



# Better kitchens and toilets: both needed for better health

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## Abstract

Both poor water, sanitation, hygiene (WaSH) and household air pollution (HAP) adversely affect the health of millions of people each year around the globe and specifically in developing countries. The objective of current work is to highlight the importance of HAP in parallel to WaSH for decision making to achieve better health specially in developing countries. There are examples, where developing countries are strengthening efforts to tackle the issue of poor water and sanitation such as ‘Clean India Mission’ was recently launched by the Government of India. However, there is lack of actions to address the issue related to HAP—to extend the coverage of clean fuel, efficient stoves and ventilated kitchens to the deprived population under the ‘Clean India Mission’. Most of the rural household and urban slums in developing countries have only a single room, where people cook and sleep. This leads them to exposure to toxic HAP, which can be minimized by developing country specific indoor air quality guidelines and action framework. Hence, there should be policies to provide them not only the subsidy for clean fuel but also to build properly ventilated kitchens along with the promotion of clean toilets and water supplies. There is a need to strengthen global efforts, to jointly address the challenges associated with the risks related to WaSH and HAP in order to efficiently reduce the global burden of disease. Further, this will also help to timely attain the sustainable development goals for better health and environment.

**Keywords** Water · Sanitation · Household air pollution · Liquefied petroleum gas · Fuel choice · Cookstoves

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**Capsule:** Mitigation of household air pollution demand integrated policy interventions to reduce the burden of disease and disability in developing countries, where it impacts the most.

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**Highlights** • Poor sanitation and household air pollution result in millions of annual premature deaths globally  
• Rural population in developing countries are more exposed to these toxic pollutants  
• India set an example by providing free LPG connections to deprived families  
• Monitoring and evaluation of the PMUY is needed to improve its efficacy and extent  
• Combined efforts are needed to efficiently reduce the disease and disabilities burden of HAP and WaSH

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## Introduction

Environmental factors have been associated with about 25% of the disease burden and premature mortality globally (Prüss-Üstün and Corvalán 2006). However, mortality and morbidity caused by diseases due to environmental factors vary between different age groups, genders and health care facilities in developed and developing regions. As per the recent estimate of Global Burden of Disease, air pollution alone stands at 1<sup>st</sup> rank as a major risk factor for premature death and disabilities in India, whereas unsafe water and poor sanitation is ranked 6<sup>th</sup> among major risk factors (IHME 2015). Unsafe drinking water, poor sanitation and hygiene are main attributes for diarrhoea having estimated 94% burden of disease due to environmental factors. Whereas household air pollution (HAP) due to burning of biomass for cooking is a major contributor for lower respiratory infections and a range of non-communicable diseases (NCDs). This indicates that these household-level environmental risks together kill millions of people each year around the world and are particularly important in developing countries.

## Results and discussion

A recent WHO report highlights that around 3 billion people still use solid biomass fuels for cooking and other purposes (WHO 2014). Further, it was estimated that HAP is responsible for 4.3 million premature deaths globally through air pollution exposure. Global Burden of Disease estimated that from the year 1990 to 2013, COPD remains at mean rank of eight in top 25 leading causes of global years lived with disability (YLDs) with a median percentage change of about 72% resulting in mean YLDs from 15,151,000 to 26,131,000 respectively for the year 1990 and 2013 (Vos et al. 2015).

Health implications are more serious in developing countries. For example, the WHO country profile identifies that HAP in India alone attributed approximately 1.2 million premature deaths and 42.5 million disability-adjusted life years (DALYs) for the year 2012 and had COPD as fifth contributor in top ten causes of YLDs in year 2013 (Fig. 1). Further, the relative risks of disease burden due to HAP are higher among the vulnerable population (women, children and elderly) in rural areas due to daily exposure during cooking using solid biomass fuels.

Similarly for WaSH—another ancient household risk—the recent estimate for 2015 shows that around 2.4 billion of world population still lacks the improved sanitation facilities (UNICEF-WHO 2015). This report also highlights that one out of eight people worldwide still defecate in the open. The situation is worse in developing countries, for example, in India there is only moderate progress in use of sanitation facilities from 1990 to 2015. Further, in 2015, 44% of the Indian population defecated in the open—10% of urban and 61% of rural population (Ravindra and Mor 2013; UNICEF-WHO 2015). The United Nation Sustainable Development Goals (SDGs) number 6 targets equitable access to safe drinking water and sanitation for all; whereas, Goal 7 also aims to provide universal access to modern energy including improved and efficient products, e.g. improved cookstoves and clean fuels (UN SDG 2015).

