Cooking with Cleaner Fuels in India: A Strategic Analysis and Assessment

This "Policy Briefs Series" is the culmination of a joint research on healthy cooking fuel options for India, carried out by TERI and AIIMS during 2009–10 with funding support from UNICEF. The findings are based on extensive primary and secondary research that included literature reviews, interviews, focus groups, and field studies in select villages of Haryana state.

This brief, *Indoor Air Pollution: A Case for Change* presents the health implications of indoor air pollutants derived from less cleaner cooking fuels. *Cooking Fuels in India: Trends and Patterns* tracks the usage and adoption of different fuels in rural and urban homes and also across select states in India. *Choices for Change: Evaluating Cooking Fuels* discusses the pros and cons of different cooking fuels and their suitability for certain user segments. In conclusion, *Call for Change: Catalysing a Cleaner Future*! invokes all stakeholders—the governments, funding agencies, industry, and consumer groups—to work in a concerted manner to accelerate adoption of cleaner cooking fuels and secure a cleaner and healthier home.

The research team comprised Rahul Srivastava, Puneet Misra, Anand Krishnan (AIIMS- CRHSP), Pavitra Mohan, Henri van den Hombergh (UNICEF); Meena Sehgal (TERI).

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The Energy and Resources Institute
Darbari Seth Block, IHC Complex,
Lodhi Road, New Delhi - 110 003

Tel. 2468 2100 or 4150 4900
Fax. 2468 2144 or 2468 2145
India +91 Delhi (0) 11
E-mail meenas@teri.res.in

www.teriin.org

POLICY BRIEF

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INDOOR AIR POLLUTION: A CASE FOR CHANGE

Key Messages

- Indoor air pollution from biomass cooking fuels is an important cause of pneumonia and low birth weight among children. In addition, indoor air pollution increases the risk of many other diseases, including chronic respiratory diseases and tuberculosis among adults.
- Pneumonia and low birth weight are among the most serious threats to children under five in India.
- It is estimated that currently about 135,672 deaths each year among children aged between 1 month and 59 months in India can be attributed to indoor air pollution, thereby accounting for about 7.6% of all under-five deaths in the country.
- These deaths are largely avoidable. Replacing biomass fuels with safer options or use of better stoves can save many of these children.
- Technological and social interventions exist for reducing exposure to indoor air pollution.

1. What is indoor air pollution and what are its main sources?

As per the 2001 national census, 82.5% Indian rural households use biomass—a major source of indoor air pollution—as a cooking fuel. The third National Family Health Survey (NFHS) in 2005–06 also arrived at similar estimates.

Non-regulated burning of wood, animal dung, and crop residue can lead to manifold increases in harmful and toxic pollutants. Air pollutants, for instance particulate matter (PM), have been linked to higher incidence of respiratory diseases, particularly among children. Toxic volatile organic compounds (VOCs), such as benzene and polycyclic aromatic hydro carbons (PAHs), which are known to be carcinogenic, are also released during combustion of biomass.

2. What are the adverse health effects of indoor air pollution?

- Indoor air pollution (IAP) has serious and significant effects on both mortality and morbidity.
- IAP has been attributed to increase the risk of many diseases and adverse pregnancy outcomes, such as acute respiratory infections (ARI), pneumonia, chronic obstructive pulmonary diseases (COPD), cataract, tuberculosis, asthma, heart diseases, and low birth weight.

This policy brief focuses mainly on impacts of indoor air pollution on child survival, which is the best documented of all health effects of IAP. In doing so, it focuses on two conditions that are most closely associated with IAP as well as major contributors to childhood mortality. However, it should be noted that other health effects of IAP, such as tuberculosis among adults, are also a significant cause of burden for the community.

3. What is the extent of the problem of acute respiratory infections in India?

- According to recent estimates, 27.5% of all under-five deaths in the post-neonatal period in India occur due to ARI.
- With the total Indian population belonging to the under-five years of age in the post-neonatal category being approximately 0.78 million, this translates to about 216,150 deaths due to ARI every year.

4. What is the increase in risk of dying from ARI due to IAP?

Researchers from the All India Institute of Medical Sciences (AIIMS) recently conducted a systematic review of studies carried out in this area. A total of 23 studies from different parts of the world were reviewed, out of which nine provided the data for generating an estimate (see Figure 1). There were differences between the studies, primarily in the manner in which they measured indoor air pollution, as well as the way in which they defined acute respiratory infections.

