

Health and the environment: addressing the health impact of air pollution

Report by the Secretariat

1. The Executive Board, in its consideration of health and the environment at its 135th session, decided to include the subject on the provisional agenda of the current session.¹ This report describes the links between air pollution and health, and outlines some strategies for prevention, control and mitigation of the adverse effects of air pollution on health, including coordinated action between the health and other sectors.

EFFECTS OF EXPOSURE TO AIR POLLUTION ON HEALTH

2. Air pollution is one of the main avoidable causes of disease and death globally. About 4.3 million deaths each year, most in developing countries, are associated with exposure to household (indoor) air pollution.² A further 3.7 million deaths a year are attributed to ambient (outdoor) air pollution.³

3. Even at relatively low levels air pollution poses risks to health, and because of the large number of people exposed it causes significant morbidity and mortality in all countries. However, although all populations are affected by air pollution, the distribution and burden of consequent ill-health are inequitable. The poor and disempowered, including slum dwellers and those living near busy roads or industrial sites, are often exposed to high levels of ambient air pollution, levels that appear to be worsening in many cities in developing countries. Women and children in households that have to use polluting fuels and technologies for basic cooking, heating and lighting bear the brunt of exposure to indoor air pollution.

4. Most air pollutants are emitted as by-products of human activity, including heat and electricity production, energy-inefficient transport systems and poor urban development, industry, and burning waste and brush or forests.

¹ See document EB135/2014/REC/1, summary record of the second meeting, section 1.

² WHO. Burden of disease from household air pollution for 2012, http://www.who.int/phe/health_topics/outdoorair/databases/HAP_BoD_results_March2014.pdf?ua=1 (accessed 1 December 2014).

³ WHO. Burden of disease from ambient air pollution for 2012, http://www.who.int/phe/health_topics/outdoorair/databases/AAP_BoD_results_March2014.pdf?ua=1 (accessed 1 December 2014).

5. Pollutants with the strongest evidence for public health concern are fine particulate matter¹ and gases (mainly carbon monoxide, ozone, nitrogen oxides, sulfur dioxide and volatile organic compounds). Fine particulate matter, which is widespread both indoors and outdoors, damages the health of more people than any other air pollutant, through the deposition of particles in smaller airways and alveoli in the lungs and their penetration into the bloodstream. (Larger or more coarse particles, including dust and pollen are more restricted to the thoracic cavity and unable to penetrate the smaller airway systems.) Among the types of fine particulate matter, particular concern centres on elemental carbon and organic materials, transition metals and metal compounds; inorganic sulfates and nitrates; ammonia; sodium chloride; and mineral dust. Absorbed particles can damage inter alia lung function and the cardiovascular system, through oxidative stress, alteration of the electrical processes of the heart and systemic inflammation, leading to endothelial cell activation and dysfunction; altered blood pressure and heart rate, including heart rate variability; arrhythmia; and deregulated coagulation pathways; and ischaemia.

6. Exposure to air pollution, especially fine particulate matter, is a leading risk factor for noncommunicable diseases, in particular: ischaemia, myocardial infarction, stroke, chronic obstructive pulmonary disease and cancers. Of deaths due to outdoor air pollution 80% are attributed to heart disease and stroke and 20% to respiratory illnesses and cancers. For household pollution, acute respiratory diseases in children and chronic obstructive pulmonary disease are the most serious consequences, followed by heart disease and stroke. Indoor and outdoor air pollution together cause about one-fifth of the global mortality from stroke and ischaemic heart disease, and more than one-third of deaths from chronic obstructive pulmonary disease.

7. Air pollution and in particular its fine particulate component have recently been classified as a cause of lung cancer by IARC,² which had already classified diesel combustion and the burning of coal (two main causes of household and ambient air pollution) as the source of carcinogens. Around 30% of all lung cancer deaths can be attributed to the joint effects of household and ambient air pollution.

8. More than half the deaths due to pneumonia in children aged under five years can be attributed to household air pollution, making it a leading factor putting children's health at risk.

9. Cohort studies also have reported significant associations between air pollution and lung function development, respiratory infections and asthma in young children. There is also consistent evidence on the association between exposure to air pollution with birth outcomes, including low birth weight, preterm birth and small for gestational age births.³

10. The impacts of both acute and long-term exposure to air pollution on health are substantial, but those resulting from long-term exposure are much greater than those observed for short-term exposure, suggesting that damage is due not just to exacerbation of underlying diseases but also to their progression. Numerous large follow-up studies that adjust for the effect of other factors such as tobacco smoking, diet or physical activity have consistently shown that long-term exposure to fine

¹ Commonly defined as particles with an aerodynamic diameter of less than 2.5 µm.

