

Environment and public health: Urgent need to focus on Household Air Pollution

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1 Background

The problem of air pollution and its adverse impact on public health is now part of the accepted discourse in India. However, this discourse and understanding is predominantly driven by the abysmal air quality of Delhi and the dubious honour of Indian cities repeatedly topping global air pollution charts. This has led the bulk of the conversation to be primarily about ambient air pollution (AAP) in urban areas, leading to solutions to deal with emissions from transport, crop burning, road dust, burning of waste and industries. While this attention is welcome, it still leaves out the single largest source of health impacts arising out of air pollution, namely household air pollution (HAP). HAP arising from the burning of solid fuels such as firewood and dung-cakes, mainly for cooking, result in emissions of fine particulate matter and forms by far the single largest source of air pollution and associated health hazards in the country.

A 2015 report¹ of the Steering Committee on Air Pollution and Health Related Issues constituted by the Ministry of Health and Family Welfare (MoHFW) states that HAP by itself contributed to about 10 lakh deaths in 2010 and is the second biggest health risk factor in India (in comparison, AAP was seventh). HAP has a strong and quantifiable link to Ischemic Heart Disease, Chronic Obstructive Pulmonary Disorder, Lower Respiratory Infection and Stroke, four of the top five causes of mortality and morbidity in India according to a 2017 study² by the Indian Council of Medical Research on disease burden in India. In addition to its direct health impacts, there is sufficient evidence to suggest that the largest single cause of AAP is actually HAP. A 2018 study³ by the reputed Health Effects Institute, found that of the 11 lakh deaths attributable to AAP in 2015 in India, as many as 2.6 lakh were due to HAP. Note that these are in addition to those directly caused by HAP. The report⁴ of the MoHFW's Steering Committee on Air Pollution and Health Related Issues similarly concluded that about 26% of particulate matter AAP was actually due to combustion of solid fuels in households.

Thus, the total health impacts attributable to HAP – directly and through its contribution to AAP – are more than half the total health impacts attributable to air pollution. Therefore, there is a strong case to be made for tackling HAP on a war footing. This requires enabling households to shift completely from solid cooking fuels to modern fuels that burn cleanly, such as LPG, PNG, electricity or biogas. 'Improved cook stoves', which India has pursued for many years, can also be a part of the solution provided their

¹ Report of the Steering Committee on Air Pollution and Health Related Issues, August 2015, available at https://main.mohfw.gov.in/sites/default/files/5412023661450432724_0.pdf (accessed April 15, 2020).

² "India: Health of the Nation's States", 2017 available at https://www.icmr.nic.in/sites/default/files/reports/2017_India_State_Level_Disease_Burden_Initiative_Full_Report.pdf (accessed April 15, 2020).

³ "Burden of Disease attributable to Major Air pollution sources in India", January 2018 available at https://www.healtheffects.org/system/files/GBD-MAPS-SpecRep21-India-revised_0.pdf (accessed April 15, 2020).

⁴ See footnote 1.

combustion emissions are as low as emissions from LPG or biogas stoves. Studies show that interventions to address this challenge are highly cost-effective using standard measures of cost-effectiveness in the health literature⁵, and hence well worth pursuing.

In an attempt to address this, the government launched the Pradhan Mantri Ujjwala Yojana (PMUY) in 2016 to disburse 8 crore free LPG connections to poor households. However, in spite of successfully providing these connections, adoption of LPG as the cooking fuel of choice, has been a challenge, particularly in rural areas. More than half the households in rural India primarily depended on solid fuels for their cooking as of December 2018 according to a report⁶ published by the Ministry of Statistics and Programme Implementation. As against the requirement of 7.5 to 9 LPG refills a year for a typical Indian household, in 2017-18, an average PMUY household consumed only 3.4 refills and an average rural household consumed only 5.5 refills. Moreover, the average LPG consumption per household decreased between 2016-17 and 2017-18 for all consumer types. This indicates that many households are using LPG only for part of their cooking (called fuel stacking) and continue to rely significantly on solid fuels. The ongoing pandemic brought upon by the nCovid19 virus is only likely to make the situation worse. The resultant economic slowdown, job losses and impoverishment are likely to push households back towards solid fuels given the costs involved in using LPG.

