The WHO guides on assessing the environmental burden of disease

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This guide is the first in a series about estimating the disease burden of environmental risk factors. It provides an introduction to the environmental factors that pose a risk to health, and outlines the general methods used to estimate the disease burden of these factors. It also introduces the Global Burden of Disease (GBD) concept (Murray & Lopez, 1996), describes National Burden of Disease (NBD) studies (Mathers et al., 2001) and provides a summary of environmental health indicators.

Other guides in the series focus on specific risk factors and on how to assess the associated disease burdens (Box 1). It is hoped that the guides will help to strengthen local capacity in the analysis and interpretation of environmental health data, and assist with decision-making at national level.

Box 1: Risk factors covered in the guides*

- Ambient air
- Indoor air
- Lead
- Water, sanitation and hygiene
- Climate change
- Occupational factors:
  - injuries
  - noise
  - carcinogens
  - dusts
  - ergonomic stressors
  - sharps injuries in health-care workers
- Nutrition
- UV radiation
- Recreational water-quality
- Fluoride in drinking-water
- Arsenic in drinking-water
- Nitrates in drinking-water
- Community noise
- Poverty

* The disease burden of the risk factors listed to the left in Box 1 has been assessed at global level (WHO, 2002), together with that of 16 other risk factors from areas such as lifestyle, diet-related risks, use of addictive substances, unsafe sex and unsafe health practices (Ezzati et al., 2003).

1.1 Objective of the guides

The objective of the guides is to provide practical information to countries on how to assess what fraction of a national or subnational disease burden is attributable to an environmental risk factor. To assess the disease burden of a risk factor, the harmful effects of the risk factor on human health must be estimated fully, as well as the distribution of the harmful effects in the population. Any estimates and assumptions used in the assessment should be stated explicitly. The outcome of the assessment is information that can be used: to guide policies and strategies both in the health sector and in the environmental sector; to monitor health risks; and to analyse the cost-effectiveness of interventions. For example, the information can highlight the contribution of major environmental risk factors to the total disease burden of a country or study population. Or, it can be used to estimate changes in the disease burden and avoidable disease burden, following interventions to reduce an environmental risk factor or to change behaviour.
More generally, an assessment of the environmental burden of disease (EBD) can be used to raise awareness and strengthen institutional capacity for reducing the impact of environmental health risks on the population. The EBD can be assessed for an entire country, or applied to the subnational level (e.g. a city or district), provided basic data are available for the chosen perimeter. EBD studies complement NBD studies, as well as studies of other behavioural or physical risk factors, such as alcohol intake, high levels of blood cholesterol, and unsafe sex.

1.2 **Target readership**

The target readership includes professionals, such as researchers in universities, government agencies or the private sector, and decision-makers at national or regional level, who are interested in quantitatively estimating the health impacts of environmental risk factors.

1.3 **Content of this series**

The Introduction (Sections 1–4) addresses the relevance of an EBD assessment to policy, as well as to the larger framework of environmental health assessment, management and evaluation. The general method for assessing the disease burden of a risk factor is also critically reviewed, as are alternative methods, and specific issues are evaluated, such as the units of measurement of disease burden, health valuation, and discounting of future outcomes. There is some guidance on adapting the methods to local needs and circumstances.

Further volumes in the series are composed of guides that help professionals quantify the EBD from some specific environmental risk factors. In these volumes, practical steps are described for performing the quantitative assessments of risk, and for processing the risk data into burden of disease (BoD) data. Data requirements are also given.

Of particular concern are the uncertainties around estimates and the interpretation of results. These issues are addressed in Section 4, and also in the volumes on specific risk factors. In the Annexes, global EBD estimates are given for 10 major environmental risk factors, including 5 occupational risk factors. The data are shown by region, by gender and for 8 age groups.

1.4 **Adapting the guides to specific needs**

The guidance provided in the series can be adapted to a country’s specific needs, to available data sets, or to the desired degree of accuracy. If more locally-specific data, or new exposure-response relationships become available, these can also be used to complement or update the evidence given in the guides for the various risk factors.

1.5 **Improving the evidence base**

Over the past 10-20 years, significant progress has been made in the evidence base that links environmental risks to health. This was possible owing to new methods in data analysis, and to improvements in computer capacity and performance. Global databases on environmental conditions have also been developed recently. However, there has also been an increase in the level of awareness and concern about environmental degradation or change, and about the short-term and long-term impacts on health. A measure of the
progress that has been made is that, two decades ago, it probably would not have been
possible to implement the EBD methods proposed in this series.
A developing evidence base also means that the methods proposed in the EBD guides
should be updated as new links between health and the environment are uncovered. The
new information could help to improve the accuracy of quantitative linkages between
health and the environment, or improve the geographical applicability of data, or better
describe the health impacts on poorly-assessed subgroups in a population (e.g. women, or
people in a particular age range).

1.6 What evidence is missing?
Although current evidence on the relationship between exposure and disease is solid
enough to develop quantitative estimates of the disease burden for a number of
environmental risk factors, many other risk factors have not been well documented. In
particular, it is easy to overlook risk factors with long latency periods or nonspecific
outcomes; factors with exposures that are difficult to assess at population level; and factors
that are distal to the outcome. And the absence of data does not necessarily mean that the
BoD is negligible or absent. The results of risk factor assessments should therefore be
interpreted with caution, and BoD assessments should be regarded as the best current
estimates of the magnitude of health problems due to environmental factors.

1.7 Related activities
An assessment of the BoD by risk factor (which includes an EBD assessment) is closely
linked to an assessment of the BoD by disease. Indeed, an EBD assessment is best
performed after a NBD study has been developed (Mathers et al, 2001), but a prior NBD
assessment is not essential for an EBD assessment.