SANDEE
South Asian Network for Development and Environmental Economics

POLICY Brief

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Open Fires, Dirty Air and Respiratory Diseases – Examining Health Costs from Indoor Air Pollution in Nepal

A SANDEE report from Nepal looks at an environmental and social problem that has long plagued rural communities in the country – the health impact of indoor air pollution (IAP) caused by cooking fires. The study finds that, although most poor people accept indoor air pollution as a 'fact of life', it is, in truth, a very significant health problem, especially for women and children. The study also finds that relatively simple solutions such as improved cooking stoves (ICS) and the use of clean fuels such as biogas can reduce levels of indoor air pollution and significantly improve people's health.

An assessment of the costs and benefits of these solutions show that there is a very strong economic rationale for adopting them in preference to traditional fuels such as wood. Both biogas and improved cooking stoves provide benefits far in excess of their relatively small costs. It is clear that if rural health policy is to be effective, more work needs to be done to highlight the dangers of indoor air pollution and to promote the economic savings and health benefits that 'clean' cooking technology can bring.

INVESTIGATING INDOOR AIR POLLUTION

In Nepal, as in most low-income countries, the majority of people cook their food using biomass fuels. Fuel wood is the main cooking fuel of about 66 percent of households. Charcoal, dung and agricultural residues are also used, but to a lesser degree. Modern fuels are only used by a small number of households. Only about 13 percent of households use kerosene and only eight percent liquid petroleum gas (LPG). Less than two percent of households use biogas.

The health impact of the fuel choices that poor people make has been investigated by a number of researchers. However these studies often fail to take into account the fact that people will act to reduce health risks or to improve their health. This omission can skew or bias results. There is therefore a need for a more rigorous assessment of the problem. There has also been little analysis carried out in Nepal to investigate why the demand for (and take up of) cleaner fuels and stoves is relatively low amongst poorer households (For more information on the health impact of IAP see side bar).

THE AIR POLLUTION PROBLEM

Throughout the developing world, the poorest people still rely on biomass for household energy needs. Use of these fuels indoors in traditional cooking stoves or open fires can lead to levels of IAP many times higher than those allowed by international ambient air quality standards. This exposes poor women and children to a major public health hazard on a daily basis. The smoke from burning biomass contains a large number of pollutants, including particulate matter (PM), carbon monoxide (CO), nitrogen dioxide, formaldehyde, and polycyclic organic matter, such as benzoapyrene (which is a carcinogen).

Of the many pollutants, particulate matter (PM_{10}) and CO are of the most concern in kitchens that burn biomass. As the effect of CO is short lived and that of PM is cumulative, many studies (including this one) focus on the latter. In this study, PM_{10} monitoring was done using a Laser Dust Monitor (LD–1). The LD-1 measures the intensity of laser beam scattered by the dust particles of specific size.

Poor people generally decide to use biomass fuels for cooking because they are cheaper than some modern fuels and are generally easy to obtain. The fact that biomass fuels can be very bad for people's health is not generally understood. Most of the time, the rural poor do not readily attribute any illnesses to the type of stove they use or fuels they burn. They generally bear the discomforts of indoor air pollution as a 'fact of life'.

This policy brief is based on SANDEE working paper No. 34-08, 'Estimating health benefits when behaviors are endogenous: A case of indoor air pollution in rural Nepal' by Krishna Prasad Pant from the Center for Economic Development and Administration (CEDA), Tribhuvan University, Kathmandu, Nepal. The full report is available at www.sandeeonline.org

PROMOTING CLEANER COOKING

This study, which was carried out by Krishna Prasad Pant from the Center for Economic Development and Administration (CEDA) at Tribhuvan University, Kathmandu, aims to inform action on IAP. To do this, the study assesses the effects of indoor air pollution on respiratory health and looks at the overall costs and benefits of using cleaner cooking fuels and cleaner stoves. It takes into account the impact of an individual's health on the fuel choices that they make and investigates why poor households do not choose fuels and stoves that will reduce IAP and so improve their health.

