrepreneurs over time was plotted using Kaplan-Meier survival curves and statistical significance was determined using a log-rank test. Relative risk estimates and 95% confidence intervals were calculated using logistic regression methods to assess the relative likelihood of an entrepreneur being a higher seller, controlling for primary factors of interest.

Results

Baseline Characteristics

Of the 300 ICS entrepreneurs who were randomized and started training, 169 (56%) resided in the rural area and

131 (44%) in the urban area. Gender distribution was similar in both sites, with women comprising 64% in the rural area and 66% in the urban area. To examine differences in entrepreneurial activity resulting from the intervention, it is important to establish baseline comparability between the groups. Table 1 presents baseline data on the final cohort of ICS entrepreneurs that includes those that were randomized and present at the training ($n = 300$). We found no significant differences between the control and intervention group with respect to key baseline characteristics that we believe could influence long-term entrepreneurial activity, such as education, age, or previous business experience.

Characteristics of Sales, by Gender and Location

From the outset of the study, we found significant differences between men and women associated with interest in becoming an ICS seller, active participation in the new business, and actual sales. Interviews with male entrepreneurs suggest significant concerns with selling a product targeted towards women's work. Male entrepreneurs cited limited social networks and challenges in reaching out to women's groups.

Basic univariate statistics are provided in Table 2 which compare the gender differences in average sales for those ICS sellers that sold at least one ICS during the course of the study. Since the data are not normally distributed we present the median and range between each group. In nearly every group, there were one or two very high selling entrepreneurs. From Table 2, women demonstrated significantly better capacity to sell ICSs than men. In addition, individuals (both men and women) who obtained the agency-based empowerment training demonstrated greater capacity to sell ICSs than the controls. Median sales were significantly higher in the urban location as compared with the rural areas. This is due, in large part, to the high poverty levels in the rural areas that result in reduced capacities to purchase durable goods. In addition, these entrepreneurs faced significant challenges in identifying new markets due to difficult travel conditions in the rugged mountain regions.

Table 1. Baseline characteristics of randomized sample ($n = 300$)

Characteristics	Control (145)	Intervention (155)	p (chi-square test)
Gender			.76
Male	52 (35.9)	53 (34.2)	
Female	93 (64.1)	102 (65.8)	
Education			.53
Primary	67 (46.2)	66 (42.6)	
Secondary	78 (53.8)	89 (57.4)	
Age, years			.95
Less than 25	22 (15.2)	21 (13.6)	
25–34	55 (37.9)	58 (37.4)	
35–44	36 (24.8)	38 (24.5)	
45+	32 (22.1)	38 (24.5)	
Location			.87
Urban	64 (44.1)	67 (43.2)	
Rural	81 (55.9)	88 (56.8)	
Previous entrepreneurial experience			.15
No	3 (2.1)	8 (5.2)	
Yes	142 (97.9)	147 (94.8)	
Current selling			.89
No	17 (11.7)	19 (12.3)	
Yes	128 (88.3)	136 (87.7)	
Current debt			.91
No	126 (86.9)	134 (85.5)	
Yes	19 (13.1)	21 (13.5)	
Access to family assistance			.80
No	69 (47.6)	76 (49.0)	
Yes	76 (52.4)	79 (51.0)	

Table 2. Median (and range) improved cookstove sales for the duration of the study, by gender and intervention

	Control Median (range)	Intervention Median (range)
Men		
Rural	1 (1–18)	3 (1–18)
Urban	1 (1–14)	5.5 (2–15)
Women		
Rural	2 (1–18)	3 (2–35)
Urban	6 (1–85)	22 (1–64)

Sales Patterns

A review of the sales patterns over time revealed that ICS sellers fell into three distinct groups: personal, limited, and active. Personal sellers sold no ICSs or only one, usually purchased for themselves. Limited sellers were those who sold a small number (two to seven units and generally sold them to family or friends). Active sellers were those who sold eight or more ICS units and tended to sell beyond their existing familial group. We found substantial variation in ICS sales over time, with entrepreneurs selling from 0 to 85 ICSs over the nearly 8-month period. Nearly three fourths (72%) of the entrepreneurs in the control group sold no ICSs or only one, compared with 50% in the intervention group. Poor or no sales tended to be more common for men (65%) compared with women (56%).

Figure 3 graphs differences in these sales patterns by gender and intervention group. Nearly 80% of the men in the control group were personal sellers, compared with 65% of women in the control group. In the intervention group, slightly more than 50% of men and slightly less than 50% of women fell in this lowest category. The next most common seller type was limited sellers, with 42% of men in the intervention group, 15% of men in the control group and approximately 25% for members in the female group, either intervention or controls. With respect to active sellers, 24% of women in the intervention group fell into this group. This is more than 2.5 times the percentages within any other group.

