

Environmental Burden of Disease Series, No. 4

Indoor smoke from solid fuels

Assessing the environmental burden of disease
at national and local levels

Manish A. Desai
Sumi Mehta
Kirk R. Smith

Series Editors

Annette Prüss-Üstün, Diarmid Campbell-Lendrum, Carlos Corvalán, Alistair Woodward

A Microsoft Excel spreadsheet for calculating the estimates described in this document can be obtained from WHO/PHE.
E-mail contact: EBDassessment@who.int



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Preface

The disease burden of a population, and how that burden is distributed across different subpopulations (e.g. infants, women), are important pieces of information for defining strategies to improve population health. For policy-makers, disease burden estimates provide an indication of the health gains that could be achieved by targeted action against specific risk factors. The measures also allow policy-makers to prioritize actions and direct them to the population groups at highest risk. To help provide a reliable source of information for policy-makers, WHO recently analysed 26 risk factors worldwide, including indoor smoke from solid fuels, in the *World Health Report* (WHO, 2002).

The Environmental Burden of Disease (EBD) series continues this effort to generate reliable information by presenting methods for assessing the environmental burden of disease at national and local levels. The methods in the series use the general framework for global assessments described in the *World Health Report* (WHO, 2002). The introductory volume in the series outlines the general method (Prüss-Üstün et al., 2003), while subsequent volumes address specific environmental risk factors. The guides on specific risk factors are organized similarly, first outlining the evidence linking the risk factor to health, and then describing a method for estimating the health impact of that risk factor on a population. All the guides take a practical, step-by-step approach and use numerical examples. The methods described in the guides can be adapted both to local and national levels, and can be tailored to suit data availability.

Affiliations and acknowledgements

This document was prepared by Manish Desai, Kirk Smith and Sumi Mehta, and edited by Annette Prüss-Üstün and Diarmid Campbell-Lendrum. Manish Desai and Kirk Smith are from the Division of Environmental Health Sciences, School of Public Health, University of California at Berkeley. Sumi Mehta, Annette Prüss-Üstün and Diarmid Campbell-Lendrum are from the World Health Organization.

In preparing this document, we drew on the methods developed for estimating the global burden of disease caused by exposure to indoor smoke from solid fuels. We therefore thank the reviewers of that analysis.

We also thank the United States of America (USA) Environmental Protection Agency for having supported the development of the Environmental Burden of Disease (EBD) approaches.

This report has not been subjected to agency review and therefore does not necessarily reflect the views of the agency. Finally, we are grateful to Kevin Farrell and Eileen Brown who put this document into its final format.

List of abbreviations

ALRI	acute lower respiratory infection(s)
ARI	acute respiratory infection(s)
COPD	chronic obstructive pulmonary disease
CI	confidence interval
DALY	disability-adjusted life year
EBD	environmental burden of disease
ETS	environmental tobacco smoke
HIV	human immunodeficiency virus
PM	particulate matter
SFU	solid fuel use
USA	United States of America
WHO	World Health Organization

Note: WHO subregion abbreviations (e.g. SEAR D) are also utilized in tables. Please see Annex 5 for a list of countries within the WHO subregions.

Summary

This guide outlines a method for estimating the disease burden at a national or local level caused by household exposures to indoor smoke from solid fuels. Solid fuel use is defined as the household combustion of coal or biomass (such as dung, charcoal, wood, or crop residues). Worldwide, approximately 50% of all households and 90% of rural households utilize solid fuels for cooking or heating. Solid fuels are commonly burned in inefficient simple stoves and in poorly ventilated conditions. In such situations, solid fuel use generates substantial emissions of many health-damaging pollutants, including respirable particulates and carbon monoxide, and results in indoor air pollution exposures often far exceeding national standards and international guidelines.

The disease burden from solid fuel use is most significant in populations with inadequate access to clean fuels, particularly poor households in rural areas of developing countries. Women and their youngest children are most exposed because of their household roles. Solid fuel use is most firmly associated with acute lower respiratory infections (including pneumonia) in young children, and chronic obstructive pulmonary disease and lung cancer in women (and to a lesser degree in men). Each of these three health outcomes is a major disease category in most societies and thus household solid fuel use is likely to be a major cause of disease burden in communities where it is prevalent. Globally, 2.6% of all ill-health is attributable to indoor smoke from solid fuels, nearly all in poor regions.

The approach described in this guide utilizes a binary classification scheme for exposure levels, separating the study population into those exposed to solid fuel use and those not exposed. This strategy enables the application of relative risks derived from a comprehensive review of the current epidemiological literature on solid fuel use. The guide presents ways to assess household fuel use, and discusses the evidence linking solid fuel use with major health outcomes. The combination of exposure levels and relative risks enables the calculation of disease burdens. Uncertainty in final results can be suggested through low-risk and high-risk scenarios. The guide closes with an illustrative case study for India.

The recommended methodology does not include all possible health outcomes suspected to be associated with solid fuel use, but just those for which the evidence is best. Annexes cover other important sources of indoor air pollution; studies linking solid fuel use with various other health outcomes; alternative approaches to determine the disease burden from solid fuel use; and sample fuel use survey questions.

Determining the impact of solid fuel use at national or local levels is important for identifying and prioritizing environmental and public health interventions. The two main intervention options focus on developing the physical and economic infrastructure to either encourage households to switch to cleaner fuels, or to employ improved stoves with chimneys or other means of reliable ventilation. In either case, education plays a vital role.

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