Despite these differences, correlation between IAP and ARI deaths was observed. The pooled odds ratio was 2.50 (1.53 to 4.10) 95% confidence interval (CI) (Random effect model). This means that children who were exposed to indoor air pollution were two-and-half times more likely to die due to acute respiratory infection as compared to those who were not exposed to IAP. This is higher than the odds ratio of 1.78 (1.45 to 2.18) 95% CI estimated from a review by Dherani, Pope, Mascarenhas, *et al*. (2008).

Between 24%–39% of ARI deaths among post-neonatal exposure can be attributed to IAP. Based on ARI attributal risk, and population exposed, this translates to 51,660–84,731 deaths in a year, in this age group.

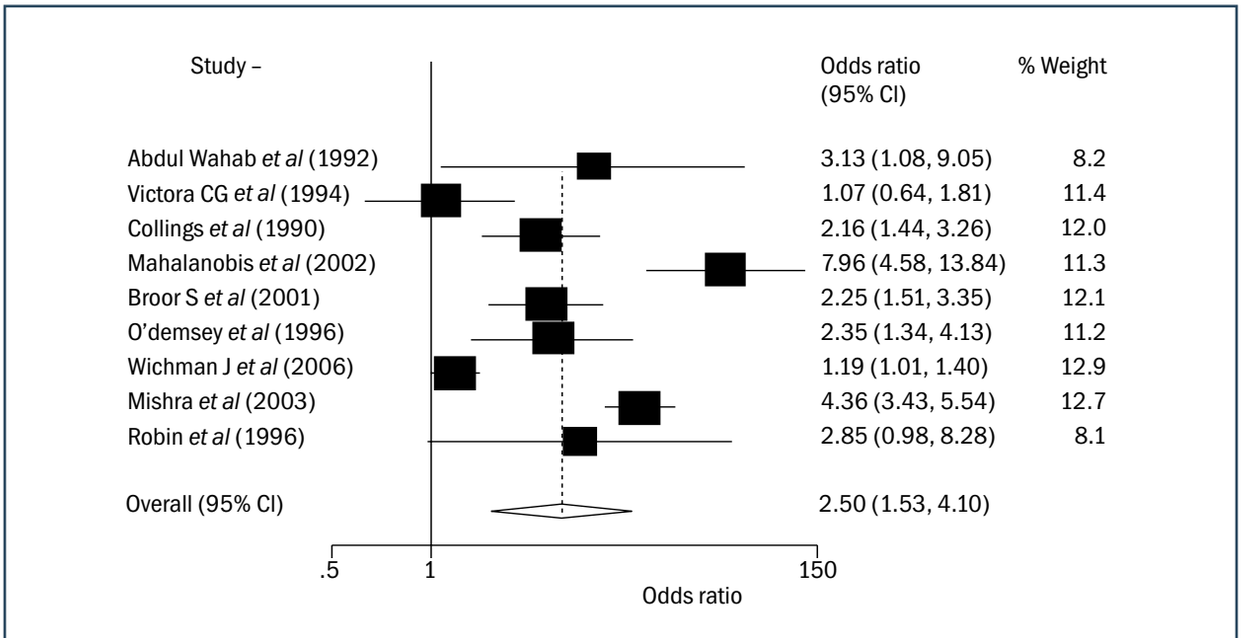

Figure 1 Summary findings from studies on association between indoor air pollution and deaths due to acute respiratory infections

5. What is the extent of the low birth weight problem in India?

- About 26 million babies are born every year in India, out of which about 28% have low birth weight (below 2,500 gm), translating into an estimated 7.28 million low birth weight babies every year.
- Low birth weight babies are 1.37 times more likely to die in infancy as compared to babies with normal weight.

6. How does exposure to indoor air pollution increase the risk of low birth weight?

In the review conducted by researchers from AIIMS, on the basis of five studies that were identified, it was found that IAP was associated with increased risk of low birth weight odds ratio = 1.31 (1.16 to 1.48) 95% CI (Figure 2). This means that mothers exposed to indoor air pollution during pregnancy were 1.3 times more likely to have a low birth-weight baby, as compared to those who were not exposed to IAP.