Further, the health impact of poor WaSH and HAP is worst in densely populated countries like India as depicted in Table 1. Around 67% of the Indian population living in the rural areas still lack proper WaSH and HAP conditions. Indeed, they are in dire need of improved sanitation facilities, affordable clean fuel and improved stoves. However, there are efforts by both international organisations and by countries themselves to address the issue of WaSH, e.g. the Clean India Mission, but less attention has been paid to tackle the issue of HAP. Inclusion of HAP in the ‘Clean India Mission’ might help prevent millions of Indians from premature death and illness.

In January 2015, the Government of India launched the first of three schemes to promote LPG in poor populations (MoPNG 2015). These include PAHAL, i.e. to pay for subsidised fuel into people’s bank account (direct benefit transfer of LPG—DBTL), Give-it-Up (GIU), which focus on voluntarily giving the subsidy on LPG fuel by wealthy people and Pradhan Mantri Ujjwala Yojana (PMUY)—to provide free LPG to below poverty line families (Smith 2017a). These are the largest efforts made in any low- or middle-income country to address HAP as a health issue by accelerating the natural penetration of LPG into poor populations. However, many issues remain to be resolved such as reducing the natural tendency of households to maintain some usage of biomass during the initial years of LPG use. In addition, there is a clear need to conduct major monitoring and evaluation of the current programmes to help improve its efficacy and extend it even further into remaining poor populations.

Most rural households and urban slums in developing countries have a single room, where they cook and sleep; this makes them vulnerable to toxic HAP exposure (Sidhu et al. 2017). Further, HAP can also cause considerable anthropogenic climate impact on regional and global scales (Gurjar et al. 2016; Ravindra et al. 2015; Ravindra 2017). Bond et al. (2004) reported that household emissions could account up to 25% of total black carbon emissions (8 Tg/year). Hence, the use of clean fuel in household will not only help to mitigate the adverse impact of climate change but also to gain health benefits.

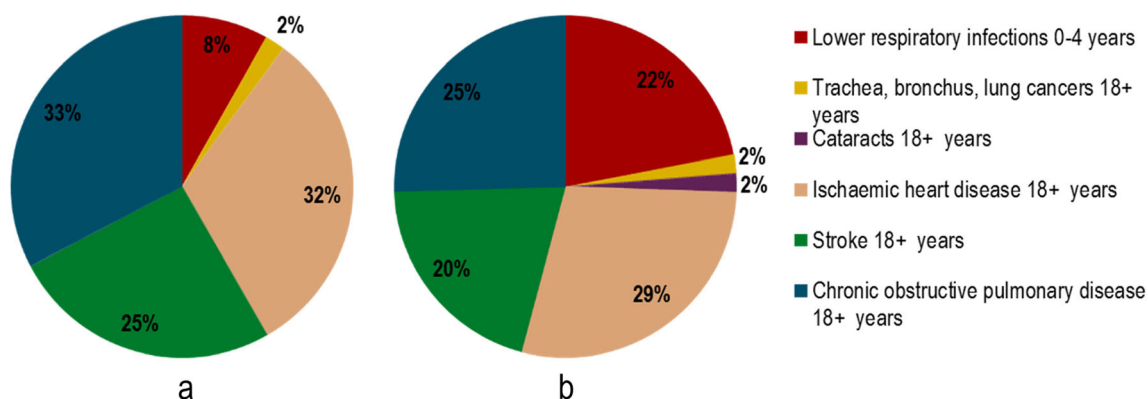


Fig. 1 Household air pollution attributable deaths (a) and disability-adjusted life years (b) in both sexes in India, 2012 (data source: WHO, 2014)

**Table 1** Comparison of global and India-specific trend of environmental burden of disease

Risk factors/year	Premature deaths/year × 1000				DALYs × 1000				Mean YLDs × 1000				% premature deaths age < 5 years			
	Global		India		Global		India		Global		India		Global		India	
	2000	2012	2000	2012	2000	2012	2000	2012	2000	2012	2000	2012	2000	2013	2000	2013
Water, sanitation and hygiene (diarrhoea)	2171	1498	801	587	160,723	99,727	50,028	29,771	7764	8468	1526	1594	13 <sup>a</sup>	9 <sup>a</sup>	15 <sup>a</sup>	10 <sup>a</sup>
Air pollution (COPD)	3059	3104	806	1062	89,422	92,376	26,674	33,170	24,493	30,749	6566	8470	17 <sup>a*</sup>	15 <sup>a*</sup>	18 <sup>a*</sup>	13 <sup>a*</sup>

Data source—WHO, 2015 (refer as 'a'); WHO, 2016

DALYs, disability-adjusted life years; YLDs, years lived with disability

\*Acute respiratory infections premature deaths

If the underprivileged population cannot afford to have clean fuel including fuel-efficient cookstoves, the Government should provide them targeted subsidy for LPG connections including cookstoves and graded subsidies for the fuel, based on income. Further, they should be provided with a properly built ventilated kitchen to reduce the exposure of harmful pollutants. It could be done as part of a programme that includes provision of sanitary toilets. Smith (2017b) highlighted that LPG subsidies are insufficient to move people away from biomass because it will take a long time to reach the poorest of the poor. Hence, there is a need to provide both built toilet and better kitchen with proper ventilation to the needy families, through the expansion of WaSH-related programmes. This will certainly help to reduce the burden of disease, specifically in Asia and Africa.

It is well known that, being NCDs (Fig. 1), most health impacts due to HAP take time to develop and also to reduce; whereas, being communicable, most WaSH health impacts are immediate and thus reduce quickly. This is one reason that WaSH remains in focus for policy makers but reduction in HAP lacks behind despite having equal or more premature deaths and DALYs. Hence, there is need to develop country specific indoor air quality (IAQ) guidelines and action framework, having special focus on HAP. Building properly ventilated kitchens for families also require policy intervention and can be supported through IAQ action framework. Further, looking at the disease burden of HAP, it should also be a priority for any sensitive government specifically in Asia and Africa to minimize adverse impact of HAP. Further, there is need to address the issue holistically by giving incentive for usage of kitchen or toilet, which also requires financial, informational and social support.

Both WaSH and HAP significantly contribute to disease burden and premature mortality in developing countries. Despite that, except for India, countries where biomass is prime fuel for cooking are currently lacking actions to seriously combat HAP beyond some efforts, for example in Nepal and Mexico, to promote improved biomass stoves. These, unfortunately, have not shown success in reducing HAP sufficiently to improve health for India. Even in India, WaSH has greater priority under the

Clean India Mission than HAP. Hence, it is becoming important for developing countries to use a combined approach to address the issue of WaSH and HAP. This will also help to achieve SDGs by the end of the next decade. The main aim of SDGs is to end poverty, protect the planet and ensure prosperity for all; the combined approach will help to achieve the SDG targets on time.

Traditionally, in India, the kitchen has been linked with cleanliness and hygiene. Linking WaSH with a clean kitchen and fuel will be a cost-effective approach such as when a survey is being conducted for eligible toilets, it can also have a component of type of kitchen and fuel uses. The approach of a clean kitchen should focus on proper ventilation in the kitchen and availability of clean fuel. For clean fuel (LPG), subsidy is already being provided under the PMUY scheme. Hence, there is only need to find a way to subsidise a clean kitchen and this can be done by bringing together several ministries (e.g. Ministry of Rural Development, Ministry of Drinking Water and Sanitation, Ministry of Housing and Urban Poverty Alleviation and Ministry of Petroleum and Natural Gas) to make a common pool of funds to promote WaSH and HAP jointly to achieve the goal of 'better health for all' including environmental sustainability.

### Conclusions

Considering the findings of recent Global Burden of Diseases (IHME 2015) and WHO reports on HAP, globally there should be more focus on policies including formulation of indoor air quality guidelines and other interventions to reduce the exposure of HAP. The aim of WaSH and HAP are better hygiene and sanitation and improved indoor air quality by adopting safe sanitation practices and using clean fuels, proper ventilation and other interventions. Hence, WaSH and HAP can be combined together for better efficiency in achieving better community services and health through a common pool of ministerial funding. This will ultimately reduce the burden of disease and disability in developing countries, where it impacts the most. Further, it will also be the right start to

achieve United Nation SDGs, which aim to end poverty, protect the environment and ensure prosperity for all by 2030.

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## Compliance with ethical standards

**Competing interests** The authors declare that they have no competing interests.

**Ethical approval** None as secondary data was analysed.

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