Information for the study was obtained from a detailed survey of 600 rural households. These were selected from six Village Development Committees in the Syangja and Chitwan districts of Nepal. A wide range of information was collected using the household survey. This information included the type of stove and fuel households use, along with family details and information on household income. Information on household IAP was also collected from a sub-sample of 99 households. To do this, levels of particulate pollution (PM_{10}) in the kitchens of these households were measured during cooking hours and non-cooking hours.

CALCULATING COSTS

The household survey was also used to assess the prevalence of three key respiratory illnesses: chronic bronchitis, asthma and acute respiratory infection (ARI). (ARI is the single most important cause of mortality in children aged under five years.) Collecting information on health in rural areas of Nepal is problematic as many diseases go undiagnosed and untreated. This makes it difficult to assess the health of individuals or the population based on reports from health clinics. To get a picture of respiratory illness in the study area evidence visible was garnered 'symptoms' of on key respiratory diseases.

To calculate the economic impact of respiratory health problems on poor households, people were asked how much they had actually spent on medical and other associated costs. These costs included the costs of medicine, costs of diagnostic tests including X-ray and laboratory, fees charged by the doctors and hospitals and travel costs to and from the hospitals or health posts for treatment. The costs of additional dietary expenses resulting from illness were also recorded and assessed, as was the economic impact of the time that people took off from work due to illness caused by IAP.

POLLUTION LEVELS AND POTENTIAL SOLUTIONS

It is clear that rural people in Nepal, who have used solid fuels for generations, do not generally think of indoor smoke as a problem per se. But, the level of particulate matter pollution found inside kitchens in the study area is alarmingly high. The average PM_{10} level in households ranged from 2,393 to 4,209 $\mu g/m^3$ with a mean of 3,233 $\mu g/m^3$. In contrast, the World Health Organization standard for PM10 is 50 $\mu g/m^3$.

An analysis of the information obtained in the field shows that the level of indoor air pollution (IAP) is significantly reduced by the use of cleaner cooking stoves (the ICS) and biogas. It is also clear that their use significantly reduces the risk of respiratory problems. For example, the use of biogas is found to reduce the risk of chronic bronchitis by 0.014, asthma by 0.011 and ARI by 0.159. While the use of an ICS reduces the risk of chronic bronchitis by 0.092.

THE COST OF IAP

For the people in the survey, respiratory illness is a relatively costly problem. Using the information gathered on health costs, it is estimated that the cost of chronic bronchitis for households in rural area is about Rs 2,576 per annum. The household costs of asthma and ARI are Rs 2,121 and Rs 4,298 respectively. It should be noted that these estimates down play the health impact of IAP, as they do not include the cost of pain, suffering and mortality. Further research is therefore needed to get a true assessment of the impact of IAP on rural communities.

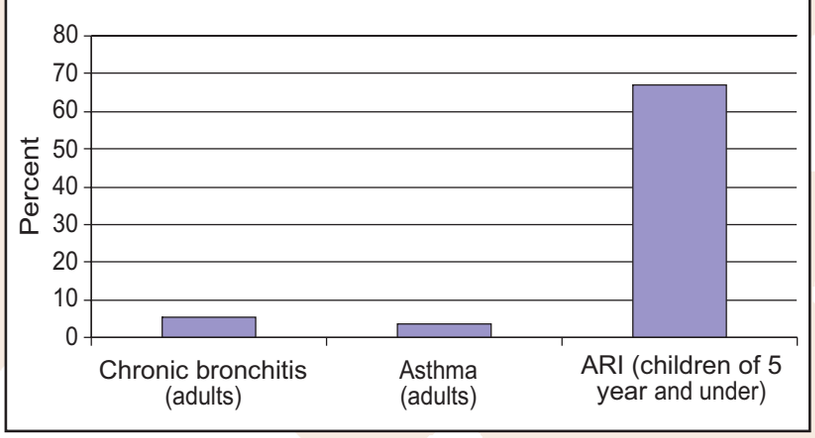
Using this study's health cost figures and the assessment of the health improvements that cleaner cooking techniques can bring, it is possible to estimate the annual reduction in household health costs that cleaner stoves and biogas can bring. These are Rs 1,217 and Rs 647 respectively.