² Straif K, Cohen A, Samet J, eds. Air pollution and cancer. IARC Scientific Publication No. 161. Lyon, France; International Agency for Research on Cancer; <http://www.iarc.fr/en/publications/books/sp161/index.php> (accessed 2 December 2014).

³ WHO Regional Office for Europe. Review of evidence on health aspects of air pollution – REVIHAAP Project: technical report. Copenhagen; Regional Office for Europe; 2013.

airborne particulates leads to increased incidence of premature mortality due to cardiovascular disease, chronic obstructive respiratory diseases as well as lung cancer.¹

STRATEGIES FOR REDUCING HEALTH IMPACTS OF AIR POLLUTION

11. Most sources of both ambient and household air pollution are directly influenced by the choice of energy technologies and fuels used, the energy efficiencies of homes and transport systems, and patterns of energy transmission and distribution. Therefore, the prevention of diseases related to air pollution depends on the implementation of specific sectoral policies that reduce air pollution at point of source (for instance, in energy and power generation, transport, urban planning, buildings, industry and agriculture). As most sources of air pollution co-exist, the relative importance or proportional contribution of specific sources in a particular setting needs to be identified in order to direct mitigation efforts appropriately for the greatest benefits to health.

12. The relative contribution of different sources in terms of the policy responses of specific sectors, however, remains unclear. The use of cross-sectoral approaches to health, such as health in all policies, can help to clarify these contributions and related opportunities for more joint action. In the context of social determinants of health, such approaches can also ensure appropriate consideration of relevant equity issues. The fact that policy options for tackling air pollution are specific to context and place – as are the health impacts of those decisions – provides further incentive for cooperation across sectors towards identifying and adopting local policies.

13. Integral to strategies to control the damaging effects of air pollution on health is the setting of clear health benchmarks, targets and reporting mechanisms for monitoring the effectiveness of air pollution control measures. WHO's air quality guidelines for both ambient² and indoor air quality³ provide benchmarks, which are considered by most countries when setting goals for clean air. However, promoting successful prevention needs intermediary and process targets, for instance through sectoral policies known to reduce air pollution most harmful to health with new targets, for instance for adopting clean-energy sources for lighting in homes, rapid transit systems, and safe walking and cycling. Process-related targets may track the use of tools such as health impact assessments in decision-making on air pollution policy. The establishment of intermediary and process targets can also provide an incentive for intersectoral engagement.

14. Cities in particular are well placed to reduce air pollution and its associated health impacts, as they concentrate in one setting sources of pollution (transport, industry, buildings and even households – in some developing countries up to one third of outdoor air pollution comes from inefficient use of energy in households). Municipalities often have powers to influence policies and investments in more energy-efficient land use, transport, buildings and energy systems, and the health sector can contribute to identifying and communicating the healthier policy options for communities.

15. Emerging clean-energy technologies, including renewable energies such as solar and wind power, offer opportunities to reduce energy poverty while facilitating a shift to cleaner sources,

¹ WHO Regional Office for Europe. Review of evidence on health aspects of air pollution – REVIHAAP Project: technical report. Copenhagen; Regional Office for Europe; 2013.

² WHO air quality guidelines for particulate matter, ozone, nitrogen dioxide and sulfur dioxide – global update 2005: summary of risk assessment. Geneva: World Health Organization; 2006 (document WHO/SDE/PHE/OEH/06.02).

³ WHO indoor air quality guidelines: household fuel combustion. Geneva: World Health Organization; 2014.

particularly at the community and household levels. Business models are needed to support wide-scale and sustained adoption of such technologies, particularly in low- and middle-income settings.

16. The same technologies that produce large air pollution emissions also tend to contribute more to climate change, through both long-term (for example CO₂) and short-lived air pollutants, such as methane and black carbon. There are, therefore, synergies between reducing air pollution and mitigation of climate-changing emissions. For example, the same heating, lighting and cookstove technologies that reduce household emissions of black carbon also reduce overall levels of fine particulate matter and other health-damaging pollutants, leading to direct health benefits.

17. As reductions in exposure to air pollution can rapidly improve health, reduced disease incidence can be an indicator of the effectiveness of measures undertaken. For example, bans on the use of coal for domestic heating in Dublin were quickly followed by reductions in mortality; reductions in industrial and motor vehicle emissions due to economic restructuring after the reunification of Germany led to reductions in the incidence of respiratory diseases and improvements in lung function in children.

