Country profiles -- sources & explanation

The country profiles contain selected summary information on key environmental risks to health that is available globally, and estimates of population health impacts. Such estimates are approximate, but may serve to point to disease prevention opportunities.

Introduction

The country profiles provide an overview of summary information on selected parameters that describe the environmental health situation of a country, as well as a preliminary estimate of health impacts caused by environmental risks. Such preliminary estimates can be used as an input to more refined estimates of a country's health impacts. A more detailed description of the background to the different sections and the data sources are described below.

Demography, development and basic health statistics

*Population:* The data source is the UN Population Division, World Urbanization Prospects: The 2005 Revision, Urban Population\(^1\).

*GNI/capita:* The data source is the World Bank Development Indicators 2008, the World Bank online database\(^2\) (accessed on January 8, 2009). Adjusted for purchasing power parity, in international dollars, for the year 2007 (or indicated if different).

*% urbanization:* The source is UN DESA, Population Division: World Urbanization Prospect - the 2005 Revision \(^1\).

*% urban population in cities > 100'000 & national capitals:* The data source is the World Bank (2000)\(^3\), with extrapolation for 2005. The extrapolation assumes the same increase as the (total) urban population\(^1\).

*Population below poverty line (national and international):* World Bank Development Indicators 2006, the World Bank\(^4\).

*Under age 5 mortality rate:* World Health Statistics 2008, WHO\(^5\).

*Life expectancy:* World Health Statistics 2008, WHO\(^5\).

Environmental burden for selected risk factors, per year

*Water, sanitation and hygiene:* Improved water refers to the coverage by an improved drinking water source, and improved sanitation refers to coverage by an improved sanitation facility. Source: WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation\(^6\); coverage data are for the year 2004. Improved drinking water sources include piped water into dwelling, plot or yard; public tap/standpipe; tubewell/borehole; protected dug well; protected spring; and rainwater collection. Improved sanitation facilities include flush or pour-flush to piped sewer system, septic tank or pit latrine; ventilated improved pit latrine; pit latrine with slab; and composting...
toilet. Estimates of deaths and DALYs from diarrhoea attributable to water, sanitation and hygiene are based on the methods outlined in the WHO Environmental Burden of Disease Series No. 14 on Water, Sanitation and Hygiene, using the mentioned WHO/UNICEF exposure data and WHO estimates of national health data.

**Indoor air:** SFU% household refers to the proportion of population using solid fuels. Source: WHO (Millennium Development Goals, including World Health Survey 2003 results. Estimates of deaths and DALYs from acute respiratory infections (children under age 5), chronic obstructive pulmonary disease (adult over 30 years) and lung cancer (adult over 30 years) attributable to indoor smoke from solid fuels are based on the methods outlined in the WHO Environmental Burden of Disease Series No. 4 on Indoor smoke from solid fuels. The present estimates differ from the ones previously published in 2007 in the country profiles in that the burden attributable to smoking was not removed from the chronic obstructive pulmonary disease and lung cancer health statistics prior to the multiplication with the attributable fraction. Smoking is an important risk factor for these diseases and so far the calculations of the estimates had been done conservatively. Inputs include the above-mentioned MDG exposure data and WHO estimates of national health data.

**Outdoor air:** Mean urban PM10 refers to the mean concentration in the year 2002 of fine suspended particles of less than 10 microns in diameters. These particles are able to penetrate deeply into the respiratory tract and therefore constitute a risk for health. The mean is a population-weighted average for urban population in cities above 100 000 inhabitants of a country. The data are from/based on (a) the Global Model if Ambient Particulates (GMAPS) developed by the World Bank (estimates for 1999 and 2002), (b) European Air quality Database (Airbase), EEA (monitored data for 2003) and (c) WHO PAHO (monitored data 2002-2004). The exposed population considered includes the urban population living in cities with more than 100'000 inhabitants and national capitals (see description and source above). Estimates of deaths and DALYs (in this case, DALYs consist only of years of life lost to premature mortality, YLL) include respiratory infections and diseases, lung cancer, and selected cardiovascular diseases attributable to outdoor air pollution. They are based on the methods outlined in the WHO Environmental Burden of Disease Series No. 5 on Outdoor air, using the exposure data and WHO estimates of national health data. See Annex 1 for additional details on EBD calculations.