Having increased access to cooking options such as LPG and electricity, India now needs to shift its attention to ensuring sustained use of such technologies, which requires a different set of interventions. Only then can the severe problem of HAP and attendant impacts on health be addressed. In this note, we provide some concrete suggestions in this regard. Since LPG is likely to be the modern fuel that is most used, many of our suggestions are LPG-related, though we do provide some suggestions regarding options such as electricity and biogas.

2 The barriers to sustained use of modern fuels

We identify three broad types of barriers that need to be overcome in order to enable sustained use of modern fuels by PMUY and other poor consumers:

- **Affordability:** Poor households who are recipients of LPG connections at concessional rates under PMUY often find it difficult to afford LPG refills even at subsidised prices. This is also true of other modern alternatives such as biogas or electricity. Non-clean alternatives such as agricultural residue and firewood might be cheaper than subsidised LPG in many parts of the country.
- **Availability:** Even with connections and the ability to pay, obtaining LPG refills may not be straightforward in rural areas, as LPG distributors may be far away and not provide home delivery. Further, rural LPG distributors may not have a viable business model, affecting their ability to serve rural consumers. Similar challenges exist with respect to biogas and electricity.

⁵ See <http://www.prayaspune.org/peg/publications/item/376.html> for details.

⁶ "Drinking water, sanitation, hygiene and housing condition in India", NSS 76th round, available at http://www.mospi.gov.in/sites/default/files/publication_reports/Report_584_final_0.pdf (accessed April 15, 2020).

- **Social and behavioural barriers:** Sustained uptake of modern options could also be hindered by taste preference for food cooked on traditional chulhas, perceptions regarding safety, gendered division of responsibilities, low value assigned to time and labour of women and girls, intra-household decision-making practices and current cooking habits.

In the rest of this note, we address each of these barriers and provide some suggestions.

3 The affordability barrier

In this section, we provide a set of suggestions to overcome the affordability barrier to sustained use of modern fuels for cooking, with a focus on LPG.

Idea 1: Phase out the loan scheme under PMUY and provide double bottle connections

Nearly 75% of PMUY connections were availed under a loan scheme, wherein an interest free loan of about ₹1500-1600 per connection is provided to the consumer to offset the cost of the stove and first refill. This amount is recovered from the subsidy due from subsequent refill purchases, which means that such consumers have to pay the unsubsidised LPG price for about 7-8 refills. This could be a major dampener to the uptake of refills among many PMUY beneficiaries. Therefore, we suggest that the government take over the pending dues against existing loans of PMUY consumers, making them eligible for subsidised LPG purchase. Similarly, the outlay for any remaining PMUY connections should be increased to cover the cost of the stove and first refill, and the loan scheme should be withdrawn. Such a move could encourage refill purchases by PMUY consumers. The budgetary outlay for this would only be about ₹8,500 crore but with a potentially significant upside to combating HAP.

In addition, PMUY consumers should be provided with free double bottle connections, where the second bottle can be a smaller 5 kg cylinder. Since households in rural areas may have to wait for a few days to get a refill, availability of a smaller, affordable second cylinder would enable them to continue using LPG in between getting refills of the larger cylinder.

