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Abstract

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**HOUSEHOLD ENERGY, INDOOR AIR POLLUTION, AND HEALTH IN DEVELOPING COUNTRIES: Knowledge Base for Effective Interventions****Majid Ezzati<sup>1</sup> and Daniel M. Kammen<sup>2</sup>**<sup>1</sup>Risk, Resource, and Environmental Management Division, Resources for the Future, 1616 P Street NW, Washington, DC 20036; e-mail: [ezzati@rff.org](mailto:ezzati@rff.org)<sup>2</sup>Energy and Resources Group (ERG) and Goldman School of Public Policy, 310 Barrows Hall, University of California, Berkeley, California 94720-3050; e-mail: [dkammen@socrates.berkeley.edu](mailto:dkammen@socrates.berkeley.edu)

Globally, almost three billion people rely on biomass (wood, charcoal, crop residues, and dung) and coal as their primary source of domestic energy. Exposure to indoor air pollution from the combustion of solid fuels is an important cause of disease and mortality in developing countries. Despite recent advances in estimating the health impacts of indoor smoke, there are limited studies targeted toward the design and implementation of effective intervention programs. We review the current knowledge of the relationship between indoor air pollution and disease, and of the assessment of interventions for reducing exposure and disease. This review takes an environmental health perspective and considers the details of both exposure and health effects that are needed for successful intervention strategies. In particular, we summarize the emerging understanding of the central role of household energy technology and day-to-day household activities in determining exposure to indoor smoke. We also identify knowledge gaps and detailed research questions that are essential in successful design and dissemination of preventive measures and policies. In addition to specific research recommendations based on the weight of recent studies, we conclude that research and development of effective interventions can benefit tremendously from integration of methods and analysis tools from a range of disciplines—from quantitative environmental science and engineering, to toxicology and epidemiology, to the social sciences.

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