Environmental Health Indicators: Frameworks for understanding risks

Carolyn Stephens
Senior Lecturer
Public and Environmental Health Research Unit
London School of Hygiene & Tropical Medicine
What are EH indicators

Indicators that are most relevant are those that represent the link between environment and health.

Link can be looked at in two ways:

• ‘backwards’ from health to environment (the environmental contribution to the health outcome of concern)

• ‘forwards’ as the link from environment to health (the potential risks to health from exposures to a specific environmental hazard) (Briggs 2003)
World

Disease burden (DALYs) in 2000 attributable to selected leading risk factors

- Underweight
- Unsafe sex
- Blood pressure
- Tobacco
- Alcohol
- Unsafe water, sanitation and hygiene
- Cholesterol
- Indoor smoke from solid fuels
- Iron deficiency
- High Body Mass Index
- Zinc deficiency
- Low fruit and vegetable intake
- Vitamin A deficiency
- Physical inactivity
- Risk factors for injury
- Lead exposure
- Illicit drugs
- Unsafe health care injections
- Childhood sexual abuse
- Urban air pollution

Number of Disability-Adjusted Life Years (000s)

- High Mortality Developing Countries
- Low Mortality Developing Countries
- Developed Countries
EH indicators: What for and what they enable

Aims to establish a harmonized and evidence-based system to support public health and environmental policies (in Europe)

- monitoring the environment and health situation and its trends in the countries and evaluating the effectiveness of relevant policies;
- making comparisons between the countries on the basis of relevant targets set in the European-wide action programmes;
- regular reporting on environment and health to support decision-makers and also providing citizens and professionals with access to information;
- exchanging information, data and knowledge as well as good practice examples benefiting public health and the environment. (WHO 2006)
Models to link environment and health

• DPSEEA Driving forces (D), that lead to pressures on the environment (P), which in turn change the state of the environment (S), resulting in human exposures (E1) and thence to health effects (E2). Actions (A) may then be taken at any point in this chain to mitigate or avoid unwanted health effects.

• MEME Multiple Exposures and Multiple Effects

• CDC have another set, many governments develop their own
• The DPSEEA model has much to commend it, and it has been widely adopted across the world. It was conceived, however, primarily to describe associations between ambient environmental pollution and health. It is far less appropriate when used in relation to other sorts of environmental hazard (such as natural hazards, vector-borne diseases or physical accidents), or in other environments of exposure (such as the home) (Briggs 2003)
Indicators for decision-making: A study in 6 cities

Information:

- Quality of existing information
- Use of information to make decisions
- Political motivation
- Technical capacity
- Participation
- Need to create information systems
### Examples of “Core” EH indicators in Europe (based on WHO 2006)

<table>
<thead>
<tr>
<th></th>
<th>Air Quality</th>
<th>Radiation</th>
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</thead>
<tbody>
<tr>
<td><strong>Driving force</strong></td>
<td>Passenger-transport demand by mode of transport; Freight-transport demand by mode of transport; Road transport fuel consumption</td>
<td></td>
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<tr>
<td><strong>Pressure</strong></td>
<td>Pollutant emissions to air</td>
<td></td>
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<tr>
<td><strong>State</strong></td>
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<tr>
<td><strong>Exposure</strong></td>
<td>Exposure to air pollutants: Population-weighted annual average concentration of PM10, PM2.5, O3; Exceedence of air quality limit values for NO2, SO2</td>
<td></td>
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<tr>
<td><strong>Effect</strong></td>
<td></td>
<td>Incidence of malignant melanoma</td>
</tr>
<tr>
<td><strong>Action</strong></td>
<td>Policies to reduce environmental tobacco smoke exposure</td>
<td>Effective environmental monitoring of radioactivity</td>
</tr>
</tbody>
</table>
Multiple Exposures; Multiple Effects (WHO 2006)
Understanding Multiple Risks to Children

- ARI example
- Children living in poverty
- Exposure
  - Children living in homes using biomass fuels
  - Mean annual PM$_{10}$ exposure of children
- Health outcome
  - Mortality rate for children aged 0-4 years due to acute respiratory illness
- Actions
  - Provide public education
  - Improve ventilation in housing
  - Use fuel-efficient stoves
  - Provide access to medical treatment and facilities
  - Use antibiotics or other

Contexts
Indicators of What?

WHO Europe
- Air Quality
- Noise
- Housing
- Traffic Accidents
- Water and Sanitation
- Chemical Emergencies
- Radiation

CDC
- Air outdoor
- Air indoor
- Disasters
- Lead
- Noise
- Pesticides
- Sun and ultraviolet
- Toxics and waste
- Water ambient
- Water
Children’s Environmental Health Indicators

- Perinatal illnesses — including low birthweight, stillbirths and congenital malformations.
- Respiratory diseases — including pneumonia, tuberculosis and asthma.
- Diarrhoeal diseases — including rotavirus infections, E. coli infections and cholera.
- Insect-borne diseases — especially malaria.
- Physical injuries — including traffic accidents, poisonings, drowning, falls and burns.

  — Briggs 2003
Intervention Indicators (CDC 2006)

- Programs that address motor vehicle emissions
- Alternate fuel use in registered motor vehicles
- Availability of mass transit
- Policies that address indoor air hazards in schools
- Laws pertaining to smoke-free indoor air
- Compliance with pesticide application standards (among pesticide workers)
- Compliance with operation and maintenance standards for drinking water systems
Millenium Indicators - EH?

- Proportion of population in malaria-risk areas using effective malaria prevention and treatment measures (UNICEF-WHO)
- Carbon dioxide emissions per capita (UNFCCC, UNSD) and consumption of ozone-depleting CFCs (ODP tons) (UNEP-Ozone Secretariat)
- Proportion of population using solid fuels (WHO)
- Proportion of population with sustainable access to an improved water source, urban and rural (UNICEF-WHO)
- Proportion of population with access to improved sanitation, urban and rural (UNICEF-WHO)
Indicators for environmental burdens of disease

Indicators in Use in Europe

- Politics of indicator use
- Stage of DPSEEA
- What exactly does it measure?
- Whose action follows it?

http://www.enhis.net/report/indicator.php?indicator=traf_e1
EHIs Issues and Challenges

Use of existing data
- Quality
- Quantity
- Disaggregation
- Measures the real problem?
- Indicators for new problems?

Policy challenges
- Points to action?
- Helps policy or politically problematic?
- Community based or topdown?