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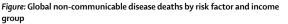
Pollution and non-communicable disease: time to end the neglect

Non-communicable diseases (NCDs) account for 72% of all deaths globally and this proportion is growing.¹ Greatest increases in NCD mortality are seen in low-income and middle-income countries (LMICs). Places that only a generation ago knew famine are today experiencing epidemics of obesity, diabetes, cardiovascular disease, and cancer.¹ These epidemics reduce human capital in developing countries and their economic costs are so great that they threaten to slow and even undercut trajectories of economic and social development.²

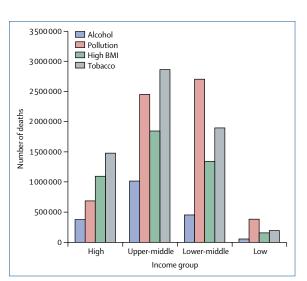
International organisations, medical associations, and global philanthropies are mobilising to meet this challenge. In 2011, the United Nations (UN) General Assembly convened a special session on NCDs, followed by a high-level meeting in 2014;³ a third such gathering is planned for 2018. WHO has developed a global action plan for the prevention and control of NCDs.⁴ The World Heart Federation is building a grand coalition to confront the global epidemics of heart disease and stroke.⁵ And in September, 2017, with the support of leading global health philanthropies, the global health organisation Vital Strategies launched the Resolve initiative to address the global pandemic of cardiovascular disease.⁶ The core strategy of each these efforts is to use evidence-based policy and clinical interventions to tackle the major behavioural and metabolic risk factors for NCDs: tobacco, hypertension, unhealthy diet, physical inactivity, obesity, and the harmful use of alcohol.7

Pollution is not among the risk factors targeted by any of these campaigns. Nor is pollution an explicit focus of the UN Interagency Task Force on NCDs despite the recommendation of the UN Economic and Social Council that pollution be a Task Force target. Yet air, soil, and water pollution in community, household, and occupational settings and toxic chemical pollution are among the leading NCD risk factors globally and are responsible for an estimated 16% of all NCD mortality.² Pollution accounts for 22% of all deaths from cardiovascular disease, 26% of ischaemic heart disease deaths, 25% of stroke deaths, 53% of deaths from chronic obstructive pulmonary disease, and 40% of deaths from lung cancer.³ Pollution's contribution to NCD mortality becomes starkly evident when countries are stratified by World Bank income group (figure). In high-income countries such as Canada, France, Germany, the UK, and the USA, where many of the unhealthiest forms of pollution such as coal-fired powerplants and lead in petrol—have been controlled, behavioural and metabolic risk factors are the main causes of NCD mortality. But in uppermiddle-income countries such as Argentina, China, Mexico, and South Africa, pollution and behavioural risk factors are of approximately equal importance; and in heavily polluted, rapidly developing LMICs such as India, Kenya, Peru, and Senegal, pollution is the predominant risk factor for death from NCDs.

Why is pollution so neglected? Failure until now to recognise the great magnitude of pollution's effects on health is one explanation; the long latency of many pollution-related NCDs compounds this failure because it impedes recognition of the relationships between cause and effect. Other factors include insufficient information about pollution's enormous economic and social costs and the great savings to be won through pollution prevention; a bias in the health policy community towards clinical interventions and against the expenditure of limited NCD prevention and control resources beyond



Data are from the Global Burden of Disease 2015 study.¹ BMI=body-mass index.





the boundaries of the health sector;⁸ media discourse that fails to reflect pollution's causes and consequences;⁹ the mistaken and obsolete belief that pollution is the unavoidable consequence of economic development;¹ and pushback and regulatory capture by powerful vested interests who manufacture doubt about the reality of pollution's health effects and impede pollution control.¹⁰ The consequence is that pollution has received scant attention and the global epidemic of pollution-related NCDs continues to worsen.

Three recent events might change this picture and begin to end the longstanding neglect of pollution. The first was the release on Oct 19, 2017, of the Lancet Commission on Pollution and Health.² This Commission documented the enormous global burden of disease caused by pollution and found that pollution is responsible for an estimated 9 million premature deaths annually. It presented new data on pollution's great economic costs; highlighted the links between pollution, poverty, and injustice; and demonstrated that pollution prevention will advance many of the Sustainable Development Goals and could slow climate change. The Commission concluded that the worst forms of pollution and pollution-related disease can be curbed in all countries by applying the proven technical and legal strategies that have successfully and costeffectively controlled pollution in high-income and, more recently, some middle-income countries.²

The second recent event was the UN Environment Assembly convened in Nairobi in November, 2017. This Assembly recognised the growing global importance of pollution, acknowledged the increasing frequency of extreme pollution events, highlighted the links between pollution and health, and issued its first ever call for a pollution-free planet.