Entrepreneurial Activity Over Time

Selling ICSs was a relatively new activity for the entrepreneurs, especially in the rural study site. ESVAK attempted

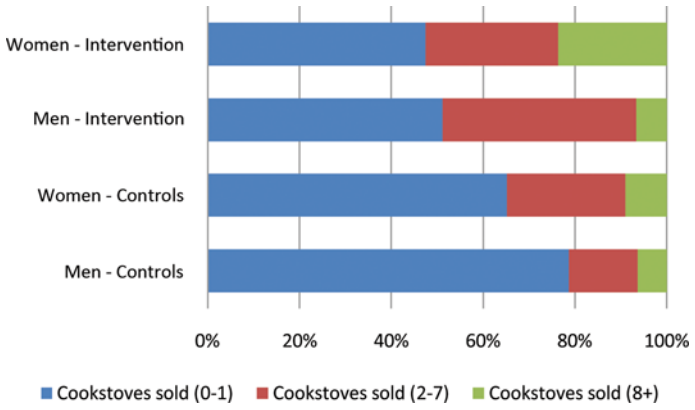

Fig. 3. Percentage of cookstove sellers, by type, gender, and intervention.

to run this program as they would any new entrepreneurial activity, where they would provide general guidance through the training and follow-up meetings. Although ICS sales officially began in December entrepreneurs were slow to sell and participation in the sales meetings lagged. The field teams sent reminder text messages prior to the follow-up meetings and also called the members to encourage them to attend. All travel expenses were covered by the project. However, despite these measures, follow-up meetings were generally poorly attended (about one fourth to one third of the sellers would attend). This was particularly true in the rural area where the terrain is difficult and travel distances were far. While the composition of attendance varied by session, mostly commonly follow-up meetings comprised of 75% women and 25% men. Entrepreneurs were given no limits as to where they could sell their stoves and they were asked to report to the main office to indicate how many ICSs were sold and also to acquire new stock.

In general, for entrepreneurs in this study, selling cookstoves was done as an additional source of income, which may have contributed to lower cookstoves sales overall. On the basis of the current market, profits per sale were generally high, with average profits ranging from 500 to 700 Kenya shillings, which is approximately US$5.50–$7.75, compared with local earnings averaging around US$1–3 per day.

In addition to actual sales, we were interested in overall intention to engage in business activity. For our purposes, this was defined as any selling of ICS, any attendance in sales meetings, or any active communication with the field and research team. If none of these conditions were met over the course of a two month period, we defined that entrepreneur as *inactive*. Using a Kaplan-Meier survival analysis, we plotted how well the individual businesses survived on the basis of the activity of the entrepreneurs in both the intervention and control groups (Figure 4).

From this diagram, there is significant enrichment for enhanced business activity within the intervention group that underwent the agency-based empowerment training. Similar analysis was done by gender and location (not shown) that indicated that women were significantly more likely to demonstrate active business engagement compared with men. In addition, the urban ICS sellers were more likely to show improved activity as compared with the rural sellers. Of note, 2 months after the start of the study, a call to all enrolled entrepreneurs was placed and revealed a large number of nonparticipants, therefore resulting in a substantial drop in active ICS entrepreneurs.

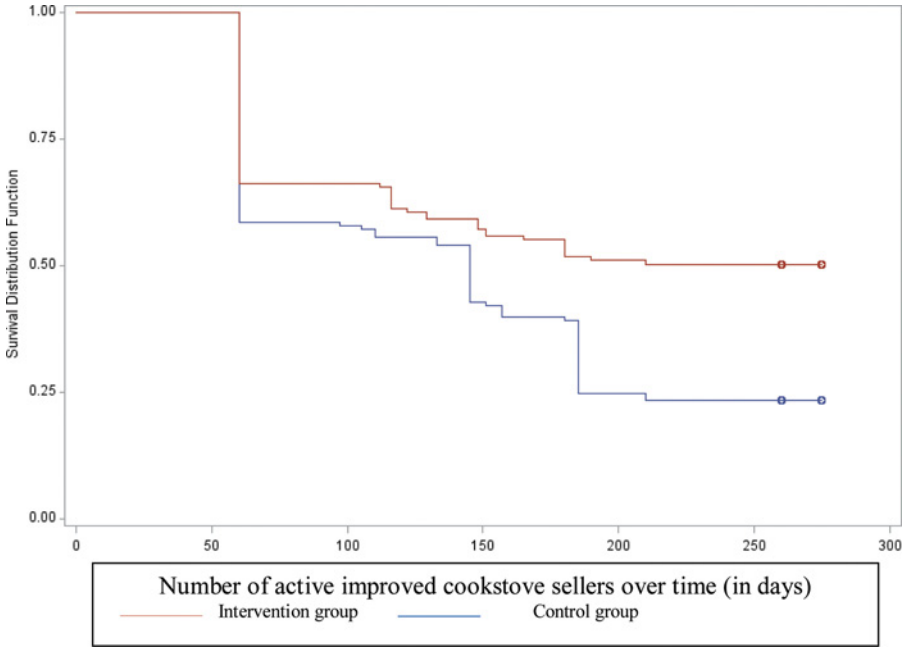

Fig. 4. Kaplan-Meier curve showing business survival (activity) rates over time between control and intervention groups. Statistical significance χ^2 *df*; Log-rank 16.23; $p < .0004$.

