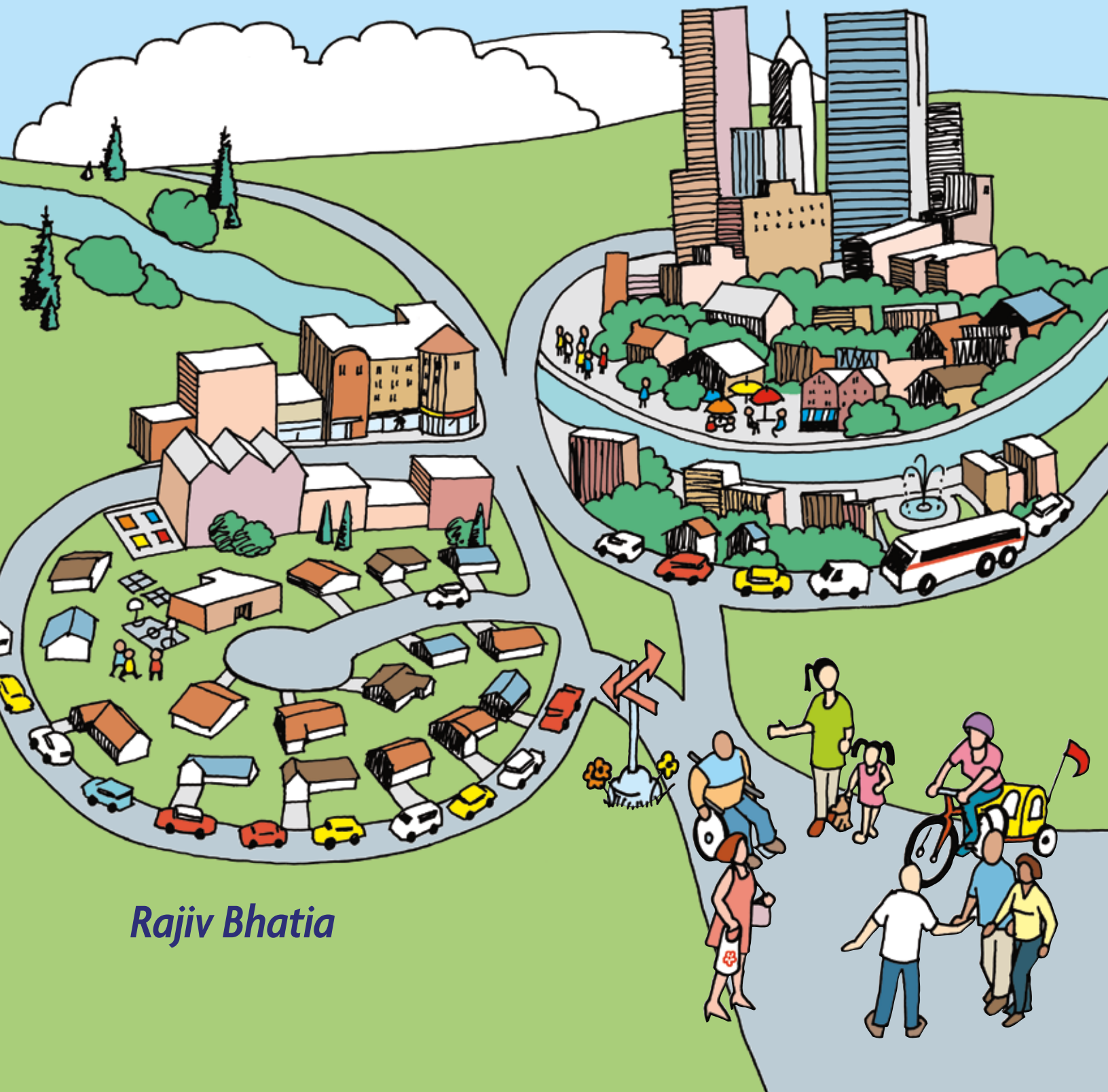


Health Impact Assessment

A GUIDE FOR PRACTICE



Rajiv Bhatia



Health Impact Assessment *A Guide for Practice*



Rajiv Bhatia

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Preface

HEALTH IMPACT ASSESSMENT (HIA) is an emerging practice that aims to bring a greater understanding of human health consequences to public policy and decision-making. The awareness and use of HIA in the United States is rapidly increasing, and this Guide aims to support practitioners in the field, by describing the key tasks and activities for HIA as well as the issues and challenges that arise in the course of practice. The Guide includes illustrative examples from practice, as well as suggestions for stakeholder participation and the integration of health analysis in the environmental impact assessment process.

This Guide is not definitive or exhaustive. The Guide complements other efforts to support high quality HIA practice, including the recently published Practice Standards for Health Impact Assessment developed by the North American HIA Practice Standards Working Group (Appendix I). The Guide is heavily informed by practice that has occurred in San Francisco and in the State of California. Many other articles, guidance documents, case studies, and evaluations provide complementary resources for those interested in the field.

Principles and Values of Health Impact Assessment

From the International Association of Impact Assessment (Quigley 2006)

- **Democracy**—emphasizing the right of people to participate in the formulation and decisions of proposals that affect their lives, both directly and through elected decision-makers. In adhering to this value, the HIA method should involve and engage the public, and inform and influence decision-makers. A distinction should be made between those who take risks voluntarily and those who are exposed to risks involuntarily.
- **Equity**—emphasizing the desire to reduce inequity that results from avoidable differences in the health determinants and/or health status within and between different population groups. In adhering to this value, HIA should consider the distribution of health impacts across the population, paying specific attention to vulnerable groups and recommending ways to improve the proposed development for affected groups.
- **Sustainable development**—emphasizing that development meets the needs of the present generation without compromising the ability of future generations to meet their own needs. In adhering to this value, the HIA method should judge short- and long-term impacts of a proposal and provide those judgments within a time frame to inform decision-makers. Good health is the basis of resilience in the human communities that support development.
- **Ethical use of evidence**—emphasizing that transparent and rigorous processes are used to synthesize and interpret the evidence, that the best available evidence from different disciplines and methodologies is utilized, that all evidence is valued, and that recommendations are developed impartially. In adhering to this value, the HIA method should use evidence to judge impacts and inform recommendations; it should not set out to support or refute any proposal, and it should be rigorous and transparent.
- **Comprehensive approach to health**—emphasizing that physical, mental, and social well-being is determined by a broad range of factors from all sectors of society (known as the wider determinants of health). In adhering to this value, the HIA method should be guided by the wider determinants of health.

1. Introduction

Health impact assessment may be defined as 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.

—ADAPTED BY THE INTERNATIONAL ASSOCIATION OF IMPACT ASSESSMENT
FROM THE WORLD HEALTH ORGANIZATION

HEALTH IMPACT ASSESSMENT, or HIA, is a structured decision-support practice to characterize the anticipated health effects, both adverse and beneficial, of societal decisions. Decisions subject to HIA may include projects, plans, programs, and policies undertaken by government or the private sector. Characteristics of HIA include a broad definition of health; consideration of economic, social, or environmental health determinants; application to a broad set of policy sectors; involvement of affected stakeholders; explicit concerns about social justice; and a commitment to transparency (Quigley et al. 2006). Where appropriate, HIA recommends alternative decision choices and mitigation strategies to ensure that decisions best protect and promote health.

Health and the protection of health are widely shared social values, but the motivation for HIA as a field comes from an understanding that economic, environmental, and social conditions have powerful influences on population health (Terris 1968; WHO 1986; Marmot and Wilkinson 2006; WHO 2008; Graham 2010). In fact, the most important determinants of health and disease are subjects of policy-making in institutional sectors outside the authority of the public health sector (WHO 2008).

Health determinants can be any personal, social, economic, and environmental factors that affect the health of individuals or populations (WHO 1998). The range of health determinants that may be affected by societal decisions are illustrated in Figure 1 on the next page. Health determinants are linked through research to health status measures, including life-expectancy, disease and injury rates, and measures of health care utilization. Considering the health effects of decisions comprehensively requires employing a holistic definition of health and considering a broad set of health determinants.

❖ *Living in a healthy place means having adequate housing; secure and meaningful livelihood; access to schools, parks and public spaces; safety and freedom from violence; unpolluted air, soil, and water; and a society which promotes not only opportunity and innovation but also cooperation, trust, and equity.*

FIGURE 1. THE DETERMINANTS OF HEALTH AND WELL-BEING



The Benefits of HIA

Sound public policy should weigh all important social objectives, including information on both short- and long-term health effects. HIA uses evidence and analysis to identify and characterize the potential harms or benefits to health of alternative decision options, including disproportionate effect on particular populations, and provides a way for the public and decision-makers to learn about the often hidden or unexpected health implications of proposed decisions, and of decision options and alternatives (WHO 1999; Kemm et al. 2004; Cole and Fielding 2007; Collins and Koplan 2009). HIA also recommends mitigations and design alternatives for plans, policies, programs, or projects that can help protect or improve health and prevent health inequities. Providing information and analysis on health effects in the course of a decision-making process may lead to decisions that are more likely to promote or protect health. HIA serves a number of additional closely related purposes, including:

- Ensuring transparency and accountability of decision-making processes that affect health;
- Addressing issues of public controversy and concern, potentially generating greater support for decision implementation; and
- Engaging affected communities in the decision process.

Public health concerns often are a source of controversy in public decisions and HIA provides a way to be responsive to those concerns. HIA serves the needs of social and environmental justice by providing a way to assess and address the health concerns of vulnerable populations through substantive analysis of their issues and engagement with these populations.

HIA findings may identify or motivate beneficial or health-protective changes to the design of a project or policy. These may include targeted mitigation and monitoring measures for adverse health effects or design alternatives that enhance a decision's health benefits. Because HIA may anticipate changes in future conditions important to health, it may be also valuable in planning health and public health service delivery and interventions.

HIA also provides a specific way for affected communities to engage in the decision-making process. Participation of diverse stakeholders in the HIA process can help identify relevant research questions, sources of data and information, and proposals for alternatives and mitigations. Meaningful and inclusive public participation can also ensure that decision-makers focus on issues that are community priorities and make judgments that take into account community values (Stevenson et al. 2006). Because protecting health is a widely shared value, HIA may also identify areas of cooperation among opposing interests and common strategies that apply to diverse interest groups. Furthermore, a transparent accounting of impacts along with mitigations may support buy-in for decision implementation.

Finally, HIA can serve as a tool for building public and institutional awareness about the needs of a health population. As noted by long-time observers of HIA, "Every HIA is undertaken to learn something, though the nature and purpose of that learning is rarely articulated." (Harris-Roxas and Harris 2010) At least three distinct types of learning may occur through HIA: identification of technical solutions to identified problems, the redefinition of problems and goals, and the growth of mutual understanding among stakeholders. As a vehicle for institutional learning, HIA may have important outcomes in the ways decision-makers think about health in policy-making; in the ways institutions integrate health considerations into policy design; and in relationships between the public health community and institutions outside the health sector (see Table 1) (Bekker et al. 2004; Elliot and Francis 2004; Hays and Kitcher 2004). HIA has affected the understanding of private sector actors, including businesses and nonprofit organizations as well, informing their priorities and how they work with others (Corburn and Bhatia 2007; Corburn 2009).

GENERAL PLAN UPDATE, HUMBOLDT COUNTY, 2008

As part of a General Plan update, the Board of Supervisors of Humboldt County in Northern California requested that the public health agency consider the health impacts of three future growth alternatives ranging from restricting development to existing urban areas to allowing continued sprawl. The public health officer consulted with a nonprofit organization to conduct an HIA on the three alternatives, with participation from the planning agency and a community group. The analysis based upon 35 community-prioritized indicators found that the compact development alternative would improve health outcomes related to almost all the indicators, while the sprawl alternative would harm health. The HIA process led to a strong partnership between the planning and health agencies as well as to increased community member participation in the General Plan process. The planning agency used the HIA extensively in forming the policies in the Circulation element and to support infill policies in the Housing Element.

Many open questions exist around nature, mechanisms, and measures of effective HIA practice (Cashmore et al. 2007, 2010; Wismar et al. 2009). HIA is not currently linked to an accountability mechanism requiring action on findings. Nevertheless, in several cases to date, analysis of health impacts appears to have led to the inclusion of health promoting choices, alternatives, and mitigations (Corburn and Bhatia 2007; Bhatia and Wernham 2008; Dannenberg et al. 2008; Corburn 2009).

TABLE 1.
POTENTIAL OUTCOMES OF HIA ON THE DECISION-MAKING PROCESS

Changes to the design, adoption, or implementation of the project/policy
<ul style="list-style-type: none"> • Inclusion of design changes or mitigations to protect or promote health • Adoption of an alternative decision option • Delay of a decision in order to assess health impacts
Changes to societal understanding of the causes of good or poor health
<ul style="list-style-type: none"> • Greater social understanding of relationships among the decisions, environmental conditions, and health • Identification of new priority public health problems • Advocacy of healthy policy interests
Changes to the way health is considered in institutional decision-making practices
<ul style="list-style-type: none"> • Coordination and cooperation among public health and other institutional sectors • Public or institutional support and/or resources for HIA • Adoption of health objectives, indicators, and standards for policy and decision-making

Health Impact Analysis in Existing Governance Institutions

Considering health in societal decision-making is neither a novel nor a radical idea. Health, and the protection of health, already motivates diverse policies, laws, and governmental actions, and several requirements to consider health exist in governmental decision-making structures in the United States.

Human health was a critical part of the vision, policy, and mandate for integrated environmental impact assessment under the 1969 National Environmental Policy Act (NEPA 1969). NEPA requires comprehensive and integrated environmental impact assessments (EIA) of any federal agency actions with potentially significant effects on the human environment. The law provides for a broad definition of the human environment and specifically mandates consideration of human health effects (NEPA 1969). Several state laws, like the California Environmental Quality Act (CEQA), have similar requirements for health analysis in EIA.

Despite the clear statutory requirements, there has been inconsistent and incomplete attention to health effects in EIA practice (Arquiaga et al. 1994; Davies and Sadler 1997; Steinmann 2000; Cole et al. 2004). Nevertheless, the comprehensive consideration of health effects within the existing framework of EIA may still provide a productive and efficient means to evaluate the health

significance of environmental, social, cultural, or economic effects analyzed (Davies and Sadler 1997; Bhatia 2007; Wernham 2007; Bhatia and Wernham 2008). (The interface of HIA and EIA is discussed in Section 4, “The Interface of Health and Environmental Impact Assessment.”)

The assessment of environmental and health impacts of public agency actions is required under mandates for environmental justice. Promulgated in 1994, Executive Order 12898 on Environmental Justice charged all U.S. federal agencies to make achieving environmental justice part of their missions by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the U.S. and its territories and possessions (Clinton 1994). A Presidential memo accompanying the order specifically charged agencies to analyze and mitigate disproportionate environmental and health impacts through the NEPA process (CEQ 1997; Bass 1998; EPA 1998).

Rigorous and quantitative assessments of health impacts are routinely included in regulatory impact assessment at the federal and state levels. Both Congressional and Executive Branch mandate cost-benefit assessment (CBA) of federal regulations (Clinton 1993; Unfunded Mandates Reform Act 1995). Benefits to health can represent a significant fraction of the economic value to environmental regulations (EPA 2000).

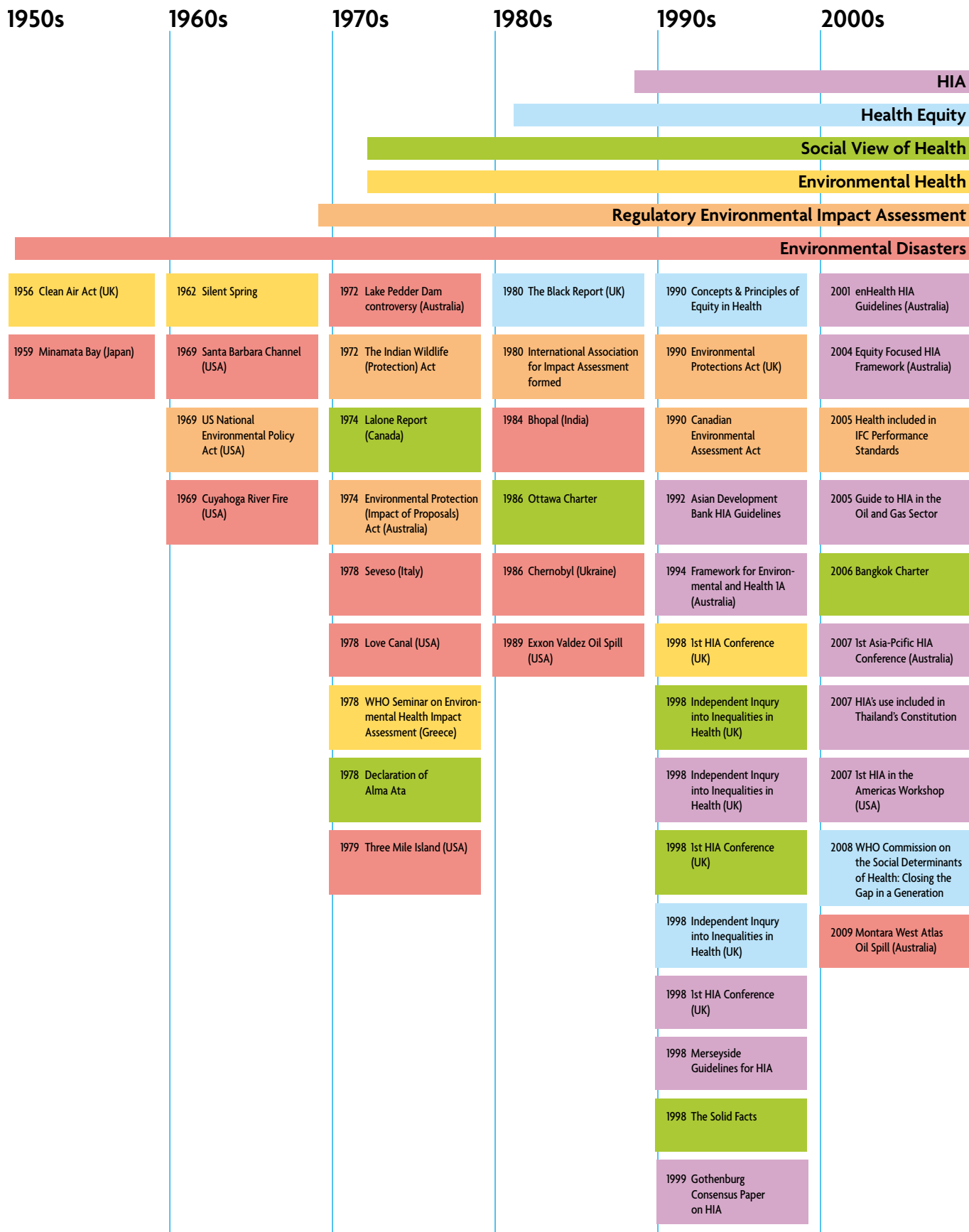
While each of the above institutional requirements address part of the need to consider health in governmental decisions, collectively, they do not encompass the entire range of contexts where health analysis may be appropriate and useful.

Milestones in the Evolution of Health Impact Assessment

HIA emerged as an independent field of practice in response to gaps in existing mechanisms to consider health in institutional decision-making and in response to calls for shared interinstitutional ownership for health promotion (WHO 1986; Harris-Roxas and Harris 2010). As illustrated in Figure 2, HIA is intertwined with the history of both environmental protection and regulation as well as growing attention to the social determinants of health and concerns about health inequities. In 1986, the World Health Organization (WHO) in its Ottawa Charter on Health Promotion, identified *peace, shelter, food, income, a stable ecosystem, sustainable resources, social justice and equity* as the fundamental conditions and resources for health. The Charter urged policy-makers in all sectors to “be aware of the health consequences of their decisions and to accept their responsibilities for health.” (WHO 1986) Furthermore, the Charter called for the “systematic assessment of the health impact of a rapidly changing environment—particularly in areas of technology, work, energy production, and urbanization.” (WHO 1986)

FIGURE 2. MILESTONES IN THE EVOLUTION OF HEALTH IMPACT ASSESSMENT

Adapted from an illustration provided by Dr. Ben Harris-Roxas (University of New South Wales, Australia)



Although components of health impact assessment exist within the practice of EIA, understanding about the breadth of health determinants contributed to calls for HIA as an independent practice. In 1999, the WHO issued a consensus statement on HIA, providing an important measure of legitimacy to the emerging field (WHO 1999).

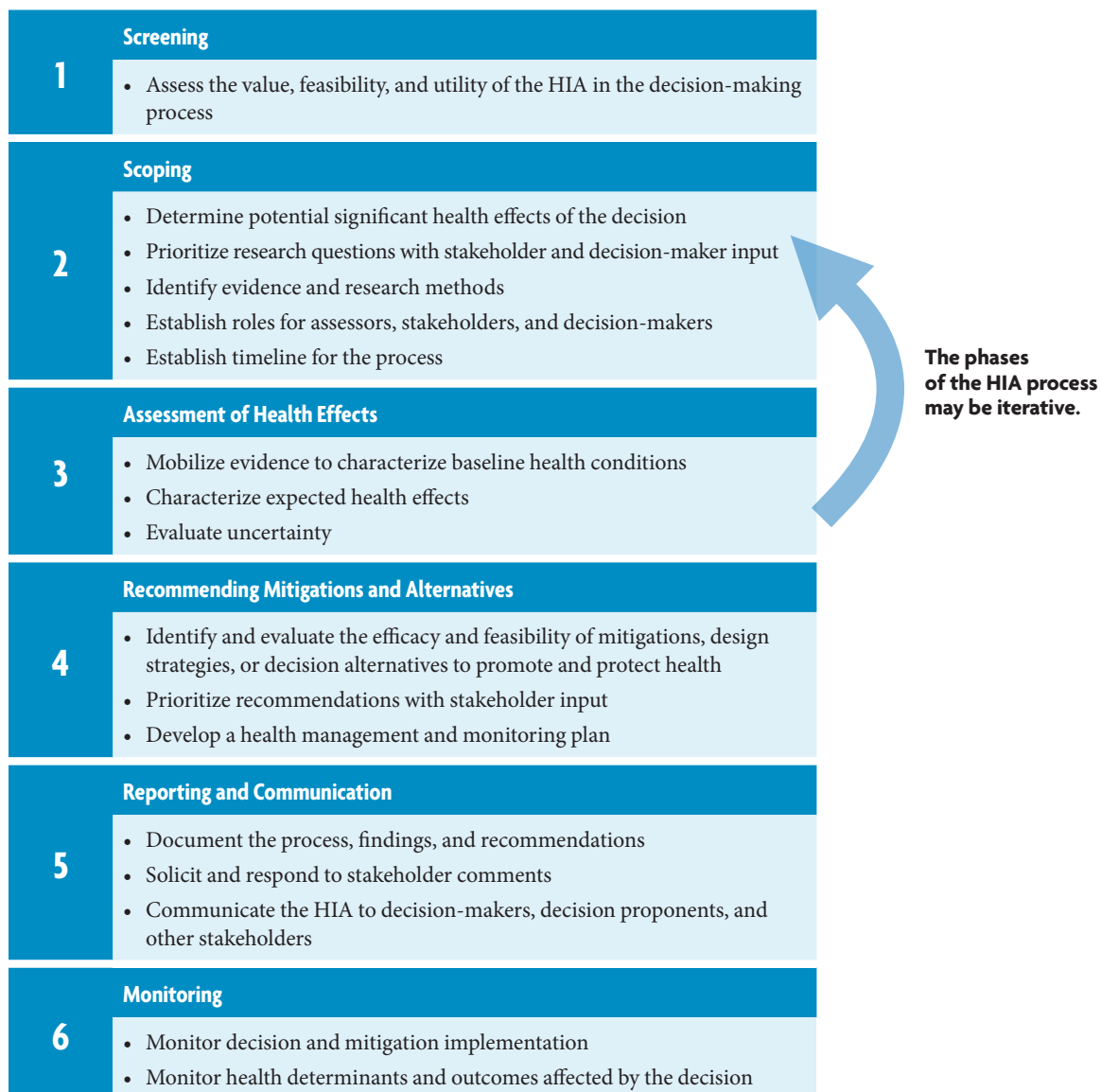
In the past two decades, HIA has evolved to become an independent professional practice internationally. Leadership for HIA has come variously from local government, community organizations, universities, and industries. For example, project proponents and affected communities may ask for HIA based on concerns about a decision's potential health or environmental justice effects or simply to fulfill a community's "right to know." Public health agencies as well as other organizations are increasingly using HIA as one of several means to raise awareness about health determinants, to advance precautionary and health supportive public policy, and to collaborate across institutional and disciplinary sectors. In rare cases, a requirement for HIA has been made for a specific project or regulation (Washington State Legislation SB 6099, 2007; California Global Warming Solutions Act AB 32, 2006).

At present, no general laws or regulations at any government level in the United States explicitly require the conduct of HIA, as described in this Guide. HIA in the United States remains a discretionary activity conducted in limited contexts where there exists *both* capacity and demand for HIA. HIA applications in the U.S. have so far been diverse in terms of approach, methods, and public engagement (Dannenberg et al. 2008). HIA has been used most extensively in areas related to environmental, transportation, and land use planning; HIA has and can be applied to labor, education, criminal justice, food systems, and other institutional sectors. The diversity of applications and the demand for formal institutionalization may change over time as awareness and acceptance of HIA as a practice grows.

2. Steps and Activities in the HIA Process

THE TYPICAL STEPS in HIA are similar to those in many other forms of impact assessment (e.g., environmental, social, and strategic) and include screening, scoping, assessment, recommending alternatives and mitigations, reporting, and monitoring (Quigley et al. 2006; NAPSWG 2010). A description of the essential steps in the process and their relationship to each other is described in figure 3 below.

FIGURE 3. SIX COMMON STEPS IN THE HIA PROCESS



Decision: The Healthy Families Act of 2009 (S. 1152 and H.R. 2460) proposed to guarantee that workers in the United States at firms that employ at least 15 employees accrue at least one hour of paid sick time for every 30 hours worked.

Screening: In Spring 2009, staff from Human Impact Partners and the San Francisco Department of Public Health determined: i) the 2009 Healthy Families Act had significant potential to affect the health of the entire population; ii) the legislation could address health disparities associated with income, class, and occupational status; iii) an HIA could document the breadth, magnitude, and certainty of potential health benefits associated with policies such as paid sick days; iv) an HIA could be completed in a timely manner; and v) the decision-making process would be receptive to an analysis of the health impacts of the proposed legislation.

Scoping: Based on a preliminary review of health research on paid sick days and comments made in public testimony, the authors identified six hypothetical scenarios that illustrated the potential pathways between paid sick days and health outcomes. Based upon the scenarios, the authors selected a set of research questions that focused the evaluation of potential pathways, then developed research methods, workplan, and timeline based on available resources.

Assessment: The HIA was conducted using reviews of existing secondary data sources and empirical literature, analyses of 2007 National Health Interview Survey data, and findings from a California survey and California and Wisconsin focus groups. The authors found that more than one-third of flu cases are transmitted at schools and workplaces each year, and that guaranteed paid sick days would reduce the spread of pandemic and seasonal flu by enabling workers to comply with public health advice if they or their family members show signs of illness. The study found that 48% of private-sector workers,

79% of low-income workers (the majority of whom are women), and 85% of restaurant workers do not have access to paid, job-protected sick days. Researchers found that the workers risked losing much-needed wages or possible termination if they stayed home sick or to care for a sick child, yet risked infecting others if they came to work sick.

According to the Centers for Disease Control and Prevention, nearly 122,000 people fell ill from foodborne disease outbreaks and another 18,030 illnesses occurred in institutional and workplace settings involving an infected food-handler between 2003 and 2007. According to the study, infected workers staying home could reduce the spread of a pandemic flu virus by up to 34%. However without preventative strategies like paid sick days, a serious flu outbreak could kill more than two million people. The HIA acknowledged that although paid sick days would require employers to cover the cost of absence due to illness, there were significant potential savings from reduced disease transmission to other workers and illness-related lost productivity.

Reporting: Report authors developed a four-page summary of report findings and a full report detailing all stages of the HIA, including detailed descriptions of methodology used. HIA findings received national attention after one of the report authors testified at a hearing of the U.S. House Committee on Education and Labor on the proposed legislation.

Outcomes: Before the HIA, the public health value of paid sick days was not broadly recognized. The HIA resulted in greater attention to this value by the media and policy advocates. The HIA also was used by policy advocates in advancing paid sick days legislation at the state and local level.

HIA report available at:
<http://www.humanimpact.org/component/jdownloads/finish/5/68>

2.1 Screening

THE PURPOSE OF SCREENING is to determine the value and feasibility of HIA in a particular decision-making context. Screening starts with the identification of a specific decision or proposal. A decision may be a proposed legislation, regulation, budgetary or fiscal strategy, land use, economic, or resource development plan, or major infrastructure project. Once a decision or proposal is defined, several factors may be considered in assessing the value of HIA (Taylor et al. 2003; NAPSWG 2010):

- The potential for the decision to result in significant effects on population health, particularly those effects that may be avoidable, unequally distributed, involuntary, adverse, irreversible, or catastrophic
- Whether there exists concerns or controversy about a decision's health effects among stakeholders, decision-makers, or the affected community
- How well health effects of the decision are understood and managed absent an HIA
- Whether HIA serves policy or legal requirements to analyze health impacts
- The potential for the findings of HIA to result in changes to a policy plan, policy, or program
- Whether there are resources and technical expertise to conduct an HIA

As the purpose of HIA is to inform and support decision-making, an HIA should be carried out prospectively before a decision is made. The earlier in the decision-making process that an HIA can be carried out, the greater the likelihood that HIA may provide timely information to decision-makers to help understand the consequences of various alternatives.

HIA should focus on decisions where there is the greatest potential for significant (e.g., widely experienced, severe, or inequitable) effects on health. Generating a comprehensive list of health determinants that could be impacted by a proposed decision (see Table 2 below) in the course of screening may support issue or impact identification.

An HIA may have particular value to decision-makers and stakeholders where health effects are uncertain or controversial. An HIA may also be useful when health impacts are scientifically established, but not widely acknowledged or understood by decision-makers, stakeholders, or the public.

The benefit of HIA on decision-making depends upon being able to conduct a sufficient analysis within the decision-making timeframe with available knowledge, methods, personnel, and other resources as well as to present the HIA in a way that is accessible and understandable by decision-makers and stakeholders.

Finally, the influence of HIA depends, in part, on the openness of decision-makers to receiving and acting on the information and their interest in protecting health. Openness is typically greater at earlier stages in the policy or project development process. Where a decision-making process is apparently rigid, an HIA, along with effective communication, may serve to open up the process to new issues and alternatives (see discussion in Section 2.5, “Reporting and Communication”).

Effective screening requires having sufficient information and clarity about the decision, including all alternatives being considered. This means involving those individuals familiar with the decision at hand and the decision-making process. Ideally, screening incorporates decision-makers and stakeholders who may use information produced by HIA.

As other mechanisms may exist for policy-makers to identify, analyze, and manage health concerns, proponents of HIA should always consider whether HIA is the most effective and efficient means to consider health. An HIA may not be warranted where existing regulations protect against a project’s likely health impacts, where a comprehensive planning process is already considering health, or where health effects analysis is being conducted with the context of EIA.

Where there is a decision to proceed with HIA, practitioners should notify all stakeholders including the decision proponent(s), any public officials with regulatory responsibility, and the decision-makers. Practitioners should document the rationale for the HIA, specific objectives, expected participants, and funding sources.

TABLE 2. DETERMINANTS OF HEALTH THAT MAY BE MODIFIED BY PUBLIC OR PRIVATE SECTOR DECISION-MAKING

Domain	Health Determinant
Behavioral Risk Factors	Diet Physical activity / inactivity Smoking Alcohol consumption Drug addiction Leisure and recreational activity
Employment and Livelihood	Employment and job security Income and employment benefits Workplace occupational hazards Workplace rewards and control
Family and Community Structure	Social support / isolation Family structure and relationships Voluntary group participation Arts and culture Faith, spirituality, and tradition Crime and violence
Housing	Housing supply, cost, and accessibility Housing size and level of crowding Housing safety Neighborhood infrastructure and livability Residential segregation
Environmental Quality	Air quality Soil contamination Noise Disease vectors Natural spaces and habitats Floods, wildfire, and landslide hazards Transportation hazards Food resources and safety Water resources and safety
Public Services	Educational access or quality Health care access or quality Transportation Parks and recreational centers Waste systems Police / security and emergency response
Private Services	Financial institutions Retail food resources Child care services
Political Factors	Inequality Social exclusion Discrimination Political participation Freedoms of speech and press

2.2 Scoping

THE PURPOSE OF SCOPING is to identify issues and methods for assessment and communication, including the strategy for stakeholder engagement. Scoping establishes the role and responsibilities of different participants in the HIA. Scoping builds upon screening and answers the following questions:

- Who will conduct the analysis (if not already determined)? Under what oversight?
- What is the timeframe for the assessment?
- Which specific decision alternatives will be evaluated?
- Which potential health impacts will be analyzed?
- What are the geographical and temporal boundaries for impact analysis?
- Who are vulnerable affected populations?
- What data, methods, and analytic tools will be employed?
- How will the HIA characterize health effects?
- Which experts and key informants will be engaged?
- What is the plan for stakeholder engagement and public review of the HIA?
- How will the HIA be communicated and reported?
By whom?

Scoping should generate a research plan responsive to the informational needs of both stakeholders and decision-makers. For example, affected communities may wish to know more about the certainty and magnitude of a health hazard or concern. On the other hand, a decision-making agency may wish to know whether the level of a particular environmental health hazard will remain within a safety standard. The informational needs driving scoping choices should be explicitly stated. The rationale for each issue selection in the scoping process should also be clearly documented.

Like screening, scoping should involve the stakeholders and decision-makers utilizing the results. Involvement of affected communities in HIA helps to identify important health concerns and questions about a decision and provides insights about data and strategies for analysis. Stakeholders can

USE OF A SURVEY TO PRIORITIZE ISSUES ADDRESSED IN AN HIA

In 2009, Human Impact Partners along with community advocacy organizations, a housing developer, and the County Department of Public Health conducted an HIA on a proposed 450-unit housing development in South Los Angeles. The setting of the proposed development was home to a growing population of low- and very low-income families with children. In order to identify and prioritize the health-related needs and concerns of neighborhood residents, the HIA partners developed and implemented a door-to-door survey of nearly 300 community residents. The results of the survey showed that local residents had concerns about how the development would effect:

- the quality and affordability of housing
- pedestrian safety
- neighborhood walkability and access to public transit
- health services
- retail food resources
- quality of schools
- access to parks and recreation facilities

The data from the survey informed the scope of the HIA and provided evidence of existing health conditions. Equally important, the survey served as an outreach tool to engage the community in the planning process for the development.

The final HIA report, including a copy of the full survey can be found at <http://www.humanimpact.org/past-projects>.

provide knowledge and access to data sources. Broad participation also reduces the opportunities for introducing biases related to the interests of particular stakeholders or disciplines. Participants in scoping may want to develop and use a comprehensive list of health determinants (see Table 2 in screening section above) to help to ensure that all potential effects are at least considered in the scoping process.

Scoping requires understanding the available data sources and research methods that can be used during the step of assessment. In this regard, public health expertise is essential in scoping for an HIA as local, state, and federal public health agencies conduct disease surveillance, maintain health data systems (e.g., vital statistics, communicable disease reports) on the baseline health status of affected populations, and identify and understand potential health impacts. Depending on the nature of the decision, scoping requires expertise from various other disciplines, for example, in planning, environmental management, or transportation. These disciplines are necessary for understanding the direct effects of decisions and approaches to estimate these direct effects.

Causal Models: The Basis of Research and Analysis

Causal models (also called causal frameworks or pathway diagrams) have been used in the public health field to describe how environmental and social conditions and risk and resilience factors influence health outcomes (Corvalán et al. 1999; Briggs 2003; Farchi et al. 2006; Briggs 2008). Causal models support the design of both public health research as well as interventions. Each HIA can benefit from constructing a causal model linking the decision under consideration to potentially related human health effects.

Causal models may be thought of as plausible scenarios for what may happen to population health if particular decisions are made. A causal model for HIA includes the decision, pathways and intermediate effects leading to health effects. The causal model forms the basis for research questions, describing the factors to be measured in baseline conditions and estimated in future conditions. Each decision context may call for developing a unique causal model. Three illustrative examples of causal models in HIA are provided in Figure 4 below.

Figure 4 is the causal model used for the San Francisco Road Pricing HIA. As the model illustrates, road pricing increases travel costs and investments in transit infrastructure, which affects in turn the number and type of travel trips, leading to changes in health related conditions. The causal model illustrates five mechanisms through which transportation policy can affect human health

- Changes in access to means of livelihood (e.g., jobs), essential goods (e.g., food, fuel, and water), and essential services (e.g., health care and education)
- Changes in social interactions at a neighborhood level
- Changes in the level of physically active travel (walking and bicycling)
- Changes in the injuries and fatalities in the transport system
- Changes in environmental pollution (noise, air, water) related to system operation

FIGURE 4. CAUSAL MODEL FOR ROAD PRICING HIA

Adapted from: Wier M, Bhatia R, Morris D, McLaughlin J, Comerford-Scully C, Harris M, Bedoya J, Cowles S, and Rivard T. *Health Effects of Road Pricing in San Francisco, California: Findings from a Health Impact Assessment.* San Francisco, CA: San Francisco Department of Public Health, August 2011.

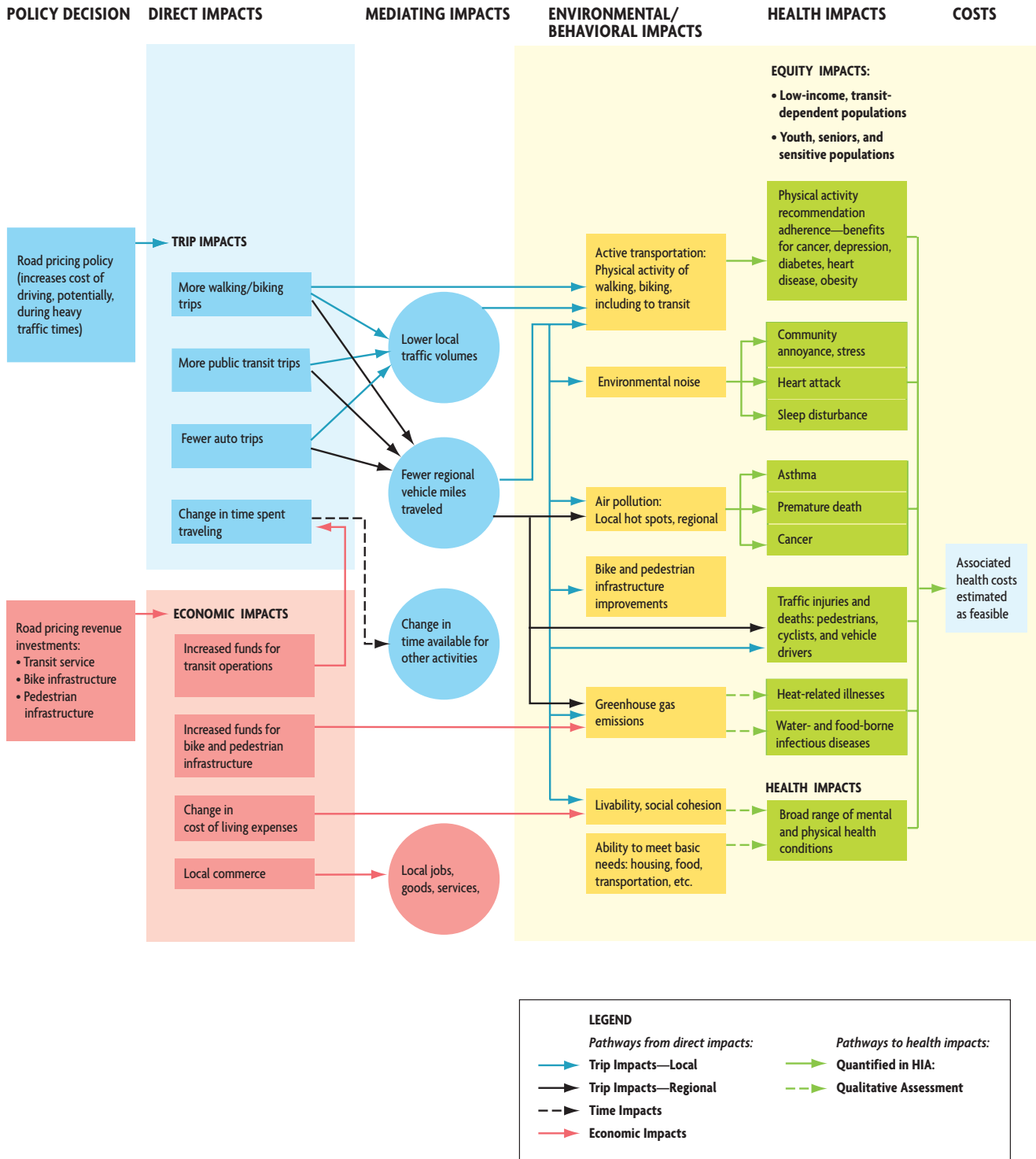


Figure 5 illustrates a causal model for health effects of policy that removes public subsidies for publicly owned housing. The immediate effect is increased housing rents. Indirect effects with relevance for health include housing insecurity, living in substandard housing, overcrowding, or an inadequate household income for essential needs.

FIGURE 5. CAUSAL MODEL FOR HEALTH EFFECTS OF CHANGES IN HOUSING RENTS

Adapted from: Public Health Advisory Committee.
A Guide to Health Impact Assessment: A Policy Tool for New Zealand, Wellington, NZ:
 National Health Committee, 2005.

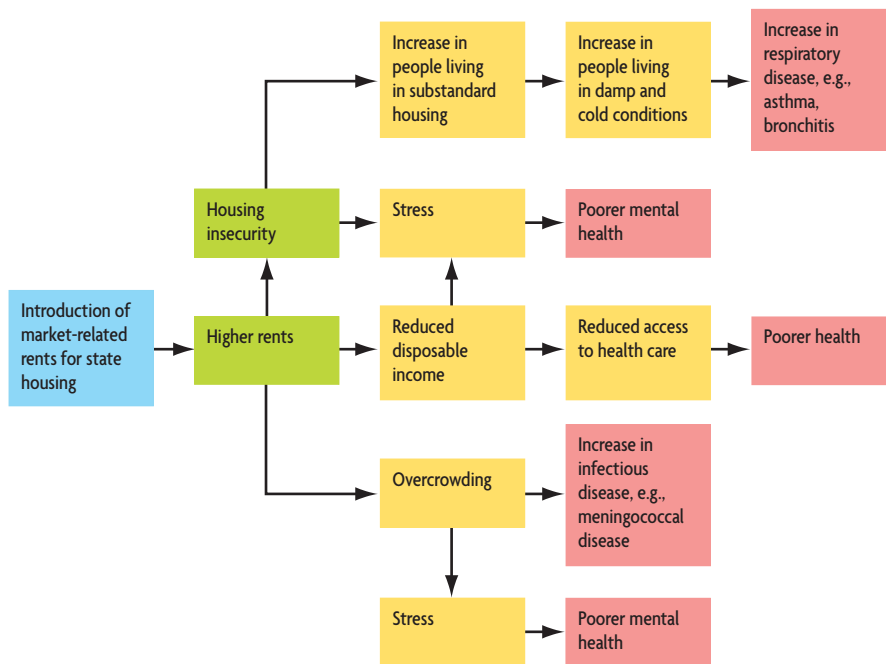
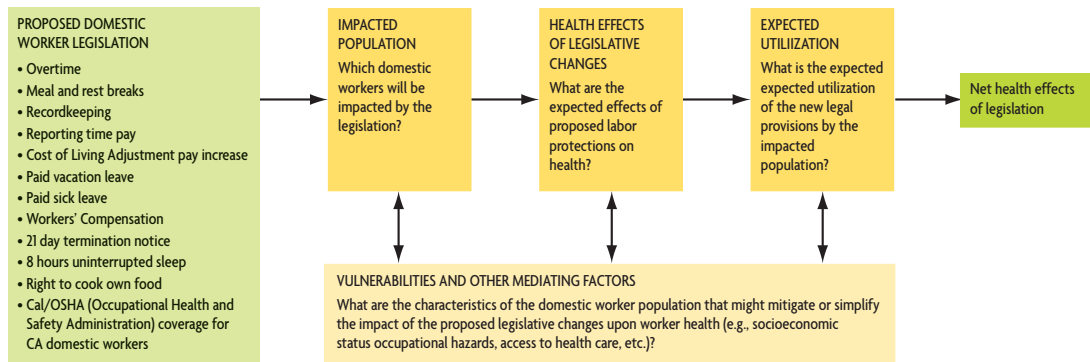


Figure 6 is the causal model for an HIA on legislation, the California Domestic Workers Employee Equity, Fairness and Dignity Act of 2011, that would extend several labor protections to domestic workers. The causal model explained the health effects are a function of:

- The size of the population currently excluded from the labor protection
- The health benefits associated with the protection
- The utilization of the protection by workers
- Vulnerability factors both influencing the need for and benefit from the protection in the specific population and influencing the utilization of the protection

FIGURE 6. CAUSAL MODEL FOR LABOR PROTECTIONS FOR DOMESTIC WORKERS



As illustrated in the examples above, causal models simplify the complex interplay among contextual environmental and cultural factors, human and social behavior, and human biology, integrating theories and empirical research from diverse disciplines. While clearly incomplete representations of the real world, causal models provide important utilities for HIA. Constructing a causal model can help build a collective understanding among experts, stakeholders, and decision-makers about the plausibility of potential effects and their relative importance. Models help prioritize which health issues may warrant or may benefit most from analysis. Models also can reveal the ways the impacts might be modified by contextual factors (conferring vulnerability or resilience). Models may suggest where there exists greater uncertainty with regards to a cause-and-effect relationship or its magnitude. Finally, they identify points for action and may help guide the selection of mitigations and alternatives.

The Range of Practice and Resource Constraints

Overall, there is no “one size fits all” approach to HIA. HIA practice may occur along a broad continuum with regards to the type of decision, the breadth of issues, the available research and research methods, the requirements for stakeholder participation, and opportunity for integration into regulatory processes (see Figure 7). This variation is necessary given that HIA may be conducted on decisions varying from national legislation, to regional resource or infrastructure plans, to local development projects.

FIGURE 7. THE CONTINUUM OF HIA PRACTICE

Conducted by a single expert or institution without oversight or stakeholder participation	Stakeholder participation ↔	Design, oversight and communication conducted with oversight of decision-maker and multiple stakeholders
Conducted independent of all other regulatory and impact assessment processes	Regulatory Integration ↔	Integrated within and exiting regulatory impact assessment process
Utilizes only available published research	Methods/Resources/Time ↔	Original data collection and analysis using quantitative and qualitative methods

While there may be many issues that warrant analysis, resources and capacity are factors that will ultimately influence the scope of issues analyzed and research methods used in an HIA. Undertaking an HIA requires having the necessary technical capacity and resources to collect, analyze, and interpret data; the ability to coordinate involvement of stakeholders; and the ability to communicate findings to decision-makers (Figure 8). Certain methods, such as quantitative modeling or original epidemiological analysis, may require additional time and expertise. Resources or capacity limitations affecting the scope of the HIA should be documented as part of the HIA report.

FIGURE 8. RANGE OF POTENTIAL HIA METHODS ACCORDING TO RESOURCES AVAILABLE

<p>Methods requiring least resources</p> <p>↑</p> <p>↓</p> <p>Methods requiring most resources</p>	<ul style="list-style-type: none"> • Expert opinion • Review of available reports and data • Interviews or focus groups • Systematic literature review • Environmental measurement or modeling • Epidemiologic or spatial analysis • Development or application of quantitative forecasting methods • Original quantitative data collection and analysis
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2.3 Assessment of Health Effects

THE PURPOSE OF assessment is to characterize the potential health effects of alternative decisions based on available evidence. The assessment produces three related outputs:

1. Ascertainment of baseline (existing) conditions in the affected population including health status, health determinants, and vulnerabilities to health effects
2. Characterization of the anticipated health effects of alternative decisions
3. An evaluation of the level of confidence or certainty in the health effects characterization

Assessment builds upon work done in the scoping phase which identifies plausible mechanisms of health effects and the measures and analytic approaches for evaluating these effects. The scoping and assessment phase are often iterative. The research questions, data, and methods selected in scoping may be modified during assessment based upon new information or practical limitations.

It is critical to distinguish between evidence and characterization of health effects, which requires weighing and interpreting evidence. Evidence and information may include available or published data as well as environmental measures and original qualitative or statistical analysis. Several principles for the selection and use of evidence are provided in the IAIA (International Association of Impact Assessment) HIA Practice Principles (Quigley et al. 2006) and the practice standards developed by the North American HIA Practice Standards Working Group (see sidebar and Appendix I). Some of the more common types of evidence and methods in HIA include:

- **Existing population demographic and health statistics** (e.g., census, surveys, vital statistics, surveillance programs, and agency reports) to profile health status and health determinants
- **Environmental measures** to assess hazardous physical agents, such as hazardous substances or contaminants in air, soil, and water; noise; and radiation or hazardous conditions, such as floods, fires, landslides, or injury hazards. Environmental measures are also used to assess public health assets and resources, including water bodies, land, farms, forests and infrastructure, schools, and parks.

PRINCIPLES FOR THE ETHICAL USE OF EVIDENCE IN HIA

- Utilize evidence from diverse sources, including available statistics, empirical research, professional expertise and local knowledge, and the products of original investigations
- Give greater weight to evidence from well-designed and peer-reviewed systematic reviews
- Consider evidence, both supporting and refuting, a priori hypotheses
- Justify the selection or exclusion of particular methodologies and data sources
- Make explicit the assumptions used in making judgments, particularly quantitative estimates of hazards or impacts
- Identify data gaps, uncertainties, and limitations of inferences
- Allow stakeholders to critique the validity of findings

- **Maps** of demographics, health statistics, or environmental measures to identify spatial relationships between places, populations, and environmental conditions and “hot spots” or spatial differences in the intensity of hazards
- **Empirical research**, particularly epidemiological research, to provide evidence to characterize relationships between health determinants and health outcomes and to quantify those relationships when possible
- **Qualitative methods**, including focus groups and structured and unstructured interviews, to help assessors access knowledge or perceptions about conditions, vulnerabilities, day-to-day experiences of community members, and experienced and perceived threats

A Sequential Approach to Health Effects Analysis

While HIA may be conducted on diverse types of decisions, in most cases, impact analysis should still proceed using a logical, replicable sequence. This Guide offers one structured approach for impact analysis that may be applied in diverse decision contexts. The sequence of task leads to characterization of health effects and assessment of uncertainties, allowing for the characterization of health effect magnitude in either quantitative or qualitative terms. Other suggested processes for HIA and HRA (Health Risk Assessment) share similarities with this suggested approach (Fehr 1999; Briggs 2008; NRC 2009).

The sequence of tasks proposed in this approach build from a causal model illustrating one or more discrete pathways from the decision to each hypothesized health effect. (See examples of causal models above.) The sequence is repeated for each health effect selected for analysis from the causal model. The tasks in this sequential approach are identified and defined briefly below and explained in greater detail in the subsequent sections.

Task 1.

Evaluate and weigh evidence of causal effects

- Utilize empirical literature and literature reviews to understand the nature of the relationship between the decision, health determinants, and health effects
- Evaluate whether evidence demonstrates a cause and effect relationship and assess the generalizability of the evidence
- Conduct original research (e.g., surveys, interviews, focus groups, epidemiologic analysis) in affected communities, if needed

❖ Epidemiological studies play a unique role in the assessment of the health risk of environmental factors. Unlike laboratory experiments, epidemiology provides evidence based on studies of human populations under real world conditions. It largely avoids the extrapolations across species and levels of exposure required for the use of data from animal experiments, which contribute large uncertainties. (WHO 2000)

Task 2.

Collect and synthesize data on baseline conditions

- Enumerate and characterize the affected population in the area affected by the decision
- Identify measurable indicators for health determinants and health outcomes, and access and synthesize existing data on these determinants and outcomes

Task 3.

Forecast health effects quantitatively where feasible

- Identify suitable prediction models (e.g., exposure response functions, regression equations, etc.)
- Evaluate whether data are available to estimate effects quantitatively
- Compute estimated health effects for each decision alternative, based on the prediction model, baseline conditions, and changes in risk or resilience factors

Task 4.

Characterize expected health effects

- Characterize the likelihood, severity, magnitude, and distribution of health effects for each decision alternative, using causal models, empirical evidence, the baseline conditions assessment and quantitative forecasting tools

Task 5.

Evaluate the level of confidence or certainty in health effect characterizations

- Judge the confidence in the effect characterization, considering data limitations and assumptions with regards to population enumeration, exposure assessment, exposure assignment, evidence for cause and effect relationships, validity of dose response function, and unmeasured mediating factors
- Evaluate how alternative assumptions may alter effect estimates and characterizations

Table 3 illustrates two work plans for the application of this sequential approach for hypothetical examples, one with and one without quantitative health effect estimates. The first example evaluates the benefits of automated speed enforcement (ASE) cameras on reducing the frequency and severity of pedestrian injuries in an urban area. The second example evaluates the benefits of a mandatory paid sick-leave benefit on the reduction of transmission of a pandemic influenza.

**TABLE 3. ILLUSTRATIONS OF ASSESSMENT METHODS—
EXAMPLES WITH AND WITHOUT QUANTITATIVE FORECASTING**

Step	Effects of Automated Speed Enforcement on Pedestrian Injuries Frequency and Severity	Effects of Paid Sick-Leave Benefits on an Influenza Pandemic
<p>1. Evaluate and weigh evidence of causal effects</p>	<p>Access systematic reviews on automated speed enforcement and speed reduction</p> <p>Synthesize literature on the relationship between travel speed and collision frequency</p> <p>Synthesize literature on impact speed and collision severity</p> <p>Assess literature on roadway and behavioral factors that affect vehicle speed</p>	<p>Synthesize literature on the effect of social distancing measures on reducing pandemic influenza transmission in workplaces and schools</p> <p>Assess utilization of paid sick leave for short-term illness for self and offspring among current beneficiaries</p> <p>Evaluate demographic characteristics of populations with and without benefits</p> <p>Assess literature on the effect of paid sick days on compliance with social distancing strategies</p>
<p>2. Collect and synthesize data on baseline conditions</p>	<p>Enumerate the current resident population and age-specific subpopulations using, for example, census data for the urban area</p> <p>Collect and geo-code available roadway speed data (exposure data) from city monitoring</p> <p>Describe the distribution of urban speeds for road types categorized by speed limits</p> <p>Enumerate frequency of pedestrian injuries in most recent 5 year period and fatalities in most recent 10 year period</p>	<p>Enumerate the national resident population by age, labor participation status, and occupation</p> <p>Enumerate the availability of paid sick leave by occupation and household size</p> <p>Enumerate the population burden of infection from annual influenza epidemics and recent influenza pandemics</p>
<p>3. Estimate Quantitatively</p>	<p>Select exposure and outcome measures: travel speed distribution (exposure) and pedestrian injury collision frequency and pedestrian fatality frequency (outcomes)</p> <p>Estimate the distribution of speeds under several speed reduction scenarios based on evaluation research on speed interventions (including automated speed enforcement, speed limit changes, area wide traffic calming)</p> <p>Select best exposure response functions relating speed changes to changes in collision frequency</p> <p>Select best exposure response function relating impact speed changes to injury fatality</p> <p>Use exposure response functions and alternative exposure distributions to compute injury frequency and fatality rates under alternative scenarios</p>	<p>Quantitative estimation not conducted due to insufficient data</p>

TABLE 3. Continued

Step	Effects of Automated Speed Enforcement on Pedestrian Injuries Frequency and Severity	Effects of Paid Sick-Leave Benefits on an Influenza Pandemic
<p>4. Characterize expected health effects</p>	<p>Evaluate the likelihood (certainty) of changes in speed resulting in changes in injury burdens and injury severity</p> <p>Describe magnitude of changes in pedestrian injury collision frequency under each scenario</p> <p>Describe magnitude of changes in pedestrian fatalities under each scenario</p>	<p>Evaluate the likelihood (certainty) of changes in paid sick days resulting in changes in cumulative attack rates</p> <p>Describe the estimated magnitude of the burden of illness attributable to a novel pandemic influenza strain</p> <p>Using evidence on utilization, judge the effect of paid sick days with compliance with social distancing strategies</p> <p>Provide the range of effect of “stay at home” social distancing policies on reduction in cumulative incidence of flu based on available modeling scenarios</p>
<p>5. Evaluate the level of confidence or certainty in health effect characterizations</p>	<p>Consider the influence of the following uncertainty factors: representativeness of speed data; relationships between observed speeds and impact speeds; application of speed-injury collision exposure response function to pedestrian injury collisions; differences between intervention location and study environments</p> <p>Conduct sensitivity analysis under alternative assumptions (e.g., assume travel speed > impact speed)</p>	<p>Describe the uncertainty in the following parameters: available data on sick leave utilization for specific illnesses; generalization of sick leave utilization from population currently with benefit to populations without benefit</p>

Task 1: Evaluate and weigh evidence of causal effects

Direct empirical evidence on the effect of public policies and decisions on health is rare (Graham 2010; Dow et al. 2010). In an HIA, other empirical research, particularly epidemiological studies, is invariably used to provide evidence to support inferences about cause and effect and to predict the likely magnitude and distribution of health effects. To evaluate causal relationships, practitioners can use an existing, published systematic literature review or conduct such a review. Practitioners can also conduct original quantitative or qualitative data collection and/or original analysis.

■ **Systematic literature review**

There are several sources of existing systematic reviews that may be useful in HIA. The Guide to Community Preventive Services (www.thecommunityguide.org) is a collection of systematic reviews of programs and policies to improve health and prevent disease. The Cochrane Collection (www.cochrane.org) and the Campbell Collaboration (www.campbellcollaboration.org) provide systematic reviews of social interventions in clinical medicine, public health, education, crime and justice, and social welfare.

RECOMMENDED STEPS IN THE EVALUATION OF EPIDEMIOLOGICAL EVIDENCE FOR HEALTH HAZARD CHARACTERIZATION

1. Development of a review protocol
2. Identification of relevant studies
3. Systematic assessment of study validity
4. Meta-analysis
5. Conclusions about causality and the magnitude of the effect size

Adapted from: WHO Working Group (2000), *Workshop Summary on the Evaluation and Use of Epidemiologic Evidence for Environmental Health Risk Assessment*

Often, HIA requires the conduct of an original review of the literature. Searchable databases, like PUBMED maintained by the National Institutes of Health, provide access to empirical literature in biomedicine and other disciplines (www.ncbi.nlm.nih.gov/pubmed). Reviews of empirical evidence for HIA should follow a protocol that identifies available studies using a priori study inclusion criteria reflecting the outcomes and exposure variables of interest (WHO Working Group 2000). The a priori inclusion criteria might also consider which populations or time periods are most relevant to the decision context. Reviews should systematically evaluate study quality attending to issues such as limited study power, and biases due to selection error, loss to follow-up, analytic methods, and confounding (WHO Working Group 2000; Mindell et al. 2006; Mindell et al. 2010).

In general, conclusions about causality and the likelihood of health effects should consider the weight of the evidence from all studies. Meta-analysis of studies may support a summary estimate of effect size using a subset of high quality studies meeting inclusion criteria. Criteria, such as those proposed by Sir Bradford-Hill and others, may help evaluate whether the weight of evidence lends support for cause and effect relationships (Hill 1965; Susser 1986; Rothman and Greenland 1998; Weed 2005). The inferences should explicitly consider whether it is plausible to generalize findings from limited studies across time, place, or demographic subgroup (i.e., external validity).

■ *Qualitative research and analysis*

Qualitative research is used in HIA to identify hypotheses for research and analysis, characterize local perceptions of impacts, prioritize issues for analysis, understand local conditions and vulnerabilities, and provide evidence for impact analysis. Community knowledge may provide some of the earliest insights on the occurrence of health impacts (Ozenoff 1994). Qualitative research methods may include focus groups, surveys, structured and unstructured interviews, and group consensus processes. Particularly important local sources of expertise for HIA include community leaders and organizers, local medical providers, and public health officials. The example in the sidebar illustrates some of the health-relevant perceptions of the residents of the Trinity Plaza Apartment on their impending eviction and involuntary displacement.

FOCUS GROUP FINDINGS OF RESIDENTS FACING EVICTION AT THE TRINITY PLAZA APARTMENTS (SFDPH 2004)

“I don’t feel as I’m disturbing my neighbors when I ask for help when my sick husband has fallen and I cannot pick him up . . . I know there is help around . . .”

“I feel I had finally got the opportunity to settle down and be able to enjoy life at the age of 64, but now I have to worry, as I wonder where I’m going to move to when there is a lack of comparable rent in San Francisco.”

“We are fearful, feelings are hurt, and [we’re having] difficulty speaking about displacement, stressed, sleeplessness, anxiety, and the issue has been constantly going on.”

Task 2: Collect and synthesize data on baseline conditions

A profile of baseline conditions enumerates the affected population; describes their health status, sensitivities, and vulnerabilities; and evaluates the existing state of health determinants. Baseline conditions provide a reference point for predicting future changes in health effects. While used in the assessment phase, information on baseline conditions may also be available and used in the scoping phase for identifying and prioritizing issues.

Measures for a baseline conditions analysis can be identified using the causal model linking the decision to health effects. Measures represent health effects as well as determinants of health affected by decisions, including behavioral risk factors, environment exposures, and health resources and resilience factors. For example, if an HIA on a transportation project or policy aims to analyze effects on asthma mediated via motor vehicle air pollutants (see Causal Model of Road Pricing HIA above), baseline conditions measures may include indicators for traffic levels, air pollutants, asthma prevalence, and asthma morbidity.

Common measures of population health outcomes include life expectancy, hospitalization rates, symptom prevalence rates, injury rates and measures of self-rated health. Determinants of health include behaviors such as smoking and physical activity, exposures such as air pollution, and health resources such as income and social networks.

Baseline conditions include vulnerability or resilience factors that mediate the health effects associated with a decision. For example, populations with a high prevalence of chronic diseases may be more vulnerable to health effects from incremental increases in pollutants. Conversely, strong and supportive social networks within a community may provide a buffer to the short-term health effects of a reduction in employment levels.

The selection of measures is limited by availability of data. The enumeration of the population and their location spatially is typically based on household surveys such as the Census in the United States. In the U.S., national- and state-level data sources for population health statistics include the Behavioral Risk Factor Surveillance System (BRFSS), which provides data on indicators of certain health behaviors and risk factors; the National Center for Health Statistics (NCHS), which compiles national vital statistics; and the Bureau of Labor Statistics (BLS), which provides data on labor and employment conditions.

National and state data on environmental conditions may be available from regulatory agencies. For example, the U.S. Clean Air and Clean Water Acts created a national system to monitor select pollutants, and the U.S. Environmental Protection Agency maintains data on air and water quality nationally (e.g., <http://www.epa.gov/tri/>). Local and state governments also track diverse environmental-level data, including traffic volumes, ambient levels of noise, traffic accidents, reported crime, and housing code violations. A number of local jurisdictions have developed place-based comprehensive indicator systems

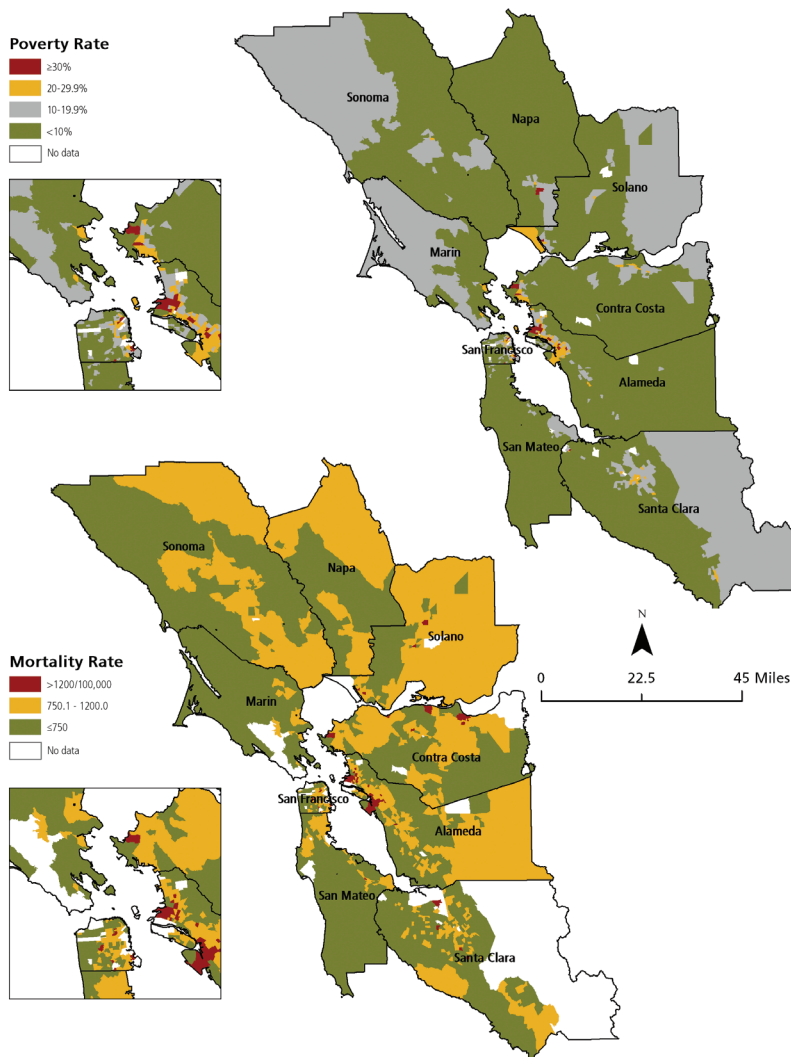
PLACE-BASED INDICATORS FOR HEALTH

A number of local jurisdictions have developed place-based comprehensive indicator systems specifically for the assessment and monitoring of community-level health conditions. For example, King County, Washington, developed *Communities Count* (www.communitiescount.org) and San Francisco developed the *Healthy Development Measurement Tool* (HDMT) in San Francisco (www.thehdmtool.org). The International Sustainability Indicators Network is a forum for learning and communication for people working on sustainability indicators (<http://www.sustainabilityindicators.org/>).

specifically for the assessment and monitoring of community-level health conditions (see sidebar on previous page). The UCLA HIA Clearinghouse (HIA-CLIC) maintains links to different data resources useful for HIA (<http://www.ph.ucla.edu/hs/hiaclic/>).

When profiling baseline conditions, it is important to evaluate spatial and demographic variations in health outcomes and vulnerabilities. These variations may relate to place or population characteristics such as age, gender, and race/ethnicity and may indicate susceptibility to particular health effects. Maps can illustrate spatial relationships between places, populations, vulnerability factors, environmental conditions, and health effects. For example, the map in Figure 9 illustrates the regional variation in mortality rates by census tract in the San Francisco Bay Area. This variation may reflect the concentration of conditions adverse to health (e.g., poverty, environmental hazards) as well as neighborhood difference in access health resources such as high-quality parks and schools.

FIGURE 9 REGIONAL VARIATION IN MORTALITY RATES IN THE SAN FRANCISCO BAY AREA
Illustration courtesy of Matt Beyers, Alameda County Department of Public Health



In many cases, available data and information can be used to model or construct indicators for health analysis. For example, data on traffic volumes, vehicle emission rates and weather can be used with the chemistry of pollutant dispersion model to model air pollutant concentrations in a city or a region. A map of this data can identify hot spots and sources of high exposure. The map in Figure 10 illustrates areas of San Francisco that exceed the California State Ambient Air Quality Standard of 12 ug/m³. The map illustrates that, in San Francisco, air pollution hot spots are primarily adjacent to freeways.

FIGURE 10. ESTIMATED PM 2.5 AMBIENT CONCENTRATIONS IN SAN FRANCISCO

Areas in red may exceed health-based air quality standards

Illustration provided courtesy of Michael Harris, San Francisco Department of Public Health



Based on the existing state database of traffic collisions, the map in Figure 11 illustrates high-risk pedestrian injury corridors in San Francisco collectively accounting for over 50% of injuries. The map illustrates that injuries and fatalities are concentrated in high-density neighborhoods, along arterial roadways and in neighborhood commercial business zones, near schools and senior centers, and adjacent to city parks.

FIGURE 11. HIGH-RISK PEDESTRIAN INJURY AND FATALITY CORRIDORS IN SAN FRANCISCO
 Illustration provided courtesy of Megan Wier, San Francisco Department of Public Health

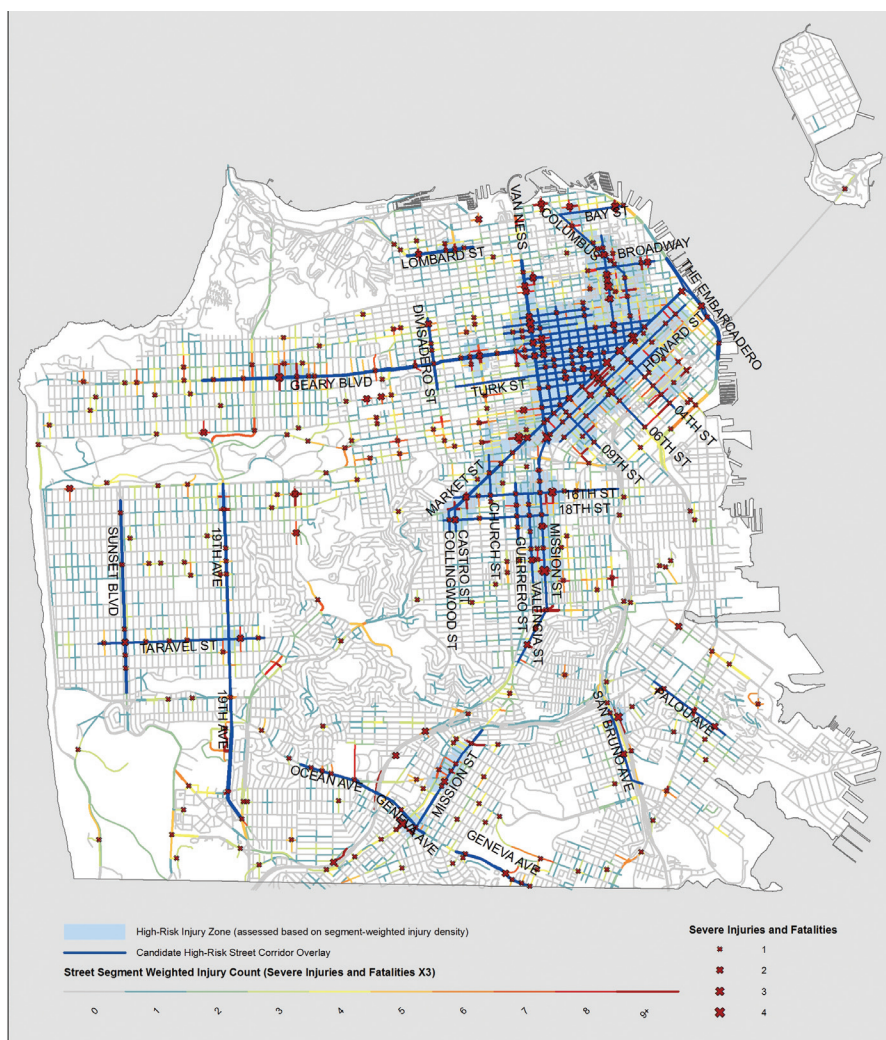
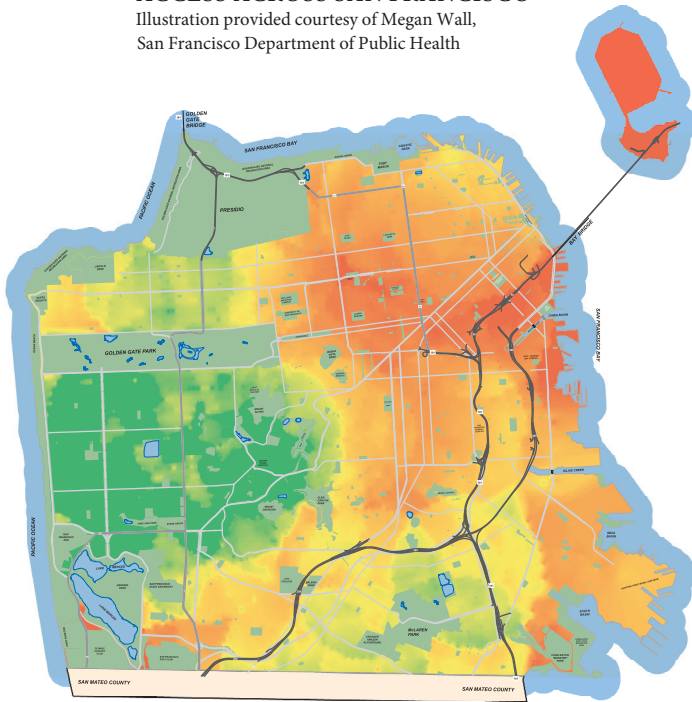
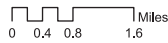
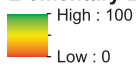


FIGURE 12. VARIATION IN SCHOOL QUALITY AND ACCESS ACROSS SAN FRANCISCO

Illustration provided courtesy of Megan Wall,
San Francisco Department of Public Health



Elementary Education Access Score



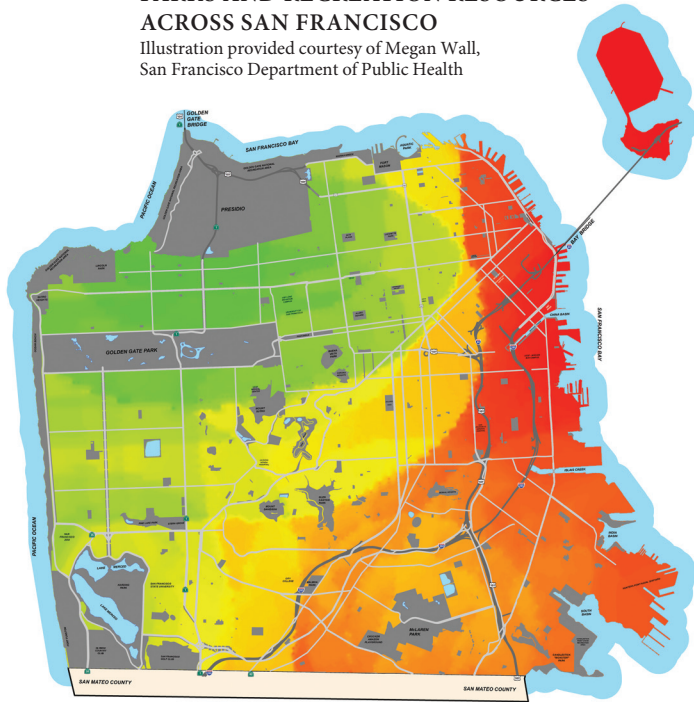
Source: California Department of Education,
2010; US Census 2010

City and County of San Francisco
Department of Public Health
Environmental Health Section

Maps can be used to profile neighborhood health resources as well as hazards. Maps may identify the location of community assets, public infrastructure, and resources related to health, such as transit, private services like grocery stores, and natural resources like parks and open space. Figure 12 above illustrates the variation of school quality and access across the city of San Francisco. The measure of school quality and access in the map was calculated as the number of available elementary school seats adjusted for neighborhood residential density and then weighted for academic performance of the school. Figure 13 below illustrates the variation in access to recreation and parks opportunities throughout the city. The measure of parks access used in this map is the acres of parks within a two-mile radius of a point with acres weighted by proximity.

FIGURE 13. VARIATION IN SIZE AND PROXIMITY TO PARKS AND RECREATION RESOURCES ACROSS SAN FRANCISCO

Illustration provided courtesy of Megan Wall, San Francisco Department of Public Health



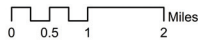
Park Proximity Score



High : 100

Low : 0

■ Parks, Open Spaces, and Recreation Centers

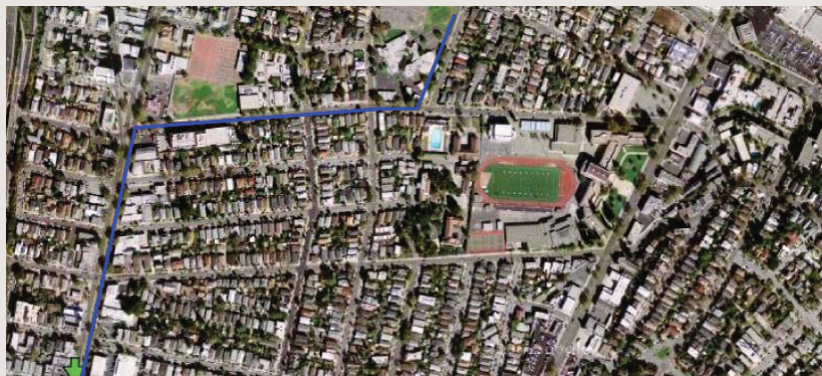


Source: San Francisco Planning Department, 2011

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Department of Public Health
Environmental Health Section

USING AVAILABLE MAPS TO EVALUATE HEALTH-RELEVANT BASELINE CONDITIONS

During the MacArthur BART transit village HIA, researchers used existing aerial maps (accessed via [google.org](http://www.google.org)) and counted pedestrian barriers and safety hazards for children on expected pedestrian routes from the proposed village to area schools (<http://sites.google.com/site/ucbhia/projects-and-research>). The typical route from the proposed transit village to Emerson Elementary School would require students to cross nine intersections, not all of which have crosswalks, along a four lane roadway with a very high volume of traffic (>20,000 trips/day). Available aerial maps could be used to evaluate other existing neighborhood assets.



Task 3: Forecast health effects quantitatively where feasible

Quantitative estimates can add precision to the evaluation of the magnitude of health effects (Veerman et al. 2005; O’Connell and Hurley 2009; Bhatia and Seto 2010). However, quantitative forecasting has high information requirements, including quantitative data on the change in the distribution of health determinants (e.g., exposures, resilience factors), the frequency of health outcomes under baseline conditions, and “exposure-response” relationships (Hertz-Piccolo 1995; Mindell et al. 2001; O’Connell and Hurley 2009; Bhatia and Seto 2010). These requirements may be impractical for many exposures and health outcomes affected by decisions. Two recent reviews describe the range of quantitative estimation approaches commonly found in HIA (Veerman et al. 2005; Bhatia and Seto 2010).

Human health risk assessment (HRA) is a quantitative approach for forecasting human health risk from environmental exposures commonly used in regulatory analysis and in EIA (Steinemann 2000; USEPA 2006; Committee on Improving Risk Analysis 2009). HRA typically predicts health risk associated with known chemical or physical hazards. In HRA, estimates of population exposure may be based on measures or quantitative models. Estimates of health risks related to these exposures utilize exposure-response relationships derived from experimental or human epidemiological studies. Meta-analyses or expert consensus processes are often used to develop these exposure-response relationships. HRA typically documents the model, parameters, assumptions, and uncertainties used to make judgments. HRA can be applied in HIA where a decision is expected to change environmental exposures in a quantifiable way.

The principles underlying HRA can also be applied to health effect forecasting resulting from changes in other social or environmental conditions, including economic factors, such as income or consumer prices. For example, using exposure-response relationships from epidemiologic research, researchers have quantified changes in mortality and other health outcomes resulting from policies that affect wages (Bhatia and Katz 2001; Cole et al. 2005).

Exposure-response functions exist only for a small subset of the known causal relationships between health determinants and health outcomes. Epidemiologic studies are the most common source of these functions in the practice of HIA. Quantitative meta-analysis can be useful in increasing confidence in the certainty and precision of an exposure-response relationship (WHO 2000). For causal models that involve intermediate behavioral, social, or economic effects,

ESTIMATING DEVELOPMENT IMPACTS ON PEDESTRIAN COLLISIONS IN SAN FRANCISCO

In order to predict the effects of land use development on pedestrian safety in San Francisco, the Department of Public Health developed a county-level model of environmental predictors of pedestrian-vehicle collisions (Wier 2009). Using binomial multivariate regression, eight variables predicted 71% of the variation in 10-year averaged pedestrian-vehicle frequencies among census-tracts; traffic volume; proportion of arterial streets; neighborhood commercial land use; total land area (square miles); employee population; resident population; proportion of households in poverty; and proportion of residents older than 65. Planning data, including data on future resident and employee populations and data on traffic volumes, provided parameters for the model’s use to estimate prospective impacts on pedestrian-vehicle collisions. The plans projected a 15% increase in traffic volume and a 16% change in populations. The model forecast that planned growth in four historically industrial and mixed-use neighborhoods would result in a cumulative 17% increase in 5-year pedestrian injury collision totals or over 30 additional collisions each year. Forecasts for individual neighborhoods demonstrated substantial variation in hazards for new residents.

exposure response functions may be borrowed from outside of epidemiologic literature. For example, in an HIA conducted on one potential regulatory strategy under the California Global Warming Solutions Act, analysts utilized a quantitative relationship between consumer fuel use and fuel price changes found in the energy resources literature and then analyzed how changes in fuel use might affect household heating and cooling and transportation behaviors.

Epidemiological or statistical analysis can provide quantitative measures of association between a determinant or risk factor and a health outcome. Original epidemiologic investigations can be time- and resource-intensive but may be warranted, particularly where there are impacts of potentially high but uncertain significance and limited published literature. In many cases, quantitative analysis can utilize existing information and publicly available data sources. For example, in the HIA of the Healthy Families Act of 2009, the HIA team analyzed data from the National Health Interview Survey to estimate differences in the frequency of emergency care for people with and without paid sick days.

It is important to consider whether quantitative analysis supports the overall objective of HIA. For example, mitigations for certain effects may be triggered by a particular quantitative threshold making quantitative analysis more useful. That said, as all health effects of a decision choice may not be amenable to quantification, relying on quantitative forecasting exclusively may present a partial or biased accounting of health effects (O’Connell and Hurley 2009). The scoping phase should assess the value or utility of quantitative effect estimates to decision-makers considering time and resource requirements and availability of required data.

Task 4: Characterize expected health effects

After the assessment team has analyzed information and evidence and conducted any forecasting using this information, they will next need to synthesize their findings into an overall characterization of the expected health effects. There is no gold standard for health effects characterizations in HIA and these characterizations are not testable or falsifiable. The validity of characterizations rest on whether the assessment team’s judgments are plausible, based on sound evidence, apply logical reasoning, and acknowledge data limitations and uncertainties (Petticrew et al. 2007; Veerman et al. 2007).

STATISTICAL ANALYSIS AS QUANTITATIVE EVIDENCE

In an HIA conducted on the West Oakland Port Expansion, the HIA team compared simple statistics on truck collisions and truck-pedestrian collision injuries and fatalities using publicly available data. Statistically, annual truck pedestrian collisions per person in West Oakland were 10 times more frequent than in the county and 6 times more frequent than the city of Oakland.

Location	Truck collisions (1996–2006)	Truck share of all vehicle collisions	Annual rate of truck-pedestrian collisions, injuries per 100,000	Annual rate of truck-pedestrian collisions, fatalities per 100,000
Alameda County	4,504	5.0	0.43	0.07
City of Oakland	1029	4.2	0.79	0.12
West Oakland Neighborhood	177	7.3	4.6	0.46

Four important and commonly described characteristics of health effects are likelihood, severity, magnitude, and distribution. The likelihood of an effect represents the degree of certainty that it will occur; likelihood is high when there is an established cause and effect relationship. The severity of a health effect indicates its importance and intensity; for example, a disabling or life-threatening injury is more severe than a self-limited infection. The magnitude represents how much a health outcome might change as a result of a decision course of action. A magnitude may include the expected change in the population frequency of symptoms, disease, illness, injury, disability, or reduced life-expectancy and is typically an estimated function of several factors, including (1) the size of the population, (2) the baseline frequency of disease, injury, illness, or mortality in the population, (3) the size of the change in the health risk or resilience factor, and (4) the size or strength of association between an affected health risk factor and health outcomes (e.g., the relative risk). The distribution of effects reflects whether they are shared fairly among the affected populations. Each aspect of the characterization of health effect(s) may have a different level of confidence (See Task 5, below).

In practice, the meaning of each of these characteristics can be subject to varied interpretation both among members of the assessment team and among stakeholders and decision-makers. Consequently, discussion and debate on the meaning and sufficiency of the characteristics and the evidence required to make a particular characterization should be considered a necessary and useful part of a transparent HIA process.

Effect characterization in HIA may benefit from a common typology or nomenclature. The scheme described in Table 4 provides an example of one typology that can be used or adapted for HIA. In any such scheme, each health effect analyzed in HIA needs to be separately characterized. The HIA should also explain where one or more health effect characteristics cannot be provided.

QUANTITATIVE HEALTH IMPACT ASSESSMENTS OF LIVING WAGE ORDINANCES IN SAN FRANCISCO AND LOS ANGELES

In 1999, Tom Ammiano, a member of the San Francisco Board of Supervisors, requested that the Department of Public Health conduct an analysis of a proposed living wage ordinance for San Francisco. The HIA provided quantitative estimates of impact of the adoption of a living wage of \$11.00 per hour on adult health and children's development outcomes (Bhatia and Katz, 2001). Using meta-analysis of peer-reviewed studies and effect measures relating income to health outcomes, the HIA predicted a decrease in the risk of premature death by 5% for adults 24–44 years of age in households whose current income was around \$20,000. For the offspring of these workers, the analysis estimated that a living wage would result in an increase of a quarter of a year of completed education, a 34% increased odds of high school completion, and a 22% decrease in the risk of early childbirth.

A related HIA published by the UCLA Health Impact Assessment Project in 2005 found that both the wage and health insurance provisions of the 1997 Los Angeles City Living Wage Ordinance would significantly reduce mortality among the approximately 10,000 beneficiaries (Cole 2005). The ordinance applied to employers engaged in work on city service contracts and mandated a \$7.99 wage along with a \$1.25 per hour contribution to health insurance benefits or an equivalent amount in additional wages. Notably, this UCLA HIA also concluded that providing health insurance was a more cost effective approach to reducing mortality than providing increased wages.

TABLE 4. HEALTH EFFECT CHARACTERISTICS AND THEIR INTERPRETATION

Likelihood	How certain is it that the decision will effect health determinants or outcomes irrespective of the frequency, severity, or magnitude?
Unlikely/ Implausible	Logically implausible effect; substantial evidence against mechanism of effect
Possible	Logically plausible effect with limited or uncertain supporting evidence
Likely	Logically plausible effect with substantial and consistent supporting evidence and substantial uncertainties
Very Likely / Certain	Adequate evidence for a causal and generalizable effect
Insufficient Evidence / Not Evaluated	—
Severity	How important is the effect with regards to human function, well-being, or longevity, considering the affected community's current ability to manage the health effects?
Low	Acute, short-term effects with limited and reversible effects on function, well-being, or livelihood that are tolerable or entirely manageable within the capacity of the community health system
Medium	Acute, chronic, or permanent effects that substantially affect function, well-being, or livelihood but are largely manageable within the capacity of the community health system; OR Acute, short-term effects on function, well-being, or livelihood that are not manageable within the capacity of the community health system
High	Acute, chronic, or permanent effects that are potentially disabling or life-threatening, regardless of community health system manageability; OR Effects that impair the development of children or harm future generations
Insufficient Evidence / Not Evaluated	—
Magnitude	How much will health outcomes change as a result of the decision (i.e., what is the expected change in the population frequency of the symptoms, disease, illness, injury, disability, or mortality)?
Limited	A change of less than one-tenth of 1% in the population frequency of a health endpoint
Moderate	A change of between 0.1% and 1% in the population frequency of a health endpoint
Substantial	A change of greater than 1% in the population frequency of a health endpoint
Insufficient Evidence / Not Evaluated	—
Distribution	Will the effects, whether adverse or beneficial, be distributed equitably across populations. Will the decision reverse or undo baseline or historical inequities?
Disproportionate harms	The decision will result in disproportionate adverse effects to populations defined by demographics, culture, or geography
Disproportionate benefits	The decision will result in disproportionate beneficial effects to populations defined by demographics, culture, or geography
Restorative equity effects	The decision will reverse or undo existing or historical inequitable health-relevant conditions or health disparities
Insufficient Evidence / Not Evaluated	—

■ *Utilizing group or consensus processes for effect characterization*

While health effect judgments should be supported with evidence, allowing experts and stakeholders to critique and deliberate on HIA findings can strengthen the characterization of effects. Formal deliberative processes, particularly when they include diverse participants, can help identify or uncover biases and conflicts in interests and moderate the effects of biases on judgments (Fischer 2000). For example, in the Delphi method, a panel of experts answers a question iteratively and is given the opportunity to revise answers after reviewing anonymous summaries of other experts' forecasts (Miller and Cuff 1986). In the Danish Board of Technology's Consensus Conference, a lay panel deliberates and develops a consensus on a particular science or technology issue and experts contribute testimony and analysis in response to questions posed by the lay panel (Anderson and Jaeger 1999). The National Institutes of Health routinely uses a deliberative process to develop an "evidence-based consensus on controversies on clinical care or other biomedical issues" (see: <http://consensus.nih.gov/>). Habitat Conservation Planning provides another example of consensus-building among diverse and conflicting interests as an alternative to command and control environmental regulations (Sabel et al. 2000). Deliberative or consensus processes can be adapted for use in HIA. For example, an assessment team might collect and organize data and evidence; however, a broader group might be convened to evaluate this evidence, to make inferences about decision-effects, and to establish a level of confidence or certainty in the results.

■ *Evaluating health effects relative to available standards and thresholds*

In some cases, it is appropriate to characterize health effects relative to existing, adopted public health targets or existing regulatory standards, including those for environmental and health protection. National state and local environmental quality legislation such as the Clean Water Act and the Clean Air Act have established several health-based environmental standards. Public health agencies have promulgated performance measures and targets for improving health (e.g., Healthy People 2010). Objectives and performance targets for other determinants of health may exist under institutions responsible for transportation, planning, housing, and education. In some cases, these standards or performance targets can serve as proxies for significant health effects. That said, existing standards may not be protective for all health effects in all populations.

■ *Analyzing and characterizing inequitable impacts*

Claims of discrimination, social, or environmental injustice, and inequitable effects are common controversies in the policy-making process, and impact assessment processes can help to respond to these concerns (Walker 2010). Describing how decisions may generate, perpetuate, or prevent health inequities should be an explicit objective of HIA.¹ The evaluation of fairness and impact on health inequities requires analysis of how health impacts are distributed across

¹ Health inequities are defined as systematic disparities in health status or in the major social determinants of health between groups with different social advantage/disadvantage (e.g., wealth, power, prestige) (Braveman and Gruskin 2003).

the population. For EIA conducted on federal agency actions in the United States, an analysis of disproportionate health impacts on low-income and ethnic minority populations is also required under Executive Order 12898 on Environmental Justice (CEQ 1997; USEPA 1998; USEPA 1999).

In general, the evaluation of how an action will affect health inequities requires an evaluation of the following three factors:

1. Whether the action will affect a population vulnerable to or experiencing health inequities (e.g., low-income, elderly, ethnic minority)
2. Whether the action will affect vulnerabilities or risk factors for adverse health outcomes in an affected population (e.g., a pre-existing environmental exposures, a higher prevalence of a disease, a dependence on an impacted environment resource)
3. Whether the action will change the magnitude of a health effect (e.g., a change in the frequency of disease) in a particular vulnerable population to a greater extent than that in the general population

The data and tools required to analyze impacts on health equity are usually no different from the tools used in impact analysis. Demographic and public health data may be used to indicate the presence and location of socially vulnerable communities, and geographic information systems (GIS) tools can identify spatial inequities in both health hazards vulnerabilities and health resources. Statistical techniques can quantify the relationships among health determinants and effects and demographic or spatial characteristics (Kakwani et al. 1997). For example, research in the United States has analyzed whether exposure to environmental hazards is higher for residents of predominantly minority or low-income neighborhoods (Stuart et al. 2009; Cottrill and Thakuria 2010). Analytic techniques for examining environmental inequities can be similarly applied to the prospective analysis of public policies (Mitchell 2005).

Health concerns about a project or plan articulated by lower-income or otherwise vulnerable communities should sensitize HIA assessors to the need to consider disproportionate impacts. Even if “exposures,” do not differentiate among populations, it is important to consider how particular vulnerabilities of a place or population may mediate health effects and inequities. Vulnerable populations may be at greater health risk to changes in food, water, or housing resources in locations with a limited supply of these resources. A population may have greater susceptibility to an environmental hazard because of a demographic characteristic (e.g., poverty, age); a higher prevalence of chronic disease (e.g., asthma); elevated levels of environmental hazards or stressors; or cultural dependence on environmental resources (e.g., sustenance consumption of local wildlife).

HIA OF CALIFORNIA BALLOT PROPOSITION 49

California State Proposition 49, passed by voters in November 2002, increased mandatory state funding for after-school programs from \$117.5 million per year to \$550 million per year. An HIA conducted by the UCLA Health Impact Assessment Project in 2003 found that while this reallocation theoretically could produce significant health benefits for low-income youth by decreasing rates of risky behaviors, reducing criminal activity, and raising participants' socioeconomic status by improving educational achievement, the lack of strict means-testing for program eligibility under Proposition 49 could potentially result in a decreased proportion of after-school program funds directed towards low-income students and schools. Furthermore, reallocation of up to \$550 million per year from the state's general fund to after-school programs could necessitate budget cuts to health and social service programs. Rules subsequently promulgated by the California Department of Education inserted provisions targeting Proposition 49 funds to low-income schools and students.

(Report available at: <http://www.ph.ucla.edu/hs/health-impact/reports.htm>)

■ *Cumulative effects*

Most HIAs will consider multiple health effects resulting from the same decision. HIA should also consider how effects may act cumulatively with other past or expected actions. Cumulative effects may combine together spatially (e.g., multiple point sources of the same hazardous exposure on a receptor), temporally (e.g., incremental air pollution due to additions to roadway capacity), or via a common mechanisms of toxicity (e.g., cholinesterase inhibition). Two different risk factors can also cumulatively affect a single health effect. For example, in one study, a combination of noise and overcrowding (two environmental conditions associated with poverty) was associated with higher stress and stress hormone levels in children (Evans and Marcynyszyn 2004). Assessing cumulative health effects is an important challenge and emerging research area for public health and environmental science (USEPA 1999). A National Academy of Sciences consensus report on risk assessment recently concluded that there is a need for such assessments to include “. . . combined risks posed by aggregate exposure to multiple agents or stressors; aggregate exposure includes all routes, pathways, and sources of exposure to a given agent or stressor.” (NRC 2009) The example in the sidebar illustrates how transportation systems impacts may act “cumulatively” on community health.

■ *Economic valuation of health impacts*

In some cases, decision-makers want information on the economic value of health effects. Economic valuation of health effects is possible in cases where health effects are quantified and data exists to place a monetary value on these health effects. In the analysis of environmental regulations, cost-benefit analyses routinely apply estimates of the economic value of outcomes such as years of lost life, loss of quality of life, loss of function, health care utilization, injury severity, property damage, and the loss of employment.

The economic value of health effects includes both direct health care costs as well indirect costs, such as lost wages for individuals, lost productivity for employers, and pain and suffering for individuals, relatives, and family members. Effects on health for one individual can also affect the health and well-being of another. Methods to assess the economic value of health effects differ with regard to how well they capture the range of costs of health

CUMULATIVE EFFECTS OF LOCATION AND REGIONAL TRAFFIC ON A SAN FRANCISCO NEIGHBORHOOD

In response to community concerns, the San Francisco Department of Public Health (SFDPH), People Organizing to Demand Environmental and Economic Rights (PODER), and the UC Berkeley School of Public Health collaborated to research the impacts of local and regional freight and automobile traffic on the Excelsior/Southeast area of San Francisco. Methods employed included air quality and noise modeling and monitoring, community surveys, secondary data analysis, traffic counting, community photography, and surveys of the physical characteristics of the pedestrian environment. The assessment revealed heavy local cut-through traffic; adverse impacts of regional freeway traffic on local noise levels and air quality; residential concerns regarding traffic hazards, trucks, air pollution, and traffic-related sleep disturbances; and impacts on a predominantly non-white, immigrant community. The case study was unique in its focus on the cumulative impacts of transportation planning policy decisions on local residents that considered the transportation infrastructure, not pollution emissions, as the fundamental source of environmental hazard. With this assessment, PODER, community members, and key community allies mobilized to demand that the Board of Supervisors direct SFDPH, the San Francisco Municipal Transportation Agency, and local legislative staff to identify protective truck routing policies (Wier 2009).

outcomes, including costs that do not have economic markets. With regards to the value of avoiding premature mortality, for example, some of the earliest methods to value of life were limited to estimates of lost economic productivity or income; these methods gave no value to “intangibles” such as grief. Other approaches to reveal the economic value that individuals place on protecting life include either using empirical analysis of observable economic behaviors (e.g., the choices among wages and hazardous employment and decisions to purchase of consumer safety products) (hedonic methods) or asking individuals to explicitly state their willingness to pay for a change in the risk of mortality (contingent valuation methods).

While useful in some circumstances, economic valuation and cost-benefit analyses are not without methodological problems. Unlike HIA, cost-benefit analysis aims to provide a “bottom line” evaluation of the value of alternative choices using a common, monetary metric. This assumes that all important effects of a decision, positive and negative, can be valued and expressed adequately in monetary terms. Economic valuation may also undervalue some human health and welfare effects or may value the health of different populations differently (e.g., populations not in the labor force or immigrant workers). Economic valuation of health and welfare outcomes raises several ethical issues, including how to put a price on health and life and how to value health impacts on future generations (Baram 1979; Revesz 1999). Recent suggestions that the monetary value of life might vary depending on the causes of death further underscore these challenges (Appelbaum 2011). Finally, it can be difficult to explain economic valuation methods and the differences in values produced by differing methods, particularly for methods that value the nonmarket attributes of health and welfare outcomes (Moore 1995).

A complete discussion of methods, applications, and limits of economic valuation is beyond the scope of this Guide. The U.S. Environmental Protection Agency (EPA) has published guidelines for economic analysis that may be a resource for economic valuation in HIA (USEPA 2000). Brodin and Hodge (2008) have also recently discussed several common issues in the application of economic valuation in HIA practice.

Task 5: Evaluate the level of confidence or certainty in health effect characterizations

HIA should always assess how gaps in evidence or assumptions may affect the confidence in the characterization of health effects. Each fact used in supporting an inference may be a potential source of uncertainty. For example, uncertainties in the baseline frequency of disease, the distribution of exposure, or the relationship between exposure and disease all generate uncertainty in health effect estimates. Common simplifying assumptions, for example, that populations affected by a decision are similar to study populations, may also be important sources of uncertainty.

A straightforward approach to characterizing the level confidence is to describe qualitatively the uncertainty in each parameter supporting a characterization,

❖ *In many ways, the task of prediction in HIA is analogous to the task of diagnosis and prognosis in clinical medical practice where a practitioner applies training and experience, a patient’s history, and diagnostic tests. Prognosis in medicine assumes uncertainty and the possibility of error, the need for monitoring, and future adjustment to therapy.*

explaining its potential variation and the influence of such variation on health effects. Table 5 illustrates the conclusions of an uncertainty analysis using the hypothetical example of an HIA conducted on automated speed enforcement cameras discussed above.

Quantitative tools are also available to assess uncertainty. Sensitivity analysis (SA) examines the relative importance of uncertain data inputs by observing how changes in parameters used as inputs to forecasting models affect model outputs.

TABLE 5. UNCERTAINTY IN HEALTH EFFECT CHARACTERIZATION OF AUTOMATED SPEED ENFORCEMENT

Health Effect Characteristic	Factors Affecting Certainty	Confidence Level
Likelihood	<ul style="list-style-type: none"> • Established physical explanation of effects • Consistent findings of empirical studies in diverse urban contexts • Effects in prospective interventions 	High
Severity	None	High
Magnitude	<p>EXPOSURE ASSESSMENT</p> <ul style="list-style-type: none"> • Distribution based on measured speed on a sample of 25, 30, and 35 mph city streets • Speeds aggregated into 5 mph increments • Measures may under-represent high speed and volume streets • Distribution of measured speed may underestimate or overestimate distribution of impact speed <p>BASELINE DISEASE PREVALENCE</p> <ul style="list-style-type: none"> • Pedestrian injury collisions are often under-reported <p>EXPOSURE-RESPONSE FUNCTIONS (ERF)</p> <ul style="list-style-type: none"> • Speed-collision ERF not specific to pedestrian injury collisions • Speed-collision ERF not validated in study location • Speed-severity ERF not validated in study location 	Moderate
Distribution	Not assessed	N/A

2.4 Recommending Mitigation and Alternatives

A KEY OBJECTIVE OF HIA is to identify decision or design alternatives or impact mitigations that protect and promote health. Recommendations for mitigations and design alternatives should be specific to health effects analyzed in HIA and should justify the recommended changes. Mitigations and policy or design alternatives should be supported by evidence of feasibility and effectiveness, and if possible, analysis should estimate how much the recommended changes will change expected health effects.

The breadth of potential alternatives and mitigations is beyond the scope of this Guide as recommendations are specific to the type of project or policy being analyzed. Developing, evaluating, and prioritizing strategies, whether alternatives or mitigations, requires a clear understanding of a) the policy/decision-making process, b) the proposed project, plan, or policy, and c) knowledge and research of existing policy implementation, design practices, and mitigation.

Developing recommendations for mitigations and design alternatives requires consultation with others, as the HIA team may not have the necessary expertise for making recommendations. The skills and expertise needed to identify and analyze alternatives and mitigations may lie with project proponents, others who are familiar with project design and implementation, community members, and other professionals. Communication with policy-makers/developers and stakeholders is often needed to gauge the feasibility of mitigations and design changes.

In situations of limited resources, HIA should aim to prioritize mitigations and design alternatives, considering their relative health benefits, costs, and feasibility. The prioritization process should include decision-makers, project proponents and stakeholders. While time-consuming, consensus on the mitigations can support stakeholder buy-in and facilitate project implementation.

Importantly, recommendations are not necessary for every HIA. In some cases, the optimum course of action for health is to leave the policy, program, or plan unchanged. Other decision contexts may provide fewer opportunities for recommending changes to policy, program, plan, or project design. For example, legislative initiatives may not be open to revision.

CRITERIA FOR SELECTING ALTERNATIVES AND MITIGATIONS

- Responsive to projected impacts
- Experience-based and effective
- Technical feasibility
- Political feasibility
- Economically efficient
- Multiobjective
- No adverse externalities
- Enforceable

Finally, HIA practitioners should be mindful that some decisions may have residual and significant adverse effects on health even with incorporation of all feasible and available mitigations. In these cases, the HIA should explicitly acknowledge that the incorporation of mitigations only offers partial relief from adverse health effects.

MITIGATING AIR POLLUTION IMPACTS FROM REZONING, SAN FRANCISCO, 2007

An HIA integrated within the environmental impact assessment for the Eastern Neighborhoods Rezoning and Area Plans found that the rezoning would substantially increase human health hazards from noise, air pollutants, and pedestrian collisions.

The Department of Public Health proposed that projects in proximity to high traffic volumes assess the concentration of PM 2.5 from traffic sources and include ventilation and filtration systems where exposure levels were harmful. The Office of the Controller of the City of San Francisco conducted a cost-benefit analysis of proposed air quality regulations for enhanced building ventilation in residences near busy roadways (Office of the Controller 2008).

The annual cost of the most expensive mitigation approach, individual unit ventilation systems, including operating and maintenance costs, and accounting for the space to accommodate the system, was estimated at \$727 per unit per year. On the other hand, estimates of the value of health benefits on premature mortality were valued at about \$2,100 per unit per year.

2.5 Reporting and Communication

HIA AIMS TO prevent uninformed decision-making. As HIA practitioners are usually not decision-makers, effective and broad communication of findings to stakeholders involved in decision-making is essential.

The HIA Report

An HIA report should provide a transparent accounting of the HIA process and its findings. A comprehensive report should identify all the participants and their roles in the HIA, and describe the screening and scoping steps. The report should, for each issue analyzed, discuss the available scientific evidence, profile existing conditions, describe analytic methods, document and interpret analytic results, characterize the health impacts and their significance, and, if necessary, list recommendations for policy, program, or project design alternatives or mitigations. If included, recommendations for decision alternatives, policy recommendations, or mitigations should be tied to impacts and justified with regards to both feasibility and efficacy. Fredsgaard et al. (2009) recently developed a set of criteria to judge the completeness of HIA reports.

The report should be written in language accessible to the target audiences, including decision-makers, responsible administrators, and decision-stakeholders. HIA reports should be succinct. A successful report focuses attention on the key information, whether impacts or alternatives, necessary to drive action. Findings may be prioritized based on the characteristics of the effects, including, for example, their magnitude, disproportionate impact on vulnerable populations, perceived public concerns, or quality of the evidence. For example, the summary table of health effects (See Table 6) from the HIA conducted of the U.S. Healthy Families Act of 2009 succinctly characterizes the magnitude of health effects and the quality of the evidence. To maintain brevity, an HIA report may include detailed technical appendices or reference more detailed studies that provide the basis for judgments and recommendations.

❖ *Information is the currency of democracy.*

—THOMAS JEFFERSON

TIPS FOR REPORTING

- Document the HIA process and findings in writing
- Prioritize findings and recommendations
- Provide an opportunity for public review
- Use opportunities in the decision's regulatory process (e.g., public hearings, EIA comment)
- Develop messages and framing for specific audiences
- Identify stakeholders and decision-makers as communicators
- Engage the media

TABLE 6: HEALTH EFFECT SUMMARY TABLE FROM THE HIA OF THE HEALTHY FAMILIES ACT OF 2009 (HIP AND SFDPH 2009)

Health Outcome	Judgment of Magnitude of Impact*	Quality of Evidence
Impacts on Worker or Dependent Health		
Taking leave for medical need	▲▲▲	Consistent but limited quantitative evidence; supportive qualitative research
Taking leave to care for ill dependents	▲▲▲	Consistent but limited quantitative evidence; supportive qualitative research
Appropriate and timely utilization of primary care	▲▲	Limited supportive quantitative evidence
Reduced visits to the emergency room	▲▲	Limited supportive quantitative evidence
Reduced avoidable hospitalization	—	Insufficient evidence
Impacts on Community Transmission of Communicable Diseases		
Seasonal or pandemic influenza	▲▲▲	Consistent and adequate indirect quantitative research; established authoritative public health guidance
Foodborne disease in restaurants	▲▲	Consistent sufficient quantitative research; established authoritative public health guidance
Gastrointestinal infections in health care facility disease transmission	▲▲	Consistent limited research; established authoritative public health guidance
Communicable diseases in child-care facilities	▲	Inadequate empirical evidence; established authoritative public health guidance
Economic Impacts on Workers		
Loss of income	▲▲▲	Sufficient evidence
Job loss	▲▲	Consistent limited evidence

* This column provides a scale of significance ranging from 0–3, where 0 = no impact and 3 = a significant impact. An effect is considered significant if it would impact a large number of people in the United States and have the potential to create a serious adverse or potentially life-threatening health outcome.

The HIA report should also offer stakeholders and decision-makers a meaningful opportunity to critically review evidence, methods, findings, conclusions, and recommendations. Ideally, a draft report should be made available and readily accessible for public review and comment. Similar to the process for EIA under NEPA, upon receipt of comments, the HIA team should address substantive criticisms either through a formal written response or through report revisions before finalizing the HIA report. The final HIA report should always be made publicly accessible.

■ *Dialogue with decision-makers*

Communication and utility of findings may be optimal where there is an opportunity for direct dialogue among assessors, decision-makers, proponents and other key stakeholders. Decision-makers may value direct face to face discussion of key findings and recommendations as this often highlights the most important issues and provides opportunity for questions. Many of the public health concepts underlying the assessment may be unfamiliar to decision-makers and stakeholders and this may require explaining those concepts as well as the way public health evidence is applied in judgments. An assessor may be able to directly respond to criticisms about the validity of the findings or about the efficacy or feasibility of recommendations. In some cases, dialogue may result in the negotiation of feasible mitigation strategies.

Dialogue may help mitigate the level of sensitivity to HIA findings. Decision proponents may be wary of information that may identify adverse impacts of proposals, and governmental agencies may be wary of results that are critical of government actions or regulatory oversights. Opportunities for dialogue among HIA assessors, decision-makers, and stakeholders help surface and manage concerns related to such sensitivities.

COMMUNICATING RESULTS OF THE PAID SICK DAYS HIA

Researchers working on the Paid Sick Days HIA collaborated with a communications firm to help them shape their messaging and framing of the report findings. The communications consultants helped the HIA team identify some important themes in the report that would resonate both with decision-makers and the broader public, such as universal paid sick days by workers will help benefit “all Californians” (as opposed to low-income workers only) and would support public health laws and recommendations regarding infection control.

Strategic media outreach helped disseminate key HIA findings via national radio and print media. Tapping into current events, the HIA findings were related to the 2009 swine-origin influenza pandemic. The research team held a briefing for legislators and provided testimony at public hearings. The Chair of the California Assembly Labor Committee referred to the HIA in explaining the benefit of the bill for the control of food borne infections transmitted by restaurant workers.

■ *Communication for diverse target audiences*

Commonly, the findings and recommendations of an HIA must be communicated in different ways to meet the needs of different audiences. There are a number of challenges in communicating technical information, such as that found in an HIA, to diverse audiences, related to language, culture, and educational levels. Targeted and audience-specific communication can include the use of fact sheets, public testimony, panel discussions, graphic and visual illustrations, written comments on regulatory decision-making, and peer-reviewed publications. Table 7 lists different forms of communication and outreach strategies that can be used to disseminate HIA findings.

Often important to the success of communication is the “framing” of findings. As noted by Dorfman and Wallack (2007), “Frames help people make sense of what they see and hear by triggering concepts that already reside in their brains.” Researchers have found that words, images, actions, and text are interpreted and understood as part of an existing causal system that provides order and meaning (Lakoff and Morgan 2001). Framing public health messages often needs to communicate a collective responsibility for health.

TABLE 7. FORMS OF COMMUNICATION IN HIA

Common Written Forms
<ul style="list-style-type: none"> • Comprehensive HIA report • Executive summary • Fact sheets • Press release/Press advisory
Formal Decision-Making Process Forms
<ul style="list-style-type: none"> • Testimony at public hearings • Public comment and response processes (in EIA, regulatory standard setting processes, permit approval, etc.) • Legislative briefings
Other Media For a Broader Outreach/Dissemination
<ul style="list-style-type: none"> • Op-ed and letters to the editor • Meeting with editorial boards • Organizational newsletters, emails, outreach materials • Community workshops or panel discussions • Distribution of materials door-to-door • Article in popular magazine • Article in peer-reviewed journal • Graphic/visual representations • Radio, TV, interviews • Websites/Blogs

Stakeholders and interest groups can play a useful role in translating HIA findings particularly in situations challenged by language or literacy barriers or where there is distrust of government institutions. However, individual stakeholders or interest groups directly communicating HIA results may not always provide a complete accounting of HIA findings or may not fully appreciate their limitations. HIA practitioners who work directly with stakeholders on communication should recognize both the strengths and challenges of such collaboration (Veerman et al. 2006).

2.6 Monitoring

MONITORING HAPPENS AFTER a decision is made and helps to ensure health protective outcomes over the long-term. Monitoring concerns both the process of decision implementation as well as its substantive outcomes on health. Process monitoring examines whether it conforms to agreed-upon policy, project, or program design and related regulations or required mitigations. Outcomes monitoring examines prospectively the changes in health determinants and population health that occur along with decision-implementation.² In some cases, outcomes monitoring can provide an early warning system to detect unexpected outcomes and thus lead to health protective decision adaptations.

A first step in monitoring is to identify key processes and outcomes to be tracked. Monitoring of implementation processes might identify key milestones or compliance measures with regard to applicable health protective regulations or mitigations. Mitigation monitoring plans with reporting to regulatory or decision-making agencies are commonly used in environmental impact assessments. Also called environmental management plans (EMP), or impact management plans, a mitigation monitoring plan documents the mitigation measures, as well as agency responsibilities and roles in ensuring and documenting mitigation achievement. Mitigation management plans and monitoring plans typically list a summary of the potential impacts requiring mitigation, a description of required mitigation measures, responsibilities and a schedule for implementation, requirements for surveillance and auditing, and triggers and contingency actions to address excessive or unexpected impacts. At present, there are few published examples of mitigation management and monitoring plans for completed HIAs. Table 8 suggests elements of such a plan based on the typical components of an EMP.

Similar to indicators used for profiling baseline conditions, indicators for outcomes monitoring can include health status, health-relevant behaviors, and health determinants. Monitoring ideally requires collection of these indicators before, during, and after policy implementation.

ESSENTIAL TASKS IN MONITORING

- Decide on and define implementation tasks, outcomes, and indicators for long-term monitoring
- Identify a lead individual or organization to conduct monitoring
- Develop a monitoring plan or program, including a plan to report monitoring findings to decision-makers and HIA stakeholders
- Ensure resources are available to conduct, complete, and report the monitoring

2. Monitoring is distinct from policy and program evaluation and is not intended to provide generalizable conclusions about policy or program effectiveness or answers to questions of cause and effect.

The selection of health effects indicators should consider latency and specificity. Health outcomes change with varying temporal relationships within environmental conditions. Long lag times between decisions and their implementation and between changes in health risk factors and health endpoints can limit the feasibility of observing changes in health outcomes. When health outcomes are influenced by multiple individual- and community-level determinants (e.g., hospitalizations for diabetes), a change in one risk factor may also not translate readily or rapidly into a change in health outcomes.

Resources provided to conduct an HIA often do not include resources for long-term monitoring. Even in these cases, HIA might provide recommendations for a comprehensive monitoring plan.

TABLE 8. COMPONENTS OF AN ENVIRONMENTAL MANAGEMENT PLAN (EMP) (WORLD BANK 1999)

Summary of impacts	The predicted adverse environmental and social impacts for which mitigation is required should be identified and briefly summarized. Cross-referencing to the EIA report or other documentation is recommended.
Description of mitigation measures	Each mitigation measure should be briefly described with reference to the impact to which it relates and the conditions under which it is required (for example, continuously or in the event of contingencies). These should be accompanied by, or referenced to, project design and operating procedures that elaborate on the technical aspects of implementing the various measures.
Description of monitoring program	The monitoring program should clearly indicate the linkages between impacts identified in the EIA report, measurement indicators, detection limits (where appropriate), and definition of thresholds that will signal the need for corrective actions.
Institutional arrangements	Responsibilities for mitigation and monitoring should be clearly defined, including arrangements for coordination between the various actors responsible for mitigation.
Implementation schedule and reporting procedures	The timing, frequency and duration of mitigation measure should be specified in an implementation schedule, showing links with overall project implementation. Procedures to provide information on the progress and results of mitigation and monitoring measures should also be clearly specified.
Cost estimates and sources of funds	These should be specified for both the initial investment and recurring expenses for implementing all measures contained in the EMP, integrated into the total project costs, and factored into loan negotiations.

3. Stakeholder Participation

ANALYSIS OF PUBLIC policy and decisions is often expert-driven allowing only limited opportunity for meaningful and inclusive public participation (Arnstein 1969; Fischer 2000). However, recent experiences demonstrate that more deliberative and inclusive public participation processes can improve decision-making (Fischer 2000). An HIA process that effectively includes meaningful stakeholder participation in decision-making might not only improve the quality and utility of the analysis but also support stakeholder consensus around a decision, reducing costly delay and controversy (Corburn 2009).

Stakeholders include any individuals or groups with a known or perceived interest in the outcomes of a decision that is the subject of an HIA, such as residents, employees or employers, sponsors of economic development projects; health providers or public health officials; or government agencies responsible for policy implementation or enforcement. While stakeholders may hold opposing positions on alternative decision choices, all stakeholders have potential contributions to make to an HIA. Residents are most often the best sources of priority community needs. Project proponents are likely to have knowledge about the feasibility of alternatives. Health providers bring essential information about the health status and vulnerabilities of community members. City, regional, state and federal agencies may have data on existing environmental, neighborhood, work, and other conditions relevant to health.

Each step in the HIA process provides an opportunity for stakeholder participation. For example, HIA assessors may convene community residents to participate in a scoping process for an HIA to better focus research questions on community priorities. In the assessment phase, assessors may use focus groups to gain insight and knowledge about health effects and strategies to mitigate these effects. Analysis of alternatives can involve a dialogue with both experts and project proponents or policy implementers. Table 9 below provides other examples of possible community roles in stages of the HIA process.

HIA STAKEHOLDER COLLABORATION AGREEMENT

For an HIA on expansion plans for the Port of Oakland, the UC Berkeley Health Impact Group and West Oakland neighborhood residents and stakeholders established a collaboration agreement. Under this agreement, community stakeholders reviewed and approved the scope of the HIA analysis and took responsibility for communicating results while the university partner was responsible for research (West Oakland HIA Working Group and UC Berkeley Health Impact Group 2007).

TABLE 9. EXAMPLES OF STAKEHOLDER INVOLVEMENT IN HIA

Screening	<ul style="list-style-type: none"> • Identifying a need for HIA • Demanding public agencies conduct an HIA
Scoping	<ul style="list-style-type: none"> • Participating in scoping exercises to identify high priority community health issues and concerns
Assessment of Health Effects	<ul style="list-style-type: none"> • Collecting, contributing, or analyzing data • Facilitating interviews and focus groups • Conducting a community survey • Interpreting or “ground truthing” findings with illustrative examples
Recommending Mitigations and Design Alternatives	<ul style="list-style-type: none"> • Suggesting mitigations and design alternatives • Prioritizing recommendations
Reporting and Communication	<ul style="list-style-type: none"> • Reviewing and criticizing reports • Hosting a press release to issue the HIA findings to the media • Meeting with public officials and decision-makers
Monitoring	<ul style="list-style-type: none"> • Creating a “watchdog” group and monitor decision outcomes and long-term results

Stakeholders, including organizations representing affected communities, can have more formal roles in the oversight of HIA as well. Stakeholder oversight that is representative of diverse interests can add a significant measure of legitimacy and authority to the HIA process and its findings. Such oversight may generate more buy-in to the process and findings, build a greater consensus for recommended decision alternatives and mitigations, and increase the communication of the HIA both to decision-makers and to the public more broadly.

Stakeholder oversight of HIA can take several forms. For example, stakeholders could convene and fund an HIA but task a technical assessment team with the tasks of scoping, analysis, and report writing. The stakeholder could maintain oversight of the process and control of the findings and their communication. In an HIA conducted on the growth of the Port of Oakland, stakeholders and HIA practitioners developed a formal collaboration agreement, specifying a division of responsibility with regard to issue selection, analysis, and communication of findings (see Sample HIA Collaboration Agreement in Appendix III). Alternatively, in the Eastern Neighborhoods Community Health Impact Assessment, the San Francisco Department of Public Health initiated and led the HIA but convened a Community Council of diverse public and private organizations to provide oversight for each step in that process (Farhang et al. 2008).

4. The Interface of Health and Environmental Impact Assessment

AS DISCUSSED IN the introduction, existing laws requiring the conduct of EIA allow public agencies to consider and respond to health effects of a broad scope of public agency actions. While these laws do not specifically proscribe the implementation of HIA procedures as described in this Guide, there is nevertheless the clear opportunity to utilize the EIA process to advance the underlying objectives of HIA. Integration of health effects within EIA will, in many cases, be more efficient than conducting both an EIA and HIA processes separately; moreover, EIA may benefit from concepts and analytic approaches applied in HIA (Banken 2001; Hilding-Rydevik et al. 2006; Bhatia and Wernham 2008; Morgan 2010).

Both NEPA, as well as related state laws, already require that EIA include consideration and analysis of direct and indirect health effects (CEQ 1978 §1508.8; CEQ 1978 §1508.27; CEQ 1997; EPA 1998). The Council on Environmental Quality (CEQ) which promulgates regulations for implementing NEPA (40 CFR 1500-1508) emphasizes that the “human environment” is to be “interpreted comprehensively” under NEPA to include “the natural and physical environment and the relationship of people with that environment.” (40 CFR 1508.14) NEPA regulations further define “effects” as those that are “. . . ecological, aesthetic, historic, cultural, economic, social, or *health*, whether direct, indirect, or cumulative.” (CEQ 1978 §1508.8) Health is also a specific factor used to determine the significance of environmental effects (CEQ 1978 §1508.27).

The practice of environmental impact assessment (EIA) emerged after 1969 as a way to implement the legal requirements of NEPA (CEQ 1997). The 1969 National Environmental Policy Act (NEPA) charged the federal government agencies “to use all practicable means, consistent with other essential considerations of national policy” to “assure for all Americans safe, healthful, productive and aesthetically and culturally pleasing surroundings” (NEPA 1969 §4331). The law requires that any major federal action significantly affecting the quality of the human environment must undergo an evaluation and public disclosure of its environmental effects (NEPA 1969). Observers of EIA suggest that the practice has opened decision-making to public scrutiny, raised the profile of environmental considerations, and, over time, altered the norms and practices of public and private organizations in a way that is more protective of the environment (Canter and Clark 1997; Cashmore et al. 2007).

Requirements for health analysis within environmental assessment are not unique to the federal level. Seventeen state-level versions of NEPA are referenced on the NEPA website (<http://www.nepa.gov/nepa/regs/states/states.cfm>). Fourteen of these contain language that would support the inclusion of health effects analysis. For example, in California, regulations for the California Environmental Quality Act (CEQA) require an environmental impact report (EIR) to be prepared if “. . . the environmental effects of a project will cause substantial adverse effects on human beings, either directly or indirectly.” (CCR §15065) CEQA regulations also specifically require that EIRs discuss “health and safety problems caused by the physical changes.” (CCR §15126.2) In California, CEQA case law has consistently upheld the requirement to study public health impacts related to changes in environmental quality.³

The case for integration of health effects analysis where EIA occurs is substantial (Laws 1994; Hilding-Rydevik 2006; Bhatia and Wernham 2008; Morgan 2010). First, the EIA process is already integrated within the public agency decision-making process, and analysis already includes many effects on social and environmental determinants of health. Second, EIA rules require identification and in some cases implementation of health protective mitigations and alternatives. Third, many stakeholders who would have an interest in health effects are already engaged in the EIA process. Fourth, planning for major infrastructure and development projects typically anticipates and provides for budgets to conduct EIA.

Environmental effects commonly considered in EIA can include damage to the health of biota; disruption of food webs; loss or transformation of habitats and natural areas; removal of natural resources; transformation of natural systems or landscapes; pollution of water, soil, or air; and change or development of the built environment. Common indirect effects on health or human welfare of these changes can include:

- Adverse health effects from a change in exposure or proximity to a new or existing environmental hazard, including air, water, or soil pollutants, noise, radiation, biological pathogens, and injury hazards
- Reduction of the quality or quantity of recreational opportunities or access to or contact with natural areas
- Prevention of culturally important uses of land and natural resources or damage to a culturally important, archaeological, paleontological, or architectural resource

³ For example: *Bakersfield Citizens for Local Control v. City of Bakersfield*; *Berkeley Keep Jets Over the Bay Committee v. Board of Port Commissioners of the City of Oakland*; and *Californians for Alternatives to Toxics v. Department of Food and Agriculture*.

- Loss of natural resource or foreclosure of future use of natural resources for livelihood or sustainability (e.g., loss of a food, energy, or water resources)
- Change in the quality of housing with regard to sanitation, light, heat, noise, etc.
- Displacement or forced migration, leading to effects on economic well-being, access to health resources, and social organization

The steps in the EIA process are similar and complimentary to the steps in the HIA process (Yost 2003). When a federal agency action triggers requirements for EIA, the responsible agency can thus borrow activities and tools used within HIA as a way to achieve the health effects mandates under NEPA. Table 10 describes activities in the HIA process that can be used to serve requirements for health effects analysis under the NEPA process. Integrating HIA activities into state and local EIA regulations would be substantially similar.

There are a number of recognized challenges to improving the integration of health effects with EIA practice. Historically, health expertise has often been lacking among agencies responsible for EIA, and health agencies and health professionals have not typically been participants in this process (Cole 2004; Bhatia and Wernham 2008). Challenges on the part of responsible agencies to augmenting the scope of health analysis within EIA include both a limited understanding of public health effects, resistance to investing the time and resources needed to conduct the necessary health analysis, and concerns about placing new regulatory burdens on decision proponents (Hilding-Rydevik 2006; Corburn 2007). Despite these challenges, a number of actions might be taken to improve practice integration (Bhatia and Wernham 2008; Wernham 2009). These include:

- Agencies responsible for EIA could seek out public health expertise when evidence suggests a decision may have significant effects on health.
- Public health officials could take more proactive roles in reviewing environmental analysis conducted on decisions affecting their constituencies.
- Responsible agencies and public health officials could collectively produce guidance for integrated analysis.
- Responsible agencies should provide resources to analyze health effects commensurate with the significance of the effects.

TABLE 10: ACTIVITIES FOR INTEGRATING HEALTH ANALYSIS UNDER THE NATIONAL ENVIRONMENTAL POLICY ACT

Stage in EIA	Health Analysis Requirements under NEPA	Activities for Integrated Health Analysis
Screening	Under NEPA, federal agencies conduct an EIS when they determine their action to be a “major federal action significantly effecting the quality of the human environment” (NEPA Sec. 102 [42 USC § 4332]).	<ul style="list-style-type: none"> • Identify health-relevant environmental effects and potential public health impacts of significance • Identify public concerns and controversies regarding health effects
Scoping	When an EIS is required, agencies are also required to analyze any potentially significant health effects of the action. Similar to environmental effects, NEPA does not specify which health effects, data sources mitigations should be considered in an EIA.	<ul style="list-style-type: none"> • Determine priority potential health impacts deserving analysis • Identify vulnerable populations • Assess issues and concerns of affected communities • Identify potential disproportionate health impacts • Identify analytic methods, data, and experts
Assessment	Assessment in an EIS involves roughly the same process as assessment in HIA. This includes a description of the affected environment (baseline conditions), an analysis of environmental consequences of the decision alternatives, and recommendations for measures to protect health. A specific consideration in determining “significance” of an effect is “the degree to which the proposed action affects public health or safety” (40 CFR 1508.27).	<ul style="list-style-type: none"> • Contribute data on the health status, vulnerability of affected populations and health-relevant environmental conditions • Develop or utilize analytic tools to analyze health impacts • Identify or proposing health-based significance thresholds • Identify and proposing mitigations and alternatives
Reporting	Assessment of health effects is reported within the Draft EIS (DEIS) either in subsections related to a category of environmental effect or in a public health, community health, or environmental justice subsection. The DEIS is subject to public comment, reassessed, and revised based upon those comments, and released as a Final EIS (FEIS). Using the information in the FEIS, agency management renders a final “Record of Decision” approving, modifying, or rejecting the proposed action.	<ul style="list-style-type: none"> • Participate in drafting the DEIS or FEIS if a cooperating agency • Review and critique of the public health sections of the DEIS by public health agencies, experts, and private organizations
Monitoring	Typically, an EIS that includes required mitigation also includes a mitigation monitoring plan.	<ul style="list-style-type: none"> • Propose monitoring indicators for health impacts of concern

5. Conclusions

HIA IS AN evolving practice that has potentially broad utility to advance and protect human health. Consistent with other guidance and standards documents for HIA, this Guide attempts to provide a practical framework that is applicable to diverse decision contexts.

In the author's opinion, there is not yet sufficient practice experience to advance one "best practice" of HIA and it is important that this Guide not be interpreted as a reflection of such. There exist several current efforts to improve the quality of the field. North American HIA Practice Standards reflect the consensus of one group of practitioners on the most salient qualities of effective practice (see Appendix I). In addition, in 2011, the National Academies of Science published, *Improving Health in the United States: The Role of Health Impact Assessment*.

In the United States, HIA is typically conducted as a voluntary practice focused on selected interests of practitioners, stakeholders, of financial sponsors. Outside the context of NEPA and similar state laws, these ad hoc efforts are not bound by any standards of quality practice nor do they trigger any responsibility on the part of decision-makers to be responsive to findings or recommendations. The experimental nature of the field is both an asset as well as a potential point of criticism.

Relatively few formal evaluations of HIA effectiveness have been conducted. (Corburn and Bhatia 2007; Wismar et al. 2007) As the practice matures, there will be a growing need to evaluate how diverse qualities of practice relate to its effectiveness in differing contexts. An "evidence-based" practice of HIA will require consensus on definitions and measures of practice effectiveness. Practice quality will also need to be measured not only by the methods employed but also on the communication and engagement efforts of practitioners. Analysis of the relationships between practice and effect need to account for their likely variation within regulatory and political contexts. (Bekker 2004; Wismar et al. 2007; Morgan 2010)

The growth of practice will eventually demand institutional rules and procedures to ensure practice, efficiency, and quality. HIA institutionalization could help efficiently target its application to maximize public health and welfare objectives and could help ensure policy-maker accountability to findings. Institutional rules could provide a rational and consistent screening approach of a large number of candidate decisions, ensure an explicit focus on distributional impacts and health equity, and provide for standards and oversight for the HIA process. Developing a consensus on the form of such institutionalization will be a significant challenge for the field.

6. References

- Anderson IA, and Jaeger B. Scenario workshops and consensus conferences: Towards more democratic decision making. *Science and Public Policy* 1999; 26:331–340.
- Appelbaum B. As U.S. agencies put more value on a life, businesses fret. *New York Times* Feb 16, 2011.
- Arnstein S. A ladder of citizen participation. *Journal of the American Planning Association* 1969; 35(4):216–224.
- Arquiaga MC, Canter LW, and Nelson DI. Integration of health impact considerations in environmental impact studies. *Impact Assessment* 1994; 12:175–197.
- Banken R. Strategies for institutionalization of HIA. *ECHHP Health Impact Assessment Discussion Papers, Number I*. World Health Organization 2001.
- Baram M. Cost-benefit analysis: An inadequate basis for health, safety, and environmental regulatory decision-making. *Ecology Law Quarterly* 1979–1980; 473.
- Bass R. Evaluating environmental justice under the National Environmental Policy Act. *Environmental Impact Assessment Review* 1998; 18:83–92.
- Bekker MPM, Putters K, and Van der Grinten TED. Exploring the relation between evidence and decision-making: A political-administrative approach to health impact assessment. *Environmental Impact Assessment Review* 2004; 24:139–149.
- Bhatia R. Protecting health with environmental impact assessment: A case study of San Francisco land use decision-making. *American Journal of Public Health* 2007; 97:406–413.
- Bhatia R, and Katz M. Estimation of health benefits accruing from a Living Wage Ordinance. *American Journal of Public Health* 2001; 91:1398–1402.
- Bhatia R, and Seto E. Quantitative estimation in health impact assessment: Opportunities and challenges. *Environmental Impact Assessment Review* 2011; 31:201–309. doi: 10.1016/j.eiar.2010.08.003.
- Bhatia R, and Wernham A. Integrating human health into environmental impact assessment: An unrealized opportunity for environmental health and justice. *Environmental Health Perspectives* 2008; 116:991–1000.
- Braveman P, and Gruskin S. Defining equity in health. *Journal of Epidemiology Community Health* 2003; 57:254–258.
- Briggs, D. *Indicators: Making a difference: Indicators to Improve Children's Environmental Health*. Geneva: World Health Organization, 2003.
- Briggs DJ. A framework for integrated environmental health impact assessment of systemic risks. *Environmental Health* 2008; 7:61.
- Brodin H, and Hodge S. *A Guide to Quantitative Methods in Health Impact Assessment*. Stockholm: Swedish National Institute of Public Health, 2008. Available at: <http://www.fhi.se/PageFiles/6057/R2008-41-Quantitative-Methods-in-HIA.pdf>
- California State Legislature. *California Global Warming Solutions Act, A.B. 32*, California State Legislature (2006).
- Canter L, and Clark R. NEPA effectiveness—a survey of academics. *Environmental Impact Assessment Review* 1997; 17:313–327.
- Cashmore M, Bond A, and Cobb D. The contribution of environmental assessment to sustainable development: Towards a richer empirical understanding. *Environmental Management* 2007; 40:516–530.
- Cashmore M, Richardson T, Hilding-Ryedvik T, and Emmelin L. Evaluating the effectiveness of impact assessment instruments; theorizing the nature and implications of their political constitution. *Environmental Impact Assessment Review* 2010; 30:371–379. doi:10.1016/j.eiar.2010.01.004.
- Clinton WJ. Executive Order, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*. Executive Order 12898. 1994.
- Clinton WJ. Executive Order, *Regulatory Planning and Review*. Washington, Executive Order 12866. 1993.
- Cole B, and Fielding J. Health impact assessment: A tool to help policy makers understand health beyond health care. *Annual Reviews of Public Health* 2007; 28:393–412.
- Cole B, Wilhelm M, Long P, Fielding J, Kominski G, and Morgenstern H. Prospects for health impact assessment in the United States: New and improved environmental impact assessment of something different? *Journal of Health Politics, Policy and Law* 2004; 29:1153–1186.
- Cole BL, Shimkhada R, Morgenstern H, Kominski G, Fielding JE, and Wu S. Projected health impact of the Los Angeles city living wage ordinance. *Journal of Epidemiology and Community Health* 2005; 59:645–650.
- Collins J, and Koplan JP. Health impact assessment: A step toward health in all policies. *Journal of the American Medical Association* 2009; 302:315–7.
- Commission on the Social Determinants of Health. *Closing the Gap in a Generation: Health Equity through Action on the Social Determinants of Health*. Geneva: World Health Organization, 2008.
- Corburn J. *Toward the Healthy City: People, Places and the Politics of Urban Planning*. Cambridge, MA: The MIT Press, 2009.
- Corburn J, and Bhatia R. Health impact assessment in San Francisco: Incorporating the social determinants of health into environmental planning. *Journal of Environmental Planning and Management* 2007; 50:323–341.
- Corvalán CF, Kjellström T, and Smith KR. Health, environment and sustainable development: Identifying links and indicators to promote action. *Epidemiology* 1999; 10:656–60.
- Cottrill CD, and Thakuriah P. Evaluating pedestrian crashes in areas with high low-income or minority populations. *Accident Analysis and Prevention* 2010; 42:1718–1728.
- CEQ (Council on Environmental Quality). *Council on Environmental Quality Regulations for Implementing NEPA*. 40 CFR Parts 1500–1508. 1978.
- CEQ (Council on Environmental Quality). *Environmental Justice: Guidance under the National Environmental Health Policy Act*. Washington, DC: President's Council on Environmental Quality, 1997.
- Dannenberg A, Bhatia R, Cole B, Heaton S, Feldman J, and Rutt C. Use of health impact assessment in the United States: 27 case studies, 1999–2007. *American Journal of Preventive Medicine* 2008; 34:241–