

HEALTH IMPACT ASSESSMENT

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Summary

Health impact assessment (HIA), as suggested by the name, assesses potential impacts on health. The techniques can be applied to virtually anything – policies, programs or projects. The main aim of HIA is to predict health issues before any policy, program, or project is implemented and hence influence the decision-making process, with the objective that negative impacts can be mitigated and positive impacts enhanced.

This chapter, which draws on the book entitled “Health Impact Assessment for Sustainable Water Management”, provides an introduction to HIA and outlines determinants of health, the values behind HIA, the use of qualitative and quantitative data and the HIA process. It illustrates these with two case study examples relating to water management in very different settings.

1. Introduction

Health impact assessment (HIA) is a relatively straightforward concept; it aims to predict health impacts *prior* to the implementation of a project, program or policy, with the aim of minimizing negative health consequences and maximizing the positive ones. In the past, development was generally undertaken without even an informal assessment of possible health impacts; largely because health was considered to be the exclusive responsibility of the health sector. This issue is surprising because there is strong evidence that improvements in overall health outcomes are directly related to improvements in non-health infrastructure areas, such as housing, water and sanitation, transportation, and information and communication (e.g. as much as 44% of the burden of disease in sub-Saharan Africa). As a result, a range of negative health impacts added a preventable burden of ill-health to the lives of vulnerable population groups. In addition, development projects failed to capture the enormous community and population health benefits that could be harnessed by tapping the cross-linkages between health and key non-health sectors. As noted more than a decade ago, in 1995 at the Pan American Conference on Health, Environment and Sustainable Development: *“Health cannot be attained by the health sector, either alone or even primarily”*.

Negative health impacts include, for example, the spread and intensification of vector-borne disease transmission, particularly schistosomiasis, and to some extent dengue, lymphatic filariasis and malaria, associated with hydropower projects and irrigation schemes, intensification of dengue transmission following the introduction of storage jars for drinking water in Viet Nam, arsenic poisoning as a result of using naturally contaminated boreholes for supplying drinking water in Bangladesh and psycho-social disorders resulting from forced resettlement out of reservoir or irrigation scheme areas. With increasing demands for ‘sustainable development’ and the acknowledgement that the greatest scope for improving public health lies outside the traditional medical profession (which tends to focus on individual-level illness management), HIA has become an important instrument to manage and mitigate possible health implications in advance of any development.

HIA aims to provide an estimation of possible health impacts (positive or negative; intended or unintended; direct or indirect; single, multiple or cumulative). While HIA is predominantly qualitative, for certain issues and if resources allow, it is possible to provide quantitative estimates (see Sections 3.2 and 4.1.4) of impact (with varying levels of uncertainty). It can be used to define health safeguards, mitigation measures and health promotional activities for the design, construction and operational project phases. Moreover, a sound HIA of a project, program and policy can guide subsequent public health management plans. Thus, HIA supports minimization and mitigation of predicted health risks and makes it possible to take optimal advantage of health opportunities.

2. Definitions of Health and Health Impact Assessment

2.1. Health

The definition of health adopted greatly affects the subsequent HIA. There are two

broad paradigms:

- the reductionist ‘biomedical’ approach, where health is considered within a series of disease categories (e.g. communicable disease, non-communicable disease, nutrition, injury, mental disorder, etc.) and the health sector structure and operations deal with these through the delivery of health services; and
- the ‘social model’ where health is considered to be “*a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity*”.

The philosophical differences in these definitions have important ramifications in the practical application of HIA to infrastructure development projects, particularly in developing world settings. Impact assessment, whether environmental or social, tends to focus on specific effects that arise out of, or because of, a proposed project, program or policy. Impact assessment of health, faces a similar problem of defining the range and scope of potential effects as a function of the underlying paradigm used to frame the definition of health. The social model leads to a far more expansive consideration of health determinants; however, there is a strong likelihood of considerable overlap with existing environmental and social assessments. In addition, many industrial project proponents and lending institutions have balked at what is perceived to be an overreaching and redundant assessment of “health” impacts. This debate is far from settled and is primarily focused on the social determinants of health, since a range of complex factors (i.e. determinants) are acknowledged to play a role in community health. It is these determinants that are affected by proposed policies, programs and projects. HIA aims to readily predict the changes in determinants. At issue is how broad the consideration of determinants should be across the universe of proposed projects, programs and policies.