Idea 2: Provide increased but tapering subsidy to PMUY and poor consumers

Paying even the subsidised price of LPG – about ₹500 per refill – may be a challenge for many rural households that could require a refill roughly every 40 days. Therefore, an increased but tapering subsidy targeted only at PMUY and other poor consumers for 9 cylinders⁷ a year is proposed to encourage beneficiaries to adopt LPG on a sustained basis. This proposal is similar to a scheme being implemented by the Department of Forests, Government of Maharashtra since 2013 to incentivise forest-dwellers to shift to LPG. The subsidy can begin at high levels to encourage LPG adoption, and taper off across the years. It is expected that this will provide enough incentive to households to begin using LPG and once they see its benefits, they will continue using it at the subsidised price after a few years. Thus, the price paid by the targeted consumers can begin at, say, just ₹300 per refill and gradually increase over, say, four years to reach the current subsidised price of LPG. Our estimates suggest that

⁷ It is understood that all PMUY beneficiaries have received BIS branded stoves that are more efficient. In that case, the number of refills that are offered subsidy under this scheme may be reduced to 7 or 8 per year.

this would imply an additional subsidy of around ₹85 / month / household on average over four years. Providing this benefit to all 8 crore PMUY households would require about ₹33,000 crore over 4 years, or about ₹8,300 crore per year on average⁸.

Idea 3: Leverage digital technology to address cash flow challenges

Subsidy reimbursement to a consumer's bank account currently takes a few days and can be unreliable. This can have a major impact on the cash-flow of poor consumers, which would discourage them from purchasing LPG refills. To address this, the government can make advance subsidy payment to the OMCs based on sales estimates, which can be reconciled on, say, a quarterly basis. This will enable the OMCs to transfer subsidies immediately to consumer accounts as soon as a purchase is recorded on a point-of-sale machine, on lines similar to the Public Distribution System (PDS) for food grains.

The ideas presented above to address the affordability barrier require increased subsidy outgo on the part of the government. The following suggestions are aimed at reducing this burden through other measures.

Idea 4: Reduce the number of subsidised refills

A typical Indian household requires only about 9 refills annually to meet all its cooking requirements but is currently eligible for 12 subsidised refills a year. We propose that the number of refills eligible for subsidy is reduced to 9 per household per year, from the current 12. While there is no data available about how much of the LPG subsidy is used to support consumption between 9 to 12 refills per annum, if one assumes that about 5% of total LPG subsidy supports such consumption, it could save about ₹1,500 crore per year.

Idea 5: Expedite mandatory efficiency programme for LPG stoves

Currently, LPG stoves in India are only subject to voluntary efficiency standards, the least efficient of which specifies a thermal efficiency of 68%. This is about 13 percentage points better than the stoves available in the market. The government can expedite making the efficiency standards for LPG stoves mandatory, and promote rapid market transformation through schemes such as bulk procurement and replacement programmes for efficient stoves as was successfully done with LED lamps. If the average efficiency of stoves in use improves to even the lowest rated level (i.e. by 13 percentage points), it would lead to about 19% saving in LPG consumption, and therefore a reduction in subsidy requirement, energy import dependence and GHG emissions. This will also open the possibility for further reduction in eligibility of subsidised refills per year to, say, 7 or 8 refills per year.

Idea 6: Shrink the pool of subsidised consumers

As of 2017, 87% of LPG consumers were eligible to receive subsidy, indicating that there is significant room to reduce the pool of those receiving LPG subsidy even after voluntary schemes such as 'Give it

⁸ The additional subsidy amount in this example is just 8% of the revenue foregone by the government in the year 2018-19, which was about ₹1,08,000 crore.

up'. It is suggested to shift to an opt-in system for subsidies rather than opt-out, wherein LPG consumers who are not in receipt of subsidies under other programmes such as PDS and MNREGA, and who do not hold BPL and Antyodaya cards can automatically be excluded from receiving LPG subsidy. Since many undeserving households may also hold such cards, other exclusion criteria based on asset ownership can be considered to further identify and exclude households that do not deserve subsidy. In order to ensure that this does not exclude any household that truly deserves the benefit, additional well-defined criteria based on other deprivations can be identified, based on which households can avail subsidy even if they are excluded through the automatic process. Introduction of this scheme should be preceded by an extensive information campaign to avoid inconvenience to those who genuinely deserve subsidy, and it can be gradually introduced after extensive piloting.