Actual ICS Sales over Time

Figure 5 outlines actual ICS sales over time by intervention group. From this figure it is clear that ICS sales were significantly limited for the first several months of the study. To encourage ICS sales, ESVAK decided to try incentives at different points in the study period. The incentive is referred to as a *promotion*; the first promotion occurred in early-March, when entrepreneurs were provided additional sales and marketing materials along with a lowered wholesale price for the ICS. A second promotion occurred in mid-April, and a final promotion was done in early July. For the final promotion in July, entrepreneurs were told that only those ICS sellers who demonstrated strong sales performance would be retained for the ESVAK business program once the study was completed. From Figure 5 it appears that the incentives were instrumental in driving sales volume up and entrepreneurs who received the agency-based training were significantly more likely to take advantage of the promotions and increase their sales in comparison to the control group.

For the final analysis, we were interested in understanding the primary driving characteristics for entrepreneurs who were active sellers (i.e., those selling eight or more ICSs).

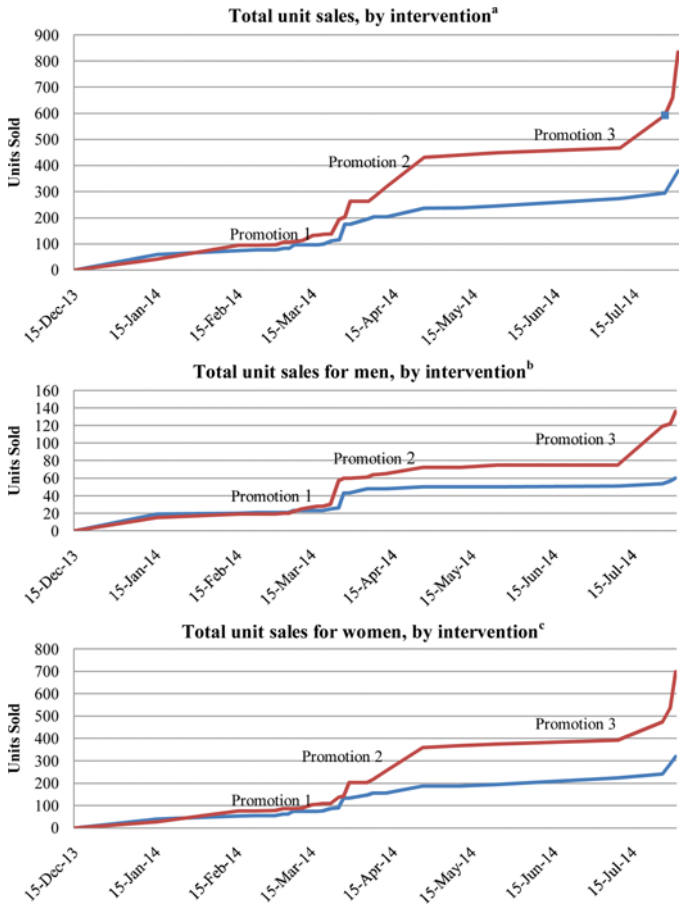

Fig. 5. Total cookstove sales over time, by intervention group. [a]Intervention $n = 835$, control $n = 379$. [b]Intervention men $n = 136$, control men $n = 60$. [c]Intervention women $n = 699$, control women $n = 319$.

Table 3. Relative risk estimates for intervention, gender and location on high-selling capacity

Effect	Point estimate	95% Wald confidence limits		*p*
Intervention	2.74	1.41	5.35	.0031
Female	2.12	1.03	4.35	.0414
Urban	2.41	1.33	4.37	.0031

Table 3 shows the result of our final analysis using logistic regression analysis to model the relative risks (or, in this case, the relative likelihood) of being a higher seller. In this comparison, controlling for gender and location, those who received the agency-based empowerment training were nearly three times more likely to be an active seller (relative risk = 2.74, 95% CI [1.41, 5.35]). Likewise, being female or living in an urban area more than doubled the likelihood of being an active seller (relative risk [female] = 2.12, 95% CI [1.03, 4.35]) and (relative risk [urban] = 2.41, 95% CI [1.33, 4.37]).

