Health awareness and the transition towards clean cooking fuels: A case study of LPG use in Rajasthan, India

Summary of main findings

Martina Zahno[1], Katharina Michaelowa[1], Purnamita Dasgupta[2], and Ishita Sachdeva[3]
[1]University of Zurich, [2]Institute of Economic Growth Delhi, [3]Delhi University

1 Motivation and study goals

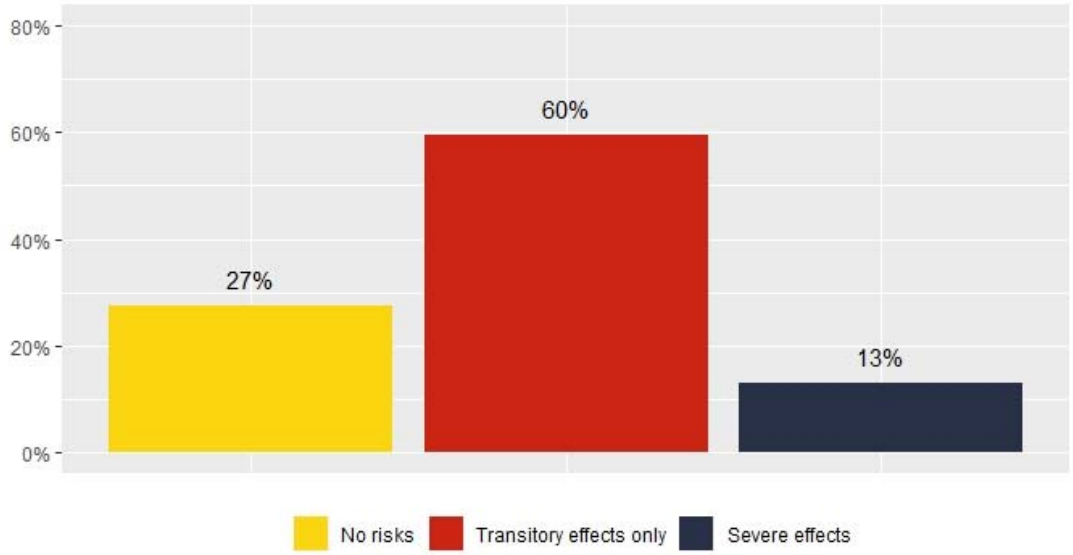
The use of solid biomass for cooking causes high emissions of aerosol and gaseous pollutants evoking serious adverse impacts on human health. According to the World Health Organization, globally approximately 4 million people die every year due to the use of solid cooking fuels, about one million of them in India alone. The government of India (GoI) is promoting the use of LPG to reduce the health burden from indoor air pollution. Through the Pradhan Mantri Ujjwala Yojana (PMUY), the GoI aims to improve access to LPG for low-income households by providing LPG connections essentially for free. As a result, the number of households with an LPG connection has increased by more than 40 million since 2016. However, so far, the actual LPG consumption has been growing at a lower rate than the huge increase in connections would suggest, since many households continue to rely on solid biomass for a major part of their cooking.

Serious lack of awareness about health-risks related to traditional cooking

As expected based on initial qualitative interviews our study confirms that households are not aware of the important health benefits of LPG: health hazards of traditional cooking are typically considered as transitory and simply a matter of getting used to the discomfort from irritants such as watering eyes and cough. In our survey in rural Rajasthan, only 13% of all respondents were aware of any relevant health effects, while 60% believed that there were just some minor transitory effects, and 27% were of the opinion that there were no health effects at all (see Figure 1). The serious lack of information was confirmed when asking about specific illnesses such as, e.g., pneumonia, strokes, cataract or delayed child development. When confronted with the relevant evidence from the scientific literature, households' reactions ranged from being genuinely surprised to feeling upset.

Given this serious lack of knowledge, our study examines whether health information may change the households' preferences towards a greater valuation of LPG. This, in turn, should find its reflection in a more regular consumption of LPG.