The third event was the release in September, 2017, by the World Bank of a critical assessment of the Bank's support for pollution management.¹¹ This report noted that the Banks's pollution control programmes had declined in recent years and recommended that the Bank scale up its support for pollution management, strengthen its support for pollution monitoring, and leverage its climate change portfolio to better combat local and regional pollution.

Despite these encouraging developments, continued progress against pollution-related NCDs will require that leaders at the highest levels of international organisations unequivocally and forcefully integrate the pollution control and NCD agendas. No longer can these two important endeavours afford to remain separate. And because the vast majority of pollution-related disease occurs in LMICs, new pollution control efforts must be developed and undertaken at the country level with financial support and technical guidance from wealthier countries and international development partners. Pollution does not respect political boundaries, and the benefits of these interventions will therefore accrue globally. We highlight four strategies for advancing the prevention and control of pollution-related NCDS.

First, encourage countries to prevent pollutionrelated NCDs by taxing polluters. Taxation strategies incentivise pollution control and have proven highly successful in preventing NCDs caused by tobacco and sugar-sweetened beverages. Moreover, revenues raised through taxes on polluting industries can be directed specifically to pollution control and thus minimise competition with other components of the NCD agenda.

Second, leverage the science and funding currently directed toward climate mitigation and adaptation. This will require modifying the priorities of climate change investments to include the near-term health benefits of pollution control.¹ Recognition of pollution's great and very immediate health and economic costs provides a powerful lever for achieving this change.

Third, empower civil society and the media to drive environmental improvements by generating actionable local data on levels of pollution within countries, cities, and communities.

Fourth, assist governments to develop hard-hitting media campaigns modelled on antismoking campaigns to counter industry efforts to obscure the harms caused by polluting industries and products.

With growing recognition of pollution's enormous global impacts, the time has come to end neglect of pollution, acknowledge that pollution is a major NCD risk factor, mobilise the necessary funding, and make pollution prevention a core component of the intersectoral NCD agenda. Prevention of pollution-related NCDs is a battle that can be won.

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- 1 GBD 2015 Mortality and Causes of Death Collaborators. Global, regional, and national life expectancy, all-cause mortality, and cause-specific mortality for 249 causes of death, 1980–2015: a systematic analysis for the Global Burden of Disease Study 2015. *Lancet* 2016; **388**: 1459–544.
- 2 Landrigan PJ, Fuller R, Acosta NJR, et al. The Lancet Commission on pollution and health. Lancet 2018; **391:** 462–512.
- 3 UN. Political declaration of the high-level meeting of the General Assembly on the prevention and control of non-communicable diseases. 2011. http://www.un.org/en/ga/ncdmeeting2011/ (accessed Nov 30, 2017).
- 4 WHO. Global action plan for the prevention and control of NCDs 2013–2020. http://www.who.int/nmh/events/ncd_action_plan/en/ (accessed Nov 30, 2017).

- 5 Wood D, Eisele J-L. A global coalition for the fight against heart disease and stroke. Lancet 2017; 390: 2130–31.
- 6 Castro JL. Vital Strategies launches Resolve, a new \$225 million global health initiative. Sept 12, 2017. http://www.vitalstrategies.org/ vital-stories/vital-strategies-launches-resolve-new-225-million-globalhealth-initiative (accessed Dec 1, 2017).
- 7 Beaglehole R, Bonita R, Horton R, et al. Priority actions for the non-communicable disease crisis. *Lancet* 2011; **377:** 1438-47.
- Maher D, Ford N. Action on noncommunicable diseases: balancing priorities for prevention and care. Bull World Health Organ 2011; 89: 547–47A.
- 9 Murukutla N, Negi NS, Puri P, Mullin S, Onyon L. Online media coverage of air pollution risks and current policies in India: a content analysis. WHO South East Asia J Public Health 2017; 6: 41–50.
- 10 Michaels D. Doubt is their product: how industry's assault on science threatens your health. Oxford: Oxford University Press, 2008.
- 11 World Bank Group. Independent Evaluation Group. Toward a clean world for all: an IEG evaluation of the World Bank Group's support for pollution management. Washington, DC: World Bank, 2017.