Discussion

With greater understanding of the deleterious effects of household air pollution and the recognition that those most vulnerable are poor women, there is growing interest in addressing this energy-gender-poverty nexus (Clancy, 2011; Clancy et al., 2003). There is limited empirical research on the gender dimensions within the energy sector and much of what is available has focused on the social and economic impacts of energy poverty on both men and women. Lack of clean energy and cooking solutions result in differential impacts within the population, with women disproportionally affected as compared with men. Household air pollution has been linked to significantly higher rates of acute respiratory illness and chronic obstructive pulmonary disease (Bruce, Rehfuess, Mehta, Hutton, & Smith., 2006; Lim et al., 2012); spinal injuries resulting from the collection of biofuels; and fatigue, headache, and back pain (Clancy, 2011; World Bank, 2012). There is also evidence of the increased vulnerability to the risk of sexual violence associated with fuel collection, especially in war torn regions (Global Alliance for Clean Cookstoves, 2011; Haile, 1989).

However, despite the renewed efforts to increase access to clean cooking solutions (Global Alliance for Clean Cookstoves, 2011), adoption rates globally (with the exception of China) are low (Lewis & Pattayank, 2013; Mobarak, Dwivedi, Bailis, Hildemann, & Miller, 2012). To significantly expand access to ICS and promote consistent adoption of ICS, it is critical to address gender inequalities in this area and identify ways of more effectively including women in the ICS value chain.

The recent seminal World Bank report on the need to enhance women's voice and agency (2014) stated that fostering agency (defined here as the capacity to act and make choices without fear of retribution) can lead to positive development outcomes, not only for women, but for their family and society as a whole. A recent analysis of Demographic and Health Survey data from Indonesia found that maternal

agency is strongly protective of diarrhea and acute respiratory tract infections, especially in children 2 years of age or younger, even after controlling for maternal education (Agustina, Shankar, Ayuningtyas, Achadi, & Shankar, 2014).

It is likely that beyond the negative social and health impacts of energy poverty that are well documented, there is a significant loss of women's agency and voice that result from poor energy access. Within the context of the energy-gender-poverty nexus, there is a significant opportunity to leverage the need to increase access to clean energy solutions with the empowerment of women. However, engagement of women requires targeted interventions that optimize their effectiveness, not only in the economic sphere, but also to build their intrinsic capacities to navigate the often significant sociocultural challenges that they face.

This study is the first to systematically test an intervention targeted at fostering individual agency within the context of a clean energy intervention. Using a randomized trial design, we were able to establish that an agency-based empowerment training could lead to significant improvements in the capacity to sell ICSs in this population of Kenyan entrepreneurs. While both men and women benefitted from this training, the greatest strides were seen for women. This enhanced individual agency not only led to greater overall sales, but also continued desire to pursue ICS sales despite limited success.

From this research, we demonstrate that women can effectively become engaged as ICS entrepreneurs and may be preferred candidates for this type of work. This is in line with the work of Batliwala and Reddy (1996) and Sarin (1984) that argues that women are ideally suited as energy entrepreneurs as they better understand the needs of other women and can more easily approach their clients.

This study introduces a novel approach to health communication that uses an agency-based focus that allows individuals the opportunity to delve into what is important to them and their desires for their own lives. Because the agency-based training is internally focused, individuals are able to find meaning and associations that are relevant to them and potentially facilitate positive behaviors (Shankar et al., 2015). This agency-based approach has significant implications for the scaling of clean cooking solutions as it provides a tool to enhance an individual's overall capacity to function in new endeavors. In most regions where energy poverty is high, women can, if properly trained, successfully engage within the energy sector, enhance their own economic condition, and promote an important social innovation within their community. Moreover, the enhanced agency directly fostered through this process has potentially a wide range of benefits for the individual, their family and their community.

There are several limitations of this study. We found significant drop out in participation over time. Qualitative data from the follow-up meetings indicate that this may be due to an expectation that participation would result in the provision of free goods or other materials, as this was a program of a charitable nongovernmental organization. In addition, there was a lag in the development of strong field support systems, especially in the rural areas where the last mile terrain travel was difficult. This also led to limited ongoing support for the newly trained entrepreneurs. Last, although there was a significant improvement in sales towards the end of the study, overall sales performance was low. Qualitative data from the ongoing support meetings indicated that entrepreneurs felt additional skills would build their competency, especially more integrated business and leadership skills. With support of the Global Alliance for Clean Cookstoves, current efforts are underway to develop an agency-based training curriculum that combines additional core competencies of gender sensitive business training and leadership skill building.

Women's individual agency is crucial for development as it enhances one's capacity to navigate the psychological, sociocultural, and structural challenges that are faced on a daily basis. It is important that efforts move beyond the need to examine empowerment as a potential byproduct of improved access to clean energy solutions and move towards the opportunity to amplify women's roles, agency, and voice in this sector. Without direct and active involvement of women, it is unlikely that we will reach our goals to advance access to and consistent adoption of clean cooking solutions.

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