2.2. Determinants of Health

The broad definition of health, outlined above, adopted by the World Health Organization (WHO) some 60 years ago can be illustrated by considering the determinants of health as outlined in Table 1. From this Table it can, however, be seen that virtually every area of human activity influences health.

Determinant	Examples
Fixed	Genes
	Gender
	Age
Social and economic	Poverty
	Employment
	Social exclusion
	Community structure and infrastructure
Lifestyle and behavior	Diet

	Physical activity
	Smoking
	Alcohol
	Sexual behavior
	Drugs
	Coping skills
Access to services	Education
	Health services
	Social services
	Transport
	Leisure
Environment	Air quality
	Noise
	Housing
	Water quality
	Social environment
	Risk of injury

Table 1. Example determinants of health

In the systematic approach used in an HIA, the existing health hazards and health promoters are identified, as well as new hazards/promoters that may be introduced as a result of a project, program or policy. Changes in the determinants of health have an impact on the probability (i.e. risk, or in the case of health promoters: opportunity) that the hazard or promoter leads to a change in health status. Individual and community vulnerability, environmental receptivity (both physical and social environment) and the capacity of the health services are the main categories of determinants under which items from Table 1 can be grouped. Using work initiated by the World Bank in the mid-1990s, a focus on environmental health and non-health sector linkages has been applied to HIA. The ‘environmental health areas’ (EHAs) are an attempt to combine the biomedical and social models of health. There is a strong public health focus on the cross-linkages between health and non-health sectors. The EHA framework is illustrated in Table 2. In 2008, the EHA framework has been adopted by the International Finance Corporation (IFC) within their “Good Practice Notes” for community health project performance standards.

	Environmental health area
1	Housing and respiratory issues – acute respiratory infections (bacterial and viral), pneumonias, tuberculosis; respiratory effects from housing,

	overcrowding, housing inflation
2	Vector-related diseases – malaria, schistosomiasis, dengue
3	Veterinary medicine/zoonotic issues – brucellosis, rabies, bovine TB, bird-flu etc.
4	Sexually transmitted infections – HIV/AIDS, syphilis, gonorrhea, Chlamydia, hepatitis B
5	Soil, water and sanitation related diseases – giardiasis, worms, water access and quality, excrement management
6	Food and nutrition related issues – stunting, wasting, anaemia, micronutrient disease (including folate, Vitamin A, iron, iodine), changes in agricultural and subsistence hunting/fishing/gathering practices, gastroenteritis (bacterial and viral), food inflation
7	Accidents /injuries – road traffic related, spills and releases, construction (home and project related) and drowning
8	Exposure to potentially hazardous materials – pesticides, fertilizers, road dusts, air pollution (indoor and outdoor related to vehicles, cooking, heating or other forms of combustion/incineration), landfill refuse or incineration ash, any other project related solvents, paints, oils or cleaning agents, by-products or release events
9	Social determinants of health – psychosocial, resettlement/relocation, violence, security concerns, substance misuse (drug, alcohol, smoking), depression and changes to social cohesion
10	Cultural health practices – role of traditional medical providers, indigenous medicines and unique cultural health practices
11	Health services infrastructure and capacity – physical infrastructure, staffing levels and competencies, technical capabilities of health care facilities at district levels; Program management delivery systems – coordination and alignment of the project to existing national and provincial level health programs (e.g. TB, HIV/AIDS) and future development plans
12	Non-communicable disease – hypertension, diabetes, stroke, cardiovascular disorders and cancer

Table 2. Environmental Health Areas used in HIAs

All of these systems are designed to create some type of matrix that can be composed that sets hazards against determinants and provides qualitative insights as to whether or not, for each hazard, risk levels will be increased, reduced or remain the same (see Section 4.2).

2.3 Health Impact Assessment

Impact assessment has been defined by the International Association for Impact Assessment as: “*Impact assessment, simply defined, is the process of identifying the future consequences of a current or proposed action*”. There are numerous definitions of HIA (some of which are more prescriptive than others), as outlined in Table 3 and probably as many (if not more) ways of performing the actual assessment, and it is widely accepted that there is no single ‘correct’ way to perform an HIA.