Figure 1: Health-risks awareness related to cooking with solid biomass [% of respondents]



2 Study design and research questions

Our evidence is based on an experiment embedded in a household survey in the rural communities of Bikaner district (Rajasthan). The sample includes 550 respondents from 55 villages who received an LPG connection under the PMUY programme, but remained irregular users. The treatment consisted of health information related to the serious illnesses that cooking with traditional biomass can imply. In contrast, the control group received some general information on LPG. Information was conveyed through verbal communication with the help of picture cards. Apart from the health information treatment, our survey covered general household characteristics, energy use patterns and questions related to health knowledge. For both treatment and control groups, we assess the following questions:

1. *What is the necessary financial compensation to induce the household to double its LPG consumption at given prices?*

This compensation is measured based on the household's willingness to pay (WTP) for an additional LPG cylinder. We assessed this WTP through an auction mechanism that enabled the respondent to obtain a voucher with a price discount if his or her bid was sufficiently high. A specific deadline for the use of the voucher was set as to ensure that households could make use of the voucher only if they increased their current LPG consumption by 100%. Given this deadline for the validity of the voucher, we can examine a second question reflecting actual behavioural change:

2. *Do households use the price-reducing vouchers to purchase of a refill before the given deadline?*

The use of the voucher implies that the household truly consumed the remaining LPG in the initial cylinder more quickly than usual, and that the incentive of the discount on the next cylinder was sufficiently strong to trigger this behavioural change.

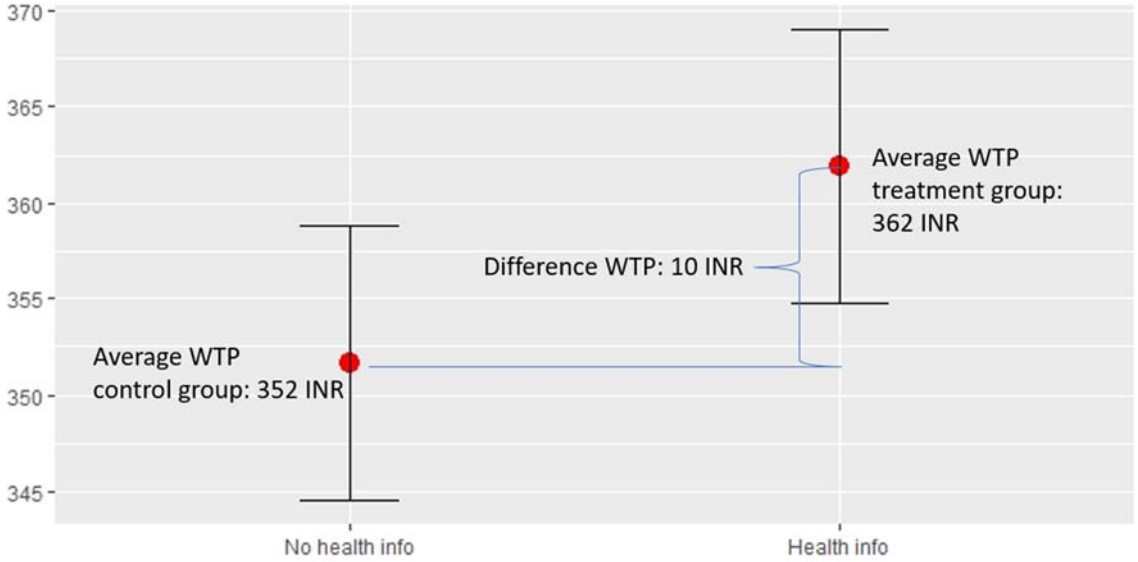
The main interest of the study is to examine how the answer to both of the above questions is affected by the information on the health aspects of cooking with solid biomass (i.e. by our health information treatment).

3 Main findings

Effect on willingness to pay

When asked to consume LPG twice as quickly as they would under normal circumstances, the average household in our sample reveals a WTP of 357 INR for a new cylinder. Put differently, these households require an average discount of 123 INR on the already subsidized price of 480 INR in order to change their behaviour. For households that receive the health information, the discount required is on average 10 INR less than for other households. Figure 2 presents the same information in terms of the difference in the willingness to pay.