Idea 7: Develop viable business models for biogas

The government should consider undertaking pilot studies and experiments to explore different approaches to biogas in rural India, to identify viable and scalable business models. These could begin in cattle-rich areas with suitable agro-climatic conditions, and the approaches could revolve around household-sized plants, community-sized plants, bottled biogas supply, monetising the sludge by-product and so on. Identifying such options would provide a useful alternative to depending on LPG as the sole modern cooking option in rural India. To operationalise this, the Union Government should allocate ₹3,000 crore over the next three years for various pilots under a PPP model (with developers, SHGs, cooperatives etc.) to understand barriers to adoption of biogas and to address scalability issues.

4 The availability barrier

Quality of Supply and Service (QoS) is a critical element to ensure that LPG or other modern cooking fuels are available on a reliable basis to consumers. In the LPG segment, this involves addressing QoS challenges regarding LPG distributors and the public sector Oil Marketing Companies (OMCs). Some suggestions in this regard are provided below.

Idea 8: Enhancing accountability of OMCs

While there are some guidelines (termed as the LPG Marketing Discipline Guidelines, or LPG-MDG) governing the accountability of LPG distributors, there are currently hardly any mechanisms to hold OMCs accountable. Further, the existing guidelines are ambiguously worded, difficult to implement given current realities and do not place the consumer at the centre of assessing and critiquing QoS. Therefore, it is suggested that

- A model Distributor Agreement and LPG-MDG should be developed with fair terms for both the OMC and distributor, and with well-defined Standards of Supply and Service along with provisions for penalties to be levied on OMCs and distributors for failing to provide desired levels of QoS.
- The OMCs need to be much more transparent regarding their actual service quality. They should begin by regularly publishing the performance of various agencies in the LPG value chain on some key performance indicators.

- Periodic, independent, third-party service delivery audits should be conducted and made publicly available.

Idea 9: Enhancing viability of rural distributors

Rural LPG distribution is a difficult business given the limited paying ability of rural consumers and greater cost to service them, as they are dispersed over a wider area. In order to make rural LPG distribution viable, which in turn will help improve quality of service to rural consumers, it is suggested that they be permitted to undertake some other businesses from the same premises as long as they are not in conflict with the LPG distribution business and do not pose any safety threat. Examples include providing services for phone recharging, digital services and so on.

An alternative and longer-term approach could be for the public sector OMCs to take over rural distributorships, with some help from the government. This will enable OMCs to directly cater to the service needs of rural consumers, and also make them responsible for the QoSS of such consumers. It will also make administering of schemes such as enhanced subsidy (Idea 2) easier. As many new distributorships have to be opened in rural areas, OMCs can begin by operating those and can also gradually take over existing rural distributorships that the incumbent distributor is willing to transfer to the OMC.

Idea 10: Independent regulator for LPG

The LPG sector is currently not governed by an independent regulator, but is regulated by the government which is also the owner of the OMCs providing the service. An independent regulator can help by developing good standards for service quality and ensuring their adherence, in addition to regulating other aspects such as pricing and fairness of distribution agreements. The downstream petroleum sector already has a regulator, namely the Petroleum and Natural Gas Regulatory Board (PNGRB). PNGRB can easily be mandated to regulate the LPG sector and improve its QoSS by notifying domestic LPG as petroleum product to be regulated, or by suitably amending the PNGRB Act. Needless to say, PNGRB should also be appropriately staffed and empowered to help it fulfil this role.