**Note on additivity of disease burden attributable to risk factors:** The disease burden for selected risk factors represents the burden that could be prevented if the particular exposures were removed. This means that in principle the same burden could be reduced by acting on different risks, and therefore the burden from the various risk factors listed should not be summed up (unless only one of the risk factors is taken into account when certain diseases are impacted more than once). In the current case, where only acute respiratory infections are addressed twice (by outdoor air and solid fuel use), the overestimate is likely to be minor, as solid fuel use is mainly an issue in rural areas and outdoor air in urban areas.
Note on uncertainty in environmental disease burden estimates:
A number of potential sources of error may flow into the estimates of environmental burden of disease. These can come from (a) the measure of exposure, (b) the exposure-risk relationship, (c) the assumptions made in the applicability of the exposure or exposure-risk relationship to the country of concern and (d) the health statistics. While it is generally not possible to estimate a formal confidence interval (given that the uncertainty of the various data sets are not always known), it is possible to estimate a range of possible values the environmental disease burden may take (a sort of sensitivity analysis), based on different input parameters and assumptions. Such an analysis is not provided in the preliminary country profiles of environmental burden of disease, but should be performed in the national process of reviewing these profiles. Elements for performing such a sensitivity analysis are provided in the guides documenting the methods for estimating the disease burden7,9,10,12,13.

Main malaria vectors of the genus Anopheles: The main malaria vector present in the country. Source: WHO14. See Annex 2 for criteria for including vector species in these profiles.

Main other vectors: Main other vectors relevant to health present in the country. Source: WHO14. See Annex 2 for criteria for including vector species in these profiles.

Preliminary estimates of environmental burden of disease
The health data presented in the second part – total number of deaths and DALYs per capita and percentage of the national burden of disease attributable to the environment – represent the disease burden that could be avoided by modifying the environment as a whole1. These estimates are to be seen as approximate estimates that may feed into a country's own process to estimate their environmental burden of disease, and can be refined/validated. They are based on WHO estimates of national health data8 and on regional attributable fractions estimated by literature review/expert survey15. The latter work builds on previous efforts that WHO has undertaken to estimate the global estimates of burden of disease caused by 26 risk factors, published in the World Health Report 200216, and involves a systematic review of literature as well as surveys of over 100 experts worldwide. The report gives, for 85 out of the 102 major diseases and injuries classified by WHO, the fraction of disease that can be attributed to the environment and that could be prevented.

The lowest and highest country rates are the rates in the best and worst performing countries, expressed in DALYs per 1000 capita. The visual scale displays where the country is situated in terms of the specific disease burden attributable to the environment, in comparison to other countries (the visual scale represents the ratio of the country rate and the range between the lowest and the highest country rate).

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1 Definition of the modifiable environment: air, soil and water pollution with chemicals and biological agents; ultraviolet and ionizing radiation; built environment; noise, electromagnetic fields; occupational risks; agricultural methods, irrigations schemes, anthropogenic climate changes, ecosystem degradation; Individual behaviors related to the environment (e.g. hand washing).
Other indicators

*Use of leaded gasoline:* Indicates whether leaded gasoline was sold, in the year 2008. Data source: meta-data analysis conducted by WHO of reported start and end dates of outphasing of leaded gasoline\textsuperscript{17,18,19,20,21,22,23,24}, completed by web searches for particular countries.

*Overcrowding:* Percent of people living in overcrowded dwellings (i.e. more than two people per room), at national level. Data source: World Development Indicators 2006, The World Bank\textsuperscript{4}.

