Environmental and occupational epidemiology

The environment in which we live and work strongly influences the causation of disease and injuries.

Exposures to environmental factors can be quantified as a “dose” which is used to establish dose-effect and dose–response relationships.

Health impact assessments are used to forecast the likely health impact of major human interventions in the environment.

Injury epidemiology has been used to identify which specific preventive actions are most likely to be effective.

Environment and health

The human environment consists of very basic elements: the air we breathe, the water

we drink, the food we eat, the climate surrounding our bodies and the space available for our movements. In addition, we exist in a social and cultural environment, which is of great importance for our mental and physical health

Most diseases are either caused or influenced by environmental factors

Environmental factors that may affect health

- Factors Examples

Psychological Stress, unemployment, shiftwork, humanrelationships

Biological Bacteria, viruses, parasites

Physical Climate, noise, radiation, ergonomics

Accidental Hazardous situations, speed, influence of

alcohol, drugsChemical Tobacco, chemicals, dust, skin irritants,food additives

Impact of exposure to environmental factors

Between 25% and 35% of the global burden of disease may be caused by exposure to environmental factors.

The major health problems are associated with unsafe drinking water and sanitation, indoor air pollution due to biomass energy use for cooking and heating, and urban air pollution from motor vehicles and electric power generation.

High burden in low-income countries

The environmental disease burden is much higher in low income countries than in high-income countries, although in the case of certain noncommunicable diseases, such as cardiovascular diseases and cancers, the per-capita disease burden is larger in high-income countries

Hierarchy of causes in environmental and occupational health

Driving forces behind current health-environmenttrends

- Population dynamics
- Urbanization
- Poverty and equity
- Science and technology
- Consumption and production patterns
- Economic development

Major human activities affecting environmental quality

- Household wastes
- Fresh water
- Land use and agricultural development
- Industrialization
- Energy

Poor environmental quality: exposures and risks

- Air pollution
- Food
- Soil
- Housing
- The workplace
- The global environment

Evaluation of preventive measures

The main emphasis in environmental and occupational epidemiology has been on studies of the causes of disease. Specific preventive measures to reduce exposures and the impact of occupational health services also need evaluating. Exposure to hazardous environmental factors is often the result of some industrial or agricultural activity that brings economic benefit to the community, and the costs of eliminating these exposures can be considerable

Exposure and dose

Epidemiological studies on the effects of environmental

factors often deal with very specific factors that can be measured quantitatively. The concepts of exposure and dose are therefore particularly important in environmental and occupational epidemiology.

Exposure has two dimensions: level and duration. For

environmental factors that cause acute effects more or less immediately after exposure starts,

Epidemiological research on the health effects of climate change

Emerging large-scale risks to population health are:

- global climate change
- degradation of arable land
- depletion of fisheries
- widespread shortage of fresh water
- losses of species and ecosystems.

In epidemiological studies, all kinds of estimates of exposure and dose have been used to quantify the relationship between an environmental factor and the health status of a population

Biological monitoring

If the environmental factor under study is a chemical, the exposure level and dose can sometimes be estimated by measuring the concentration in body fluids or tissues.

This approach is called biological monitoring. Blood and urine are most commonly used for biological monitoring, but for certain chemicals other body tissues and fluids

may be of particular interest: hair is useful for studies of exposure to methylmercury from fish; nail clippings have been used to study arsenic exposure

Risk assessment

Risk assessment is a term with a variety of definitions, but the intuitive interpretation is that it is some form of assessment of the health risk of a defined policy, action or intervention. WHO has produced numerous guidelines and methods for doing risk assessments, particularly in relation to chemical safety.

Health impact assessment

Health impact assessment can be considered as a risk assessment focused on a specific population or exposure situation, while risk assessment has a more general application, answering such questions as: “What type of health risk can this chemical potentially cause in certain exposure situations?” Health impact assessment is now widely recommended as a method to assess the potential value of different preventive policies and actions.

Risk management

The term risk management is applied to the planning and implementation of actions

to reduce or eliminate health risks.

Environmental health impact assessment

In recent years, increased attention has been given to environmental impact assessment(predictive analysis) and environmental audit (analysis of the existing situation)of industrial or agricultural development projects. These procedures have become legal requirements in many countries. The health component of these environment assessments has been labelled environmental health impact assessment and is an important application of epidemiological analysis in environmental health. Such assessment is also used to predict potential health problems in the use of new chemical or technologies

There are several steps to assist in an overall environmental risk assessment: Identify which environmental health hazard may be created by the technology or project under study. Are there chemical hazards? If so, which specific chemicals are involved? Are there biological hazards? (see Table 9.1)Analyse the type of health effect that each hazard may cause (hazard assessment).The information can be collected in systematic reviews of the scientificliterature (in the same manner as a Cochrane review of treatments for specificdiseases, as outlined in (Chapter 3) for each hazard or by referring to internationalhazard assessments, such as the Environmental Health Criteria Seriesor the Concise International Chemical Assessment Documents published byWHO, the Monograph Series published by the International Agency for Researchon Cancer (IARC) and, if necessary, complementing this informationwith epidemiological studies of people exposed to the hazards in question.

Measure or estimate the actual exposure levels for the people potentially affected,including the general population and the workforce. The humanexposure assessment should take into account environmental monitoring,biological monitoring and relevant information about history of exposure and changes over time.

- Combine the exposure data for subgroups of the exposed population with thedose–effect and dose–response relationships for each hazard to calculate the likely health risk in this population.