Figure 2: Willingness to pay by experimental group [in INR]



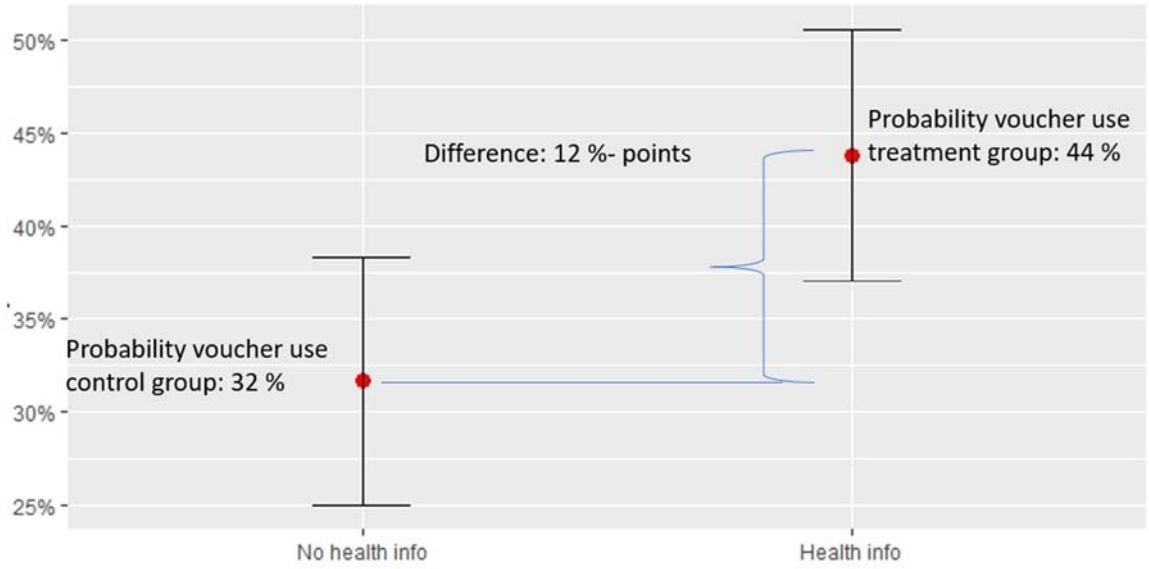
Notes: Group means and error-bars depicting 90 % confidence intervals for predicted means. The treatment effect (point estimate=10 INR) is significant at the 10% level (p= 0.065) (not shown). For female respondents alone, the effect is somewhat stronger (14 INR) and significant at the 5% level (p=0.013).

The difference between WTP with and without the health information treatment is statistically significant. It is driven by the reaction of female respondents, for whom the effect is much stronger than for men. The overall difference of 10 INR between households with and without the health information may appear small. However, the amount has to be put in perspective given the low income of the respondents in our sample (median monthly expenditure is 6000 INR). In fact, given the brevity of the information (usually less than 5 minutes) and the lack of familiarity with the enumerator who delivered the information, the small effect we find is already quite remarkable. We may expect much stronger effects if the information was more intense or repeated, or delivered, e.g., by a trusted health worker.

Effect on voucher use

Through a monitoring of voucher use, we are able to track whether the health information leads to real behavioural change. The use within the stipulated date is an indirect proof of an increase in LPG consumption and confirms that the household is willing to buy a new cylinder at the discounted price. Figure 3 presents a comparison of the probability of use of vouchers by households who received the health information vis-à-vis those that did not receive it. The analysis is based on 279 vouchers handed out to the households.

Figure 3: Probability of voucher use by experimental group [in %]



Note: Predicted group means and error-bars depicting 90 % confidence intervals for predicted means. The treatment effect (point estimate=12 percentage points) is significant at the 5% level (p= 0.037) (not shown).

We find that health information increases the probability to make use of the voucher. The effect is statistically significant and strong. For households receiving the heath information the probability to use the voucher increases by 12 percentage points, from 32% to 44%. The estimated increase is even higher (21 percentage points) when household differences in income and wealth are taken into account. Given the very brief information we provide, and the gap between the time when the information is provided and the date by which the voucher is used, this strong treatment effect is truly remarkable.