18. At regional and global levels, and in particular in the context of discussions on the post-2015 sustainable development goals, reducing air pollution can be a health-relevant indicator in sustainable development policies, particularly with regard to sustainable transport, sustainable cities and clean energy.

THE ROLE OF THE HEALTH SECTOR AND MEMBER STATES IN ADDRESSING AIR POLLUTION AND HEALTH ISSUES

19. Preventing the ill-effects of air pollution depends on intersectoral action. The health sector needs to engage with a range of other sectors at national, regional and international levels in order to provide authoritative advice about those sectors' policy options that will yield the greatest benefits to health.

20. In supporting such engagement health ministries can play major roles, such as the following.

(a) **Connecting health statistics to data on levels and sources of air pollution.** National statistics on morbidity, mortality and the use and costs of health care services are often not linked to data on air pollution or its sources (such as electricity production, transportation, heating and cooling of buildings, cooking and lighting). A targeted effort to analyse and communicate those linkages can bring together the relevant sectors, through sharing of information about interventions that simultaneously reduce air pollution and promote health.

(b) **Strengthening monitoring of health outcomes related to air pollution.** Activities could include the development of associated indicators (namely impacts on health attributable to air pollution) and reinforcing links between monitoring systems used for air quality, health, weather and climate.

(c) **Identifying expected risks to and benefits for health of policy interventions in the most polluting sectors, so as to identify interventions with the most health benefits.** Evidence from the use of existing tools, such as health impact assessments, can be used to support debate and decision-making. Reviews of existing national regulation and policies in polluting sectors can also be used to document their current health impacts.

- (d) **Engaging in health diplomacy at national, local and international levels.** Discussion with more polluting sectors could identify policies for reducing air pollution, lead to proposals for cooperation in order to identify those with greatest health benefits, and promote tracking of progress using health measures of performance.
- (e) **Identifying research priorities and supporting investigation of effective interventions in polluting sectors.** Such activity should focus on research to identify policies with most health benefits, including support for the establishment or strengthening of national institutions capable of conducting such research.
- (f) **Communicating widely sector policies that offer the most health benefits, and cooperating on communication strategies at global, national and local levels.** The aim would be to clarify and strengthen the health sector's contribution to the adoption of policies that bring the greatest improvements to health and to generate popular interest and demand for such policies.

FACILITATION OF MEMBER STATE ACTION ON AIR POLLUTION AND HEALTH BY THE SECRETARIAT

21. WHO's core role is to provide the health sector evidence, guidance and technical support and to facilitate its greater engagement with other sectors that are the primary polluters. Activities so far have included: the development of guidelines (for instance, on ambient air quality and household fuel combustion); global monitoring of solid fuel use by households, household air pollution and ambient urban concentrations of particulate matter in 1600 cities worldwide; and synthesis of knowledge on good practice (for example, health risks and benefits of transport, housing and energy policies). WHO also engages in health diplomacy and represents health interests in multisector forums such as the Climate and Clean Air Coalition to reduce Short-lived Climate Pollutants, the Global Alliance for Clean Cookstoves, and the United Nations Secretary-General's Sustainable Energy for All initiative. The underlying principle is to strengthen support to Member States, amplifying the health sector's ability to lead and influence change, mainly through activities such as:

- (a) **consolidation and sharing of evidence and lessons learnt** about the effectiveness of different sectors' policy measures and interventions to reduce air pollution and improve health outcomes;
- (b) **monitoring and reporting on national, regional and global trends**, including: the burden of disease attributable to outdoor and household air pollution, broken down by population group, and more systematic monitoring and reporting of reductions in air pollution and improvements in health associated with implementation of specific sustainable development policies in for example cities and/or the transport, energy, housing or agricultural sectors;
- (c) **provision of capacity building and technical support**, for example, in: assessing the burden of disease attributed to air pollution in a given context or setting; applying health in all policies or health impact assessments; issuing guidance for the identification and selection of air pollution policies most beneficial to health; and fostering health sector engagement in relevant wider intersectoral processes;
- (d) **exercising leadership in wider global efforts to tackle air pollution**, while maximizing synergies with programmes in related areas, such as climate change and sustainable energy, and forging appropriate links with existing global health initiatives;

- (e) **continued promotion of evidence-based guidelines** that inform norms and standards and thereby influence national, regional and global benchmarks and targets for indoor and outdoor air quality, and strategies and policies where evidence of pollution reductions and health benefits is most robust.

ACTION BY THE EXECUTIVE BOARD

- 22. The Board is invited to note the report.

= = =