Definition	Year of publication
A combination of procedures, methods and tools by which a	1999

policy, program or project may be judged as to its potential effects on the health of the population and the distribution of those effects within the population.	
A means of evidence based policy making for improvement in health. It is a combination of methods whose aim is to assess the health consequences to a population of a policy, project, or program that does not necessarily have health as its primary objective.	2000
A multi-disciplinary process within which a range of evidence about the health effects of a proposal is considered in a structured framework, ... based on a broad model of health which proposes that economic, political, social, psychological and environmental factors determine population health.	2001
Can best be described as a decision-making tool, one that is designed to take account of the wide range of potential effects that a given proposal may have on the health of its target population. Thus, it is a process that: considers the scientific evidence about the relationships between a proposed policy, program or project and the health of a population; <ul style="list-style-type: none"> • takes account of the opinions, experience and expectations of those who may be affected by a proposed policy decision; • highlights and analyses the potential health impact of the proposed policy decision; • enables decision makers to make fully informed decisions and to maximize positive and minimize negative health impacts; and enables consideration of health inequalities. 	2001
Is a developing approach that can help to identify and consider the potential – or actual – health impacts of a proposal on a population. Its primary output is a set of evidence-based recommendations geared to informing the decision making process.	2002
Provides a structured framework to map the full range of health consequences of any proposal, whether these are negative or positive. It helps clarify the expected health implications of a given action, and of any alternatives being considered, for the population groups affected by the proposal. It allows health to be considered early in the process of policy development and so helps ensure that health impacts are not overlooked.	2002
A combination of procedures, methods and tools that systematically judges the potential and sometimes unintended effects of a policy, plan, program or project on the health of a population and the distribution of those effects within the population. HIA identifies appropriate actions to manage those effects.	2006

Table 3. Definitions of HIA

In addition to prompting the maximum health of a population, four values are important for HIA, namely:

- **Democracy**, emphasizing the right of people to participate in a transparent process for the formulation, implementation and evaluation of policies, programs or projects that affect their life, both directly and through elected political decision makers.
- **Equity**, emphasizing that HIA is not only important in relation to the aggregate impact of the assessed policy on the health of a population but also on the distribution of the impact within the population, in terms of gender, age, ethnic background and socio-economic status, accounting for vulnerable groups (see Table 4).
- **Ethical use of evidence**, emphasizing that the use of quantitative and qualitative evidence has to be rigorous, and based on different scientific disciplines and methodologies to get as comprehensive an assessment as possible of the expected impacts.
- **Sustainable development**, emphasizing that both short- and long-term, as well as direct, indirect and cumulative impacts are taken into consideration.

There are a number of factors that make some people more vulnerable to health impacts, as illustrated in Table 4.

Factor	Effects
Age	The very young and very old are more likely to acquire infections due to naïve or waning immunity and, once infected, are more likely to develop severe outcomes. The elderly may be more anxious about unfamiliar systems or maintenance requirements.
Pre-existing disease	A person with AIDS or severe combined immunodeficiency syndrome is likely to suffer far more severe symptoms with cryptosporidiosis and some other infectious diseases
Genetic	People with certain genotypes are more likely to experience complications, such as joint problems, following gastrointestinal infections
Gender/pregnancy	Certain infections are more severe in pregnancy, either increasing the risk of fatality for the woman, or damage to the fetus
Behavior	Behavior patterns, such as performing unsafe sex

Table 4. Selected factors leading to inequality of health risk

3. The Health Impact Assessment Process

The HIA process consists of procedures (i.e. a sequence of steps that need to be systematically applied) and methods (for each step, specific methods have been developed that can be applied in relation to the specific conditions for a given HIA). Thus, procedure is about management and method is about technique, which may include screening checklists and frameworks.