In contrast to the gender-specific effect observed for WTP, the probability to use the voucher—and hence actual behavioural change—do not depend on the gender of the household member receiving the health information. If at all, the effect appears to be stronger for men.

4 Additional results

Effect on health-knowledge

So far, it was implicitly understood that the effects shown above resulted from the increased knowledge about the serious health hazards associated with traditional cooking. When testing this based on the information from our survey, we find that indeed, households obtaining the health information report much more frequently to be aware of serious adverse health effects (48% versus 13% in the control group). In addition, the share of correctly identified smoke-related illnesses rises by about 16 percentage points. Overall, we thus observe a clearly positive effect on health knowledge itself.

At the same time, there is substantial scope for further improvement if concrete health information is incorporated in more intensive information campaigns. As highlighted above, this can in turn be expected to further strengthen the positive effects on household preferences and on the actual increase in the consumption of LPG.

Other constraints to regular LPG use

While this study focuses on the effect of health information, our survey also covered other potential constraints to LPG use. When directly asked about reasons for their irregular use of LPG, 77% of the respondents mentioned the cost of the refill as the main barrier. In contrast, none of the other factors we suggested was considered as the main barrier by more than 6% of the respondents. These other factors include transport cost, the distance to the supplier, safety concerns or the taste of food. This suggests that among the rural poor addressed by the PMUY, refill cost indeed dominates all these other concerns.

For the poor PMUY beneficiaries, not only the connection, but also the purchase of each and every cylinder constitutes a major investment. The low WTP measure we obtain on average confirms this result. As explained above, the price a typical household in our sample is ready to pay for a new cylinder within a short time horizon obliging it to consume LPG more regularly is below 360 INR, i.e., substantially below the subsidised price of 480 INR. The problem is reinforced by the fact that a large majority of the sample households took up the government provided loan for the stove and the first cylinder, for which repayment tranches are added on initial refill cost. In addition, respondents were often unaware of the subsidy, possibly because it is paid directly to their bank account.

5 Policy implications

Our study leads to the following main conclusions:

First, health information matters. As current knowledge is extremely limited, there is a huge scope for improvement. However, the information has to refer to the concrete, serious health hazards, rather than just presenting LPG as a 'clean' fuel. The important misconception of health problems as only transitory (and thus not really alarming) needs to be addressed.

Second, behavioural change as measured by an actual increase in LPG consumption cannot be enhanced by focusing the health information specifically on women. The reason may be that men are mostly responsible for the purchase of expensive goods such as LPG cylinders. Hence, targeting women alone may not be a good strategy, although they show a stronger immediate reaction to the health information provided to them (as evidenced by their stronger increase in WTP).

Third, complementary support for investment in refills will remain important since it is improbable that even a broad-scale and highly convincing health information campaign will bridge the entire gap that currently exists between households' willingness to pay and the cost of a new cylinder.

This support can possibly take different forms. One option is to continue with targeted subsidies, and to even increase them to further reduce investment cost for poor households. It is also important that households are aware of existing subsidies and understand the pricing policy. In addition, an initial reduction of the cost for refills with only a slow and gradual price increase might be helpful for the adjustment to the new expense pattern. This may be even more relevant for those PMUY beneficiaries whose loan repayment for the stove and the first cylinder is currently added to the cost of the following refills.

Another option could be to move from the standard 14.2 kg cylinder to a smaller 5 kg cylinder, which is currently not regularly available. This will be helpful in particular for those households, for which the large investment per cylinder rather than overall cost are the main barrier to regular consumption. Even now, some households spend more on solid biomass than they would spend on LPG, in which case the overall cost is obviously not the problem. In such cases, smaller cylinders sold at a proportionately lower price would provide an appropriate solution. While distance to the supplier and transportation cost have been a lesser concern in our sampling region, wherever these problems appear, smaller—and hence more easily movable—cylinders could also be a helpful solution.

We are aware that the government is already exploring some of these options. Our study lends encouragement to these developments and provides evidence-based suggestions for further complementary policy measures.

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