

ORIGINAL RESEARCH

Health Care Expenditures Associated With Pollution: Exploratory Methods and Findings



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Abstract

BACKGROUND The research done for this paper is part of the background analysis undertaken to support the work of the Global Commission on Pollution, Health and Development, an initiative of The Lancet, the Global Alliance on Health and Pollution, and the Icahn School of Medicine at Mount Sinai. The paper expands on areas where the current literature has gaps in knowledge related to the health care cost of pollution. Objectives. This study aims to generate an initial estimate of total tangible health care expenditure attributable to man-made pollution affecting air, soil and water.

METHODS We use two methodologies to establish an upper and lower bounds for pollution related health expenditure. Key data points in both models include (a) burden-of-disease (BoD) at the national level in different countries attributable to pollution; and (b) the total cost of health care at the national level in different countries using standard national health accounts expenditure data.

FINDINGS Depending on which determinist model we apply, annual expenditures range from US\$630 billion (upper bound) to US\$240 billion (lower bound) or approximately three to nine percent of global spending on health care in 2013 (the reference year for the analysis). Although only 14 percent of global total for pollution related health care spending is in lower- and middle-income countries (LMICs) in our primary (lower bound) model, the relative share of spending for pollution related illness is substantial, especially in very low-income countries. Cancer, chronic respiratory and cardio/cerebrovascular illnesses account for the largest health care spending items linked to pollution even in LMICs.

CONCLUSIONS These conditions have historically received less attention by national governments, international public health organizations and development/financial agencies than infectious disease and maternal/child health sectors. Other studies posit that intangible costs associated with environmental pollution include lower productivity and reduced income – components which our models do not attempt to capture. The financial and health impacts are substantial even when we exclude intangible costs, yet it is likely that in many LMICs poor households simply forgo medical treatment and lose household income as a result of man-made environmental degradation.

RECOMMENDATIONS When evaluating the value of public health or environmental programs which prevent or limit pollution-related illness, policy makers should consider the health benefits, the tangible cost offsets (estimated in our models) and the opportunity costs.

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All authors verify that they have no competing interest. In addition to their work roles, both Alexander S. Preker and Olusoji O. Adeyi are commissioners with the Lancet Commission. Diane-Charlotte Simon is a research analyst at NewWorld Capital, New York, NY. Both Marisa Gil Lapetra and Eric Keuffel are associates with Health Investment & Financing. Eric Keuffel is also the founder and principal of the Health Finance and Access Initiative. The themes, views, and conclusions in this paper are the authors' alone and should not be attributed to any institution with which they are associated. All authors verify direct involvement in the research and write up of the journal submission.

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KEY WORDS pollution, diseases burden, cost of healthcare, health expenditure, global estimate

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INTRODUCTION

A detailed review of the cost of pollution is currently being undertaken by the Global Commission on Pollution, Health and Development, an initiative of *The Lancet*, the *Global Alliance on Health and Pollution*, and the *Icahn School of Medicine at Mount Sinai*.¹ The results of this work, which will be published in the *Lancet* in 2017, indicate that pollution results in 9 million deaths each year, or 15% of all deaths worldwide. More than 90% of these deaths occur in low- to middle-income countries (LMICs).^{*} The research done for this paper is part of the background analysis undertaken to support the work of the commission in areas where the current literature has gaps in knowledge related to the health care cost of pollution.

For decades, environment and policy experts have focused on social and economic issues related to man-made pollution.^{2,3} More recently, increased attention has also been given to health impacts related to pollution.⁴⁻⁷ Strong scientific evidence now exists on the health problems linked to smoke; other ambient air threats such as ambient particulate matter; contaminated water; and soil with pollutants such as mercury, lead, and other heavy metals or chemicals.⁸

The health care costs associated with pollution are less well known.⁹ The Organization for Economic Cooperation and Development (OECD) has estimated the pollution-related health care expenditures for a limited number of its member countries, but its dataset is incomplete and no previous attempts have been made to estimate the global cost of health care related to pollution.¹⁰⁻¹²

Industrialization, urbanization, enhancements in agricultural production methods, food processing, and use of cars are some of the key contributors to the recent increase in health-related pollution. Pollutants from these sources are now known to have a damaging effect on almost all vital organs of living

organisms, including the brain, lungs, heart, liver, kidneys, soft tissue, and bone.¹³

Although pollution-related health problems are now well known, they were not a focus of the international development community¹⁴⁻¹⁶ or national health strategies until recently.¹⁷ The 2015 Millennium Development Goals did not incorporate pollution-related health. The World Bank, the International Finance Corporation, and regional development banks do have environmental safeguard policies and attempts have been made to address threats from water, soil, and airborne pollutants. However, other than medical waste disposal projects, none of these environment projects were specifically designed to address pollution-related health problems.

Recently, attempts have been made to add up health-related problems by estimating the global burden of disease (BoD) linked to pollution and its potential impact on development. Notably, such attempts have been made by the World Health Organization (WHO), the Institute for Health Metrics and Evaluation, and Pure Earth.

This study aims to estimate the total annual, global, tangible health care expenditures attributed to pollution (HEAP). Recognizing that significant data constraints exist, including limited health care expenditure data at the global level for specific diseases and premature deaths, we seek to generate an order of magnitude for plausible lower and upper bounds for the tangible health care costs associated with pollution using 2 deterministic models, each with different assumptions and methods.

METHODS

Definitions and Scope of Study. To calculate the global tangible health care costs related to pollution, this paper adopts the same definition of pollution as that used by the *Lancet* Commission study. These include air, water, and soil pollution and specific pollutant types, including ambient particulate matter pollution (APMP), household air pollution (HAP), water pollution, sanitation, and lead pollution. We also use the same pollution-related disease from the *Lancet* Commission study. These include the following:

^{*}The *Lancet Commission* defines pollution-related disease as diseases and premature deaths “caused by exposures to all forms of pollution—ambient air pollution; household air pollution; unsafe drinking water and inadequate sanitation; toxic chemicals at industrial, mining and hazardous waste sites; lead; and occupational pollutants.”

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