The basic steps of the HIA procedure include:

- **Screening**, a desk-based preliminary exercise applied to a proposed project, program or policy, to decide whether investing in full-scale HIA is warranted.
- **Scoping**, a process setting the temporal and spatial boundaries for the HIA, identifying the range and types of potential negative and positive health effects considering specific phases of the project and identifying vulnerable population groups (see Table 4). The output of the scoping process can be utilized as a basis for a formal set of terms of reference for the full HIA.
- **Assessment**, the actual hazard identification, risk assessment and impact synthesis process, followed by the formulation of conclusions and recommendations for safeguards, mitigating measures and health promotion (normally carried out by consultants). An important issue for HIAs in developing country settings is the lack of baseline data.
- **Appraisal**, the quality control component of HIA, focusing on the objectivity, comprehensiveness and evidence-base of the HIA and on the technical soundness, social acceptability and economic feasibility of proposed measures. This is normally carried out by the government regulator in the Ministry of Health.
- **Formulating and prioritizing recommendations**, consolidation of recommendations into a public health management plan, with well founded arguments to obtain the necessary resources.
- **Negotiation**, with the Ministry of Finance over allocation of funds for the different components of the public health management plan, and with the proponent and other relevant line ministries over the institutional arrangements determining roles and responsibilities for the plan's implementation.
- **Implementation of the public health management plan**, the key activity is monitoring of compliance with the agreed plan, of the health status of affected communities longitudinally, and of the effectiveness of proposed mitigation measures.

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Biographical Sketches

Lorna Fewtrell is a senior research fellow within the Centre for Research into Environment and Health at Aberystwyth University in Wales. She has built on her background of biochemistry and toxicology by extending into the health and environment field and specializes in drawing together information from a wide range of sources. She has worked on the Global Burden of Disease and also with the World Health Organization on risk harmonization in relation to water-related guidelines. Her recent work involves HIA (with an emphasis on using quantitative approaches) in relation to sustainable water management and she has recently co-edited an IWA book on this subject.

Gary R. Krieger has been involved in multiple public and environmental health evaluations, HIA and risk assessments in an international setting. Krieger has collaborated on, and contributed to, key International Finance Corporation (IFC) guidance on HIA for industrial projects in developing country settings, including the 2007 Good Practice Notes for Performance Standard #4 “Community Health,” 2008 “HIA Toolkit” for environmental and social specialists, and the 2008 Good Practice Note on “Influx Management.” He co-authored the 2005 International Petroleum Industry Environmental Conservation Association (IPIECA) Guidelines for HIA in the oil and gas industry. Krieger has co-authored, edited and published two editions of a large textbook on medical toxicology of hazardous materials. In addition, Krieger has edited both editions of the book on environmental practice for the National Safety Council. He has also co-edited the text on Occupational Health for the Safety Council. He has been a co-editor of three additional Occupational Safety and Health books for the National Safety Council and a guest editor of the Medical Clinics of North America, Occupational and Environmental Medicine. He is certified in Toxicology, Occupational Medicine, Internal Medicine and has a Diploma in Tropical Medicine and Hygiene (DTM&H) from the London School of Hygiene and Tropical Medicine.

Jürg Utzinger is a Tenure-Track Assistant Professor in Epidemiology and heads the Ecosystem Health Sciences Unit at the Swiss Tropical Institute in Basel, Switzerland. He received his PhD degree in epidemiology in 1999 at the University of Basel with a thesis on the epidemiology and control of human schistosomiasis in Côte d’Ivoire. Utzinger was a post-doctoral research fellow with Professor Burton Singer’s group at the Office of Population Research, Princeton University from 2000 to 2004. Utzinger’s research, teaching, and training pertains to the epidemiology and control of tropical parasitic diseases, particularly schistosomiasis, soil-transmitted helminthiasis, food-borne trematodiasis and malaria. He has ongoing collaborative projects in China, Côte d’Ivoire, and elsewhere in Africa and Asia. Over the past five years, Utzinger has also been engaged in HIA of large infrastructure development projects in the developing world and assisted with the initial HIA of the Nam Theun 2 hydroelectric project in Lao PDR and longer term follow-up. Utzinger has done consultancies for the World Health Organization, the Consultative Group on International Agricultural Research and other international organizations. Utzinger has published over 150 scholarly articles and contributed to book chapters. He is deputy editor on PLoS Neglected Tropical Diseases and Geospatial Health, and serves on the editorial board of Acta Tropica and Expert Opinion on Pharmacotherapy.