Idea 11: Monitoring QoSS and tariff innovations for electricity

Electricity-based cooking on induction stoves is highly efficient. Moreover, recent investments in grid expansion and household electrification have also made it more likely that electricity is more accessible to all. However, going forward, electricity distribution companies (DISCOMs) will find it challenging to ensure reliable, affordable power supply to households, particularly in rural areas, due to increasing costs and migration of cross-subsiding consumers to alternative supply options. This could lead to a vicious cycle of neglect of QoSS to rural, poor consumers, poor revenue collection and increased theft. Therefore, to enable effective functioning of DISCOMs, especially in rural areas, there is a need to rethink current tariff design, increase the role of state government subsidies and ensure greater accountability for QoSS to small and poor consumers. While these are related to larger reforms needed in the electricity sector, some initiatives to specifically encourage electricity-based cooking include:

- National level programme for bulk procurement and supply of low-cost, energy efficient induction stoves
- Concessional or subsidised tariffs to all consumers who are electrically poor and not just BPL cardholders, based on annual (rather than monthly) consumption limits of, say, 1200 units per year
- Pilots to test scalability and affordability of rooftop solar based electric cook stoves in remote areas
- Load research studies to understand impact of electric cooking on peak demand

5 The social and behavioural barrier

This barrier is relatively less well understood compared to others, and hence more research is needed to understand the behaviours and socio-cultural barriers that prevent uptake of modern fuels. Investment in such research would help determine adequate policy action to ensure that sustained government efforts to transition to modern cooking fuels bear fruit. Based on the research, context-specific strategies can be deployed. India and its public health systems have had successful experiences in driving such behavioural change. Examples include the change to wide-spread use of vaccination, condoms and institutionalised delivery. Therefore, the expertise and experience of the country's public health system, spearheaded by the MoHFW, should be leveraged as part of this exercise.

Switching from solid fuels to modern fuels is a complex process which is influenced by economic as well as socio-cultural aspects. The affordability and availability related interventions are likely to succeed if paralleled with interventions to address user and community needs and perceptions. Evidence from other countries indicates that this has to go beyond health risk communication, and needs to take into account the motivation and capabilities of households and opportunities (or lack of it) offered by the immediate context. Given the socio-cultural diversity in India, there cannot be a 'one size fits all' intervention, but a 'bottom-up approach' that engages and enables households and communities is required. We propose the following in this regard.

- Improve our understanding on levels of sustained use of modern fuels by incorporating relevant indicators to capture levels of stacking in national surveys such as the National Family Health Survey.
- Generate evidence, through action research, on demand side factors and decision-making processes that influence sustained use of modern fuels.
- Improve our understanding on ways to enable communities and facilitate community level action, by identifying district level mechanisms to facilitate dialogue between community stakeholders, domain experts and government functionaries. The MoHFW can facilitate this.

The provision of modern cooking fuels and solutions should not be seen as a programme of only the Ministry of Petroleum and Natural Gas, or the Ministry of Power, but should also include, for example, the MoHFW, the Ministry of Women and Child Development, the Ministry of Rural Development and the Ministry of Human Resources Development⁹, in order to be able to deal with 'demand side' issues such as social, cultural and behavioural barriers. It is suggested that a national level programme/mission, on

⁹ Data suggests that the LPG coverage and usage in the mid-day meal program is far from adequate, with the figures in 2018-19 being 67% for institutions that provided mid-day meals and 4% for those covered by central kitchens.

the lines of Swachch Bharat Abhiyan, which involves multiple ministries and agencies, be developed to promote and accelerate the shift to clean-burning cooking fuels.

6 Conclusions

Usage of solid fuels for cooking in households leads to significant household air pollution, which is one of the largest causes of mortality and morbidity in India according to many studies. Moreover, these mortality and morbidity impacts primarily fall upon women and young children. Therefore, any attempt to address the public health implications of the environmental pollution and climate change must include addressing this challenge of shifting away from solid fuels to clean-burning modern fuels.

In this note, we have provided many suggestions about how various barriers to sustained adoption of such clean-burning fuels can be overcome. Many of these pertain specifically to LPG as a cooking fuel, because it is the most preferred modern fuel in the country and is backed by a large government programme. Some suggestions have also been provided regarding fuels such as electricity and biogas, and regarding the demand side aspects of sustained use of modern fuels. We believe that adopting such ideas will go a long way in addressing one of India's most serious environmental health challenges.

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