*Malnutrition:* Prevalence of stunting (<-2 SD height-for-age from WHO standard median) in children 0-60 months. Source: WHO Global Database on Child Growth and Malnutrition\textsuperscript{25}. 
Annex 1: Technical details for estimating the burden from outdoor air pollution

Particulate matter
Particulate matter estimates. Monitored PM10 data were preferred over modelled data. When monitored data were available, an urban\textsuperscript{ii} -population weighted mean was calculated for the given country. If data for only one city was available, these were used with the estimates from the World Bank\textsuperscript{3} for the other cities.

Conversion factor PM10/PM2.5. The conversion factors recommended in the EBD Series on Outdoor air\textsuperscript{12} were used for the national EBD estimates, i.e. 0.5 for developing countries, 0.65 for developed countries and 0.73 for Eur-A countries.

Exposure-health outcome relationship
The log-linear exposure-risk relationship recommended in the EBD Series on Outdoor air\textsuperscript{12} was used to quantify diseases related to long-term exposure.

Deaths and DALYs
The deaths and DALYs that are presented are those that can be avoided if the Air Quality Guidelines (AQG)\textsuperscript{26} values of PM10=20\,μg/m\textsuperscript{3} and PM2.5=10\,μg/m\textsuperscript{3} were implemented (used as counterfactual values). I.e. the presented burden is not strictly the disease burden due to outdoor air pollution, but rather the burden that can be reduced by implementing the AQG.

\textsuperscript{ii} Urban population in cities >100'000 habitants and national capitals.
Annex 2: Criteria for the selection of vector species included in the country profiles on the environmental burden of disease

The distribution of vector-borne diseases is inherently linked to the distribution of vector species, the majority of which are insects. The distribution of vector species, in turn, is associated with the distribution of different ecosystems. The distribution of some vector species is restricted by highly specific ecological requirements, that of other vector species stretches over different ecosystems as they are more versatile in their ecological needs.

Similar to the variations in environmental receptivity to disease vectors, there also are important variations in the sensitivity of vectors to environmental management measures, i.e. environmental modification and environmental manipulation. Intensity of disease transmission is another determinant of the practical feasibility of environmental interventions.

For some vector-borne diseases, particularly those of a viral origin, other factors may influence the distribution, such as cross-immunity between different viruses. In the case of dengue, for example, the low incidence of outbreaks in East Africa cannot be explained by an absence of disease vectors, which are abundantly present. In a number of countries where malaria has been eradicated successfully, the anopheleine vector species (and, therefore, the potential for malaria transmission should the appropriate parasite species be re-introduced) remain present.

The country profiles focus on environmental determinants of burden of diseases that can be managed by human action. The vector-borne diseases included in these profiles are those reported on routinely in the summary WHO global burden of disease analyses. These include: malaria, lymphatic filariasis, leishmaniasis, onchocerciasis, dengue and Japanese encephalitis.

Not included are: the trypanosomiases (sleeping sickness in Africa), other vector-borne virus diseases (yellow fever, various encephalitides, Chikungunya virus, O’nyongnyong virus), louse-borne infections (typhus, trench fever and borreliosis), tick-borne diseases (encephalitides, Crimean-Congo haemorrhagic fever, borrelioses, rickettsioses), mite-borne rickettsiosis, flea-borne diseases (plague, murine typhus) and loiasis.

Based on the above considerations, the following criteria were applied in listing the vector species in the list of risk factors of the country profiles:

1. only vectors of the vector-borne diseases routinely reported on in the summary WHO global burden of disease analysis are included;
2. of the malaria vector species, only the primary vectors are listed;
3. malaria vectors are only specified for countries where malaria causes a measurable disease burden
4. The dengue vector *Aedes aegypti* is distributed world-wide, *A. albopictus* has a more limited distribution – the dengue vectors are not specified in the individual lists.
References

1. UN DESA, Population Division: World Urbanization Prospect - the 2005 Revision.
8. World Health Organization.. Global burden of disease.. Available at: www.who.int/healthinfo/global_burden_disease/estimates_country.
25. www.who.int/nutgrowthdb/database/en