



**Smoke in the Kitchen: Health impacts of indoor air  
pollution in developing countries**

**8 February, 2005, 9:30 am – 12:30 pm, New York**

*Seminar Proceedings*

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## **Executive Summary**

The United Nations Development Programme (UNDP), with support from the Intermediate Technology Development Group (ITDG), the United States Environmental Protection Agency (USEPA) and the World Health Organisation (WHO), hosted a seminar entitled "*Smoke in the Kitchen: Health impacts of indoor air pollution in developing countries*" on 8 February, 2005 in New York. According to the WHO, smoke from burning solid fuels is estimated to be responsible for 1.6 million deaths each year in the world's poorest countries. Indoor air pollution affects poor women and small children far more than any other sectors of society, killing almost 1 million children under five every year. Almost one half of the world's population still rely on solid fuels for their everyday cooking and heating; some 2.4 billion people burn biomass (wood, crop residues, charcoal and dung) and a further 0.6 billion burn coal.

The purpose of the seminar was to raise awareness among country governments and UN agencies on the health impacts of indoor air pollution from household energy use, and to promote global action to reduce people's exposure to this substantial environmental health risk. A number of public health and energy experts offered presentations during the seminar. This included leading experts from the WHO, University of California at Berkeley School of Public Health, Columbia University, USEPA and ITDG. Presentations from experts provided in-depth background on the subject, and offered strategic policies and tangible solutions to move forward towards action. Presentations were followed by interactive dialogue with seminar participants, during which a number of key barriers and concrete next steps were identified.

Suggested next steps included creating a standardised methodology to measure cost benefit analysis of investing in efforts to curb indoor air pollution. It was agreed that since indoor air pollution is an interdisciplinary and inter-sectoral issue, it is often difficult to determine which government ministries or departments should take responsibility for it within their institutional framework. Approaching the Finance Ministry directly with quantified impacts of addressing indoor air pollution is one way to alleviate this problem since the Finance Ministry determines allocation of resources.

It was determined that the 5-year review of progress since the Millennium Declaration will be an excellent forum in which to further underscore this important development issue. It should be made clear to the government delegates attending the event that a majority of the Millennium Development Goals will not be achieved without addressing indoor air pollution since this issue has broad poverty, income, gender, health and environmental implications. Therefore, scaling up of efforts to reduce solid fuel use should be seen as a means to achieving the Millennium Development Goals. Attempts should be made to mobilise the private sector by engaging a core group of large corporations and demonstrating the potential market size among affected populations by offering market data on their products. Improved access to microfinance was seen as a vital link to addressing indoor air pollution since many solutions to the problem include capital intensive technologies. Lastly, it was emphasized that although studies have been performed that quantify health effects of indoor air pollution in developing countries, the amount of data available is surprisingly low. Therefore, continued research would help to engage country governments and the development community on the issue.

## **Acknowledgements**

The seminar entitled “*Smoke in the Kitchen: Health impacts of indoor air pollution in developing countries*” was made possible by a number of generous and committed organisations and individuals, all of whom deserve our sincere gratitude. UNDP acknowledges the generous support of ITDG, USEPA and WHO, who provided travel costs for presenters. We would also like to thank Mr. Shoji Nishimoto, Assistant Administrator and Director, Bureau for Development Policy, UNDP, for his inspiring words that commenced the seminar, and the indoor air pollution experts who travelled to present their knowledge and expertise on this important subject.

## **Background**

According to the World Health Organisation, the smoke from burning solid fuels is estimated to be responsible for 1.6 million deaths each year in the world's poorest countries. Indoor air pollution affects poor women and small children far more than any other sectors of society, killing almost 1 million children under five every year.

Almost one half of the world's population still rely on solid fuels for their everyday cooking and heating; some 2.4 billion people burn biomass (wood, crop residues, charcoal and dung) and a further 0.6 billion burn coal. While biomass is considered a renewable fuel, the inefficient and unhealthy use of these solid fuels in the home is putting millions of the world's poorest families at risk. Particles from burning wood and charcoal make lungs vulnerable to acute lower respiratory infections, such as pneumonia and chronic obstructive pulmonary disease, and there is evidence linking indoor air pollution to asthma, tuberculosis, cataracts, low birth weight and infant mortality. Pollutants in coal smoke can cause lung cancer, arsenic poisoning and fluorosis.

Lack of access to clean and reliable cooking fuels further impacts the lives of women and children by constraining time for income generation or study due to long hours spent collecting fuel and the increased risk of burns. Rural women and their families pay a high economic price for keeping the fire burning. Up to three mornings a week are spent collecting fuel such as wood. This perpetual toil prevents poor rural women the opportunity to be more productive through paid work that would raise their family's income, improve the standard of living and enhance their nutritional and health status.