Nearly 82% of pregnant women are exposed to biomass-related indoor air pollution, with an estimated 12%–28% of low birth weight babies being exposed to the same. At case fatality rate of 4.2%, the estimated deaths in this group associated with IAP range from 38,329 to 93,038 (see Table 1).

7. Of the total deaths occurring among under-five children in India, how many can be attributed to IAP?

Applying the odds ratio, prevalence estimates, and percentage exposed to indoor air pollution to epidemiological formulae for estimating attributable risk, we have computed the share of low birth weight and ARI deaths that can be attributed to IAP (see Table 1). The total number of deaths can range from 89,989 to 177,769.

Table 1 Estimates of child deaths due to exposure to indoor air pollution

Estimated post neo-natal under-five deaths due to ARI attributable to IAP	68,952 (51,660–84,731)
Estimated post neo-natal under-five deaths due to low birth weight attributable to IAP	66,720 (38,329–93,038)
Estimated total deaths	135,672 (89,989–177,769)

Another study by Tielsch, Katz, Thulasiraj *et al*. (2009) in south India estimated a 21% higher six-month mortality in six-month-old children who are exposed to IAP. If we extrapolate this to infancy period, it translates to about 200,000 additional deaths in India due to IAP.

8. Are these deaths avoidable or preventable?

These deaths are largely avoidable. There are mainly two types of interventions against indoor air pollution. The first is to replace biomass fuels with safe fuels, while the second intervention is to improve combustion of bio-fuel to reduce the amount of smoke that is generated. While these options would result in significant reduction of IAP in exposure, the ultimate impact that interventions will have depends upon the intervention that is used and the coverage achieved with that particular intervention.

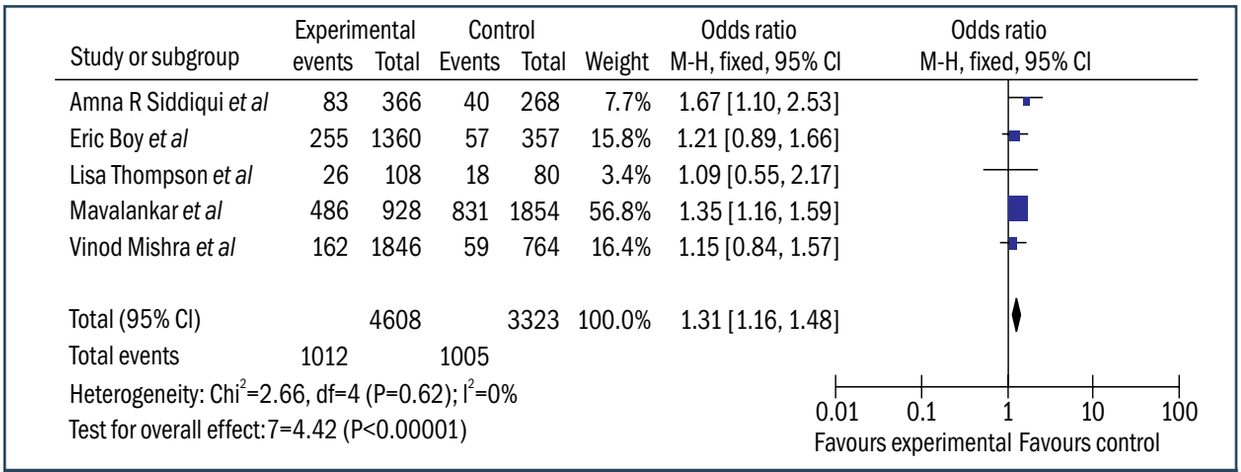

Figure 2 Summary findings from studies on association between indoor air pollution and incidence of low birth weight.

9. How is this issue being addressed by policy-makers and programme managers?

There can be a number of reasons.

- The problem has not received the attention that its magnitude deserves. While ARI and low birth weight are recognized as priority health problems in children, indoor air pollution is not widely perceived as an important contributor to under-five mortality. Only a few national and international agencies have been focusing on this issue. However, IAP has been identified as one of the interventions to reduce pneumonia-related deaths in the Global Action Plan for Prevention and Control of Pneumonia (GAPP) formulated by WHO and UNICEF.
- All interventions, such as supply of cleaner cooking fuels or improved stoves, can be funded and implemented by different ministries—for instance, ministries of new and renewable energy, petroleum, and natural gas.

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