ARE THE SOLUTIONS AFFORDABLE?

On the cost side, the average market price of cleaner stoves is Rs 605. Taking the average life of an ICS as 10 years, the annual depreciation for such a device is about Rs 60. *This shows that the annual health benefits from each ICS is, on average, 20 times higher than its annual costs*. However, this analysis does not take the energy efficiency benefits of each ICS into account. These energy benefits are direct and more visible to households and financers and give an additional reason for households to choose this cleaner technology.

Biogas is also found to be an economically viable solution. A typical biogas plant costs a household Rs 19,615. A biogas plant will have a reasonable life expectancy of 30 years. This gives an annual depreciation of Rs 654. *Thus the annual health benefit from a biogas plant is almost equal to its annual average costs.* Again, this does not take any energy efficiency benefits into account.

Fig 1: Percent of adults and children suffering from respiratory illnessess



SANDEE

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SANDEE's Policy Brief Series seek to inform a wide and general audience about research and policy findings from SANDEE studies.

Author
K. P. Pant
Editor
Rufus Bellamy
Series Editor
Priya Shyamsundar

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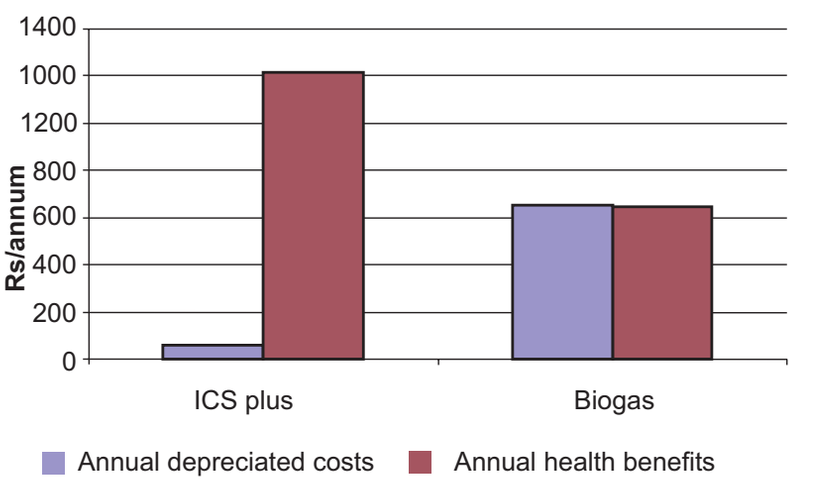
Fig 2: Health benefits and costs of interventions



PROMOTING CLEANER COOKING IS KEY

The comparison of annual health benefits and costs shows that it makes economic sense for rural people to invest in clean cooking technology such as biogas and ICS. The fact that many households do not do so already is most likely explained by the lack of information and guidance available. Because of this 'information gap' most rural people do not realize the health benefits that improved stove and biogas can provide. They are also not aware of how much respiratory illness is costing them and their families.

This means that the promotion of the improved stoves and biogas in the rural areas is vital and that this work will help to save rural people from respiratory health problems caused by indoor air pollution. Such promotion work will take resources and it is vital that this investment is well focused. Respiratory health problems affect older aged women the most. They will therefore need special attention from health workers. However, the overall push should be to get more households to adopt cleaner cooking technology by highlighting the multiple benefits that such technology can bring.

SANDEE | P.O.Box 8975 EPC-1056 | Kathmandu, Nepal
Tel: 977-1-552 8761, 552 6391 | Fax: 977-1-553 6786
E-mail: info@sandeeonline.org
Website: www.sandeeonline.org