Providing access to clean, efficient and affordable cooking and heating fuels and technology will contribute to the achievement of Millennium Development Goals for poverty reduction, education, child health, gender equality, and environmental sustainability.

### *Broader United Nations context*

Indoor air pollution and related health issues are becoming significant topics of discussion at United Nations conferences. This seminar was intended to promote dialogue and impetus on this issue in view of the upcoming 13<sup>th</sup> Commission on Sustainable Development meeting, planned for 11 to 22 April 2005. Furthermore, the event provided context to a range of women's issues to be debated at the Beijing +10 meeting, part of the 49<sup>th</sup> Session on the Commission on the Status of Women planned for 28 February - 11 March, 2005. As discussed earlier, addressing the issue of indoor air pollution is fundamental to achieving the Millennium Development Goals. In September 2005, the UN Summit will review progress

since the 2000 Millennium Declaration, further underscoring the relevance of this timely seminar on indoor air pollution.

**Presentation Summaries** (full presentations available for download at <http://www.undp.org/energy>)

**Welcome remarks: Shoji Nishimoto, Assistant Administrator and Director, Bureau for Development Policy, UNDP**

Mr. Nishimoto began by thanking the organisations and individuals who made the event possible, and proceeded to briefly outline and introduce the issue of indoor air pollution in the context of global poverty alleviation and gender issues. He provided an introduction to UNDP's global energy activities, and contextualised the scale of deaths from indoor air pollution worldwide. Mr. Nishimoto offered the comparison that a similar number of people die from indoor air pollution every month as perished in the recent tsunami disaster that devastated parts of Asia and Africa. He concluded with a challenge to seminar participants to internalise the information presented during the seminar, and work towards incorporating policies within their organisations to promote the shared goal of eliminating preventable death and disease caused by indoor air pollution.

**Health Impacts of Indoor Air Pollution from Solid Fuels, Eva Rehfuss, Technical Advisor, World Health Organisation**

Ms. Rehfuss outlined the health effects from burning solid fuels by providing supporting data of pollution levels typically observed, and comparing them to standard acceptable levels of indoor air pollution by the US EPA. Whereas the US EPA considers 50 µg/m<sup>3</sup> the level above which exposure is considered dangerous, rural homes in developing countries often see levels of 1000+ µg/m<sup>3</sup>. She provided an overview of the impact of exposure to indoor air pollution on pneumonia, chronic obstructive pulmonary disease and lung cancer (in relation to coal use). There may also be links between solid fuel use and tuberculosis, cataracts, upper airway cancer, asthma, low birth weight, prenatal mortality, otitis media and cardiovascular disease. In addition to these direct effects, indirect effects were outlined including the risk of snake bites or violent attacks such as rape while women collect fuel wood. Evidence of indoor air pollution affecting children more adversely than others was offered, and the assertion was made that every year, nearly one million child deaths could be prevented, in particular in the poorest developing countries. She outlined clear links to the Millennium Development Goals in the categories of poverty, income, gender, health and environment. Lastly, Ms. Rehfuss provided an overview of WHO's role in documenting health effects, evaluating technical solutions and advocating health as a central component of international/national energy policies.

**Quantifying the Effects on Public Health: International experience of exposure and impact assessment, Professor Kirk R. Smith, University of California, Berkeley**

Professor Smith provided technical context for the health effects of burning solid fuels. He explained that although wood and other biomass consist mainly of carbon, hydrogen and oxygen, hundreds of dangerous chemicals are produced as a result of incomplete combustion in typical household stoves. This includes small particles, carbon monoxide, formaldehyde, acrolein, benzene, 1,3-butadiene, toluene, styrene, and polyaromatic hydrocarbons. The large emission of such products of incomplete combustion is what makes small-scale biomass burning hazardous. Unfortunately, however, many efforts to

improve biomass stove energy efficiency in the past have actually reduced combustion efficiency and thus increased emissions, although perhaps saving fuel.

Globally, indoor air pollution from solid fuel use has the 10<sup>th</sup> largest disease burden of any major risk factor, whereas in India it is the 3<sup>rd</sup> largest. Although the information base is still thin, there are several potential solutions for different populations and local circumstances, including improved ventilation, improved stove technology, cleaner fuels, and behavioural changes. Paradoxically, however, in the countries that require the most aid, (like India where more than 80% of households cook with biomass) research and evidence supporting the need and cost-effectiveness of interventions must be of the highest quality and quantity since competition for scarce financial resources is also great. Current estimates of risk, for example the often quoted 1.6 million deaths per year from solid fuel use, are actually quite uncertain and may be higher or lower by a factor of two or more. Dr. Smith pointed out the difficulty that household energy improvements pose for analysts and policy makers because of the multiple benefits they bring, including energy, hygiene, health, women's status, and reduced pressure on natural ecosystems, which are difficult to aggregate together into an overall argument. In addition, because of the methane and other greenhouse pollutants produced by the same processes of incomplete combustion that create the health hazards, reduction in the potential for global warming can be added to this list as well. If current estimates are correct, it should be possible to obtain greenhouse and health protection from household energy improvements at a combined cost that would be highly competitive, raising the option of household energy as part of CDM projects.

**Achieving the Millennium Development Goals: making the case for cleaner fuels/stoves for cooking, Professor Vijay Modi, Columbia University**

Professor Vijay Modi summarised the Millennium Development Goals (MDGs) and indicated that, although no MDG relates directly to energy, most are profoundly affected by choice of cooking fuels. Therefore, reducing indoor air pollution is central to achieving the MDGs. A vision for 2015 was presented that encompassed improved transport, universal access to mechanical power, and fully electrified clinics, hospitals, schools and community centres. Dr. Modi suggested that scaling up improved cookstoves/chimneys to 50% of affected population could be completed for only \$2/capita per year. However, estimates that include the cost of time saved, benefit to human health, benefit to the environment, and financial cost of purchased solid fuels more than justifies such an investment. The cost of LPG was determined to be dramatically higher - in the neighbourhood of \$30/capita per year.

It was suggested that existing approaches to solving indoor air pollution have been too narrowly focussed on pilot studies, and that it is time to begin scaling up efforts by harnessing market forces and goal-oriented national programmes. An example of LPG in Brazil was used to demonstrate the potential for expanding rural markets. There are ways to make subsidies smart and more efficient, but they need to be targeted, transparent, temporary and competitively bid. Participants also noted that subsidies may be more effective by targeting the initial technology and fuel-switch costs rather than the recurrent, consumptive costs. Transport of fuels plays a large role in their overall cost.

Dr. Modi also explained the concept of community kitchens in India, which provide public access to well-equipped cooking facilities in rural villages for 6 rupees per hour. Although

this private-sector led effort began in August, 2002, the programme already boasts 350 sites in 20 states in India.

**Smoke in the Kitchen: three country smoke programmes – Nepal, Sudan and Kenya, Alison Doig, Energy Campaigner, Intermediate Technology Development Group**

Dr. Doig began with an introduction on ITDG. ITDG is an international NGO based in the United Kingdom, and is engaged in indoor air pollution reduction pilot projects in three very different communities in Nepal, Sudan and Kenya. Their solutions range from promoting altered behaviour through education on the topic among affected people, to fundamental technology changes such as installation of smoke hoods, eaves spaces, energy efficient stoves, and LPG stoves. Preliminary data from these pilot studies indicate a dramatic decrease in levels of indoor air pollution after provision of LPG stoves in Sudan, encouraging smoke reductions with smoke hoods in Kenya, and on-going development needed to design a smoke hood for the community in Nepal. The key is to develop a technology which works for the community, and can demonstrate effective smoke removal.

Suggestions for scale-up were offered, including developing business models in collaboration with local entrepreneurs and other methods to create and strengthen markets. In ITDG's Sudan example, where LPG technology is combined with access to loans that offset the initial investment, users saved approximately \$3.50 per month over purchasing charcoal, their traditional cooking fuel. A key to approaching the problem is to enable voices from the community to be heard by high level decision makers. This can be done through convening key stakeholders to discuss the subject and by identifying and influencing policy altering events such as PRSP revisions.

**Achieving Global Results, Joint activities through the Partnership for Clean Indoor Air, John Mitchell, Senior Energy Specialist, United States Environmental Protection Agency**

To address the increased environmental health risk faced by the almost 3 billion people who burn traditional biomass fuels and coal indoors for home cooking and heating, the Partnership for Clean Indoor Air is bringing together governments, public and private organizations, multilateral institutions, industry, and others to increase the use of affordable, reliable, clean, efficient, and safe home cooking and heating practices and reduce exposure to indoor air pollution. The Partnership is promoting effective approaches for increasing the use of improved stove and fuel technology by raising public awareness of the dangers of indoor air pollution; developing local markets for improved technologies; improving the design and performance of cooking technology; and monitoring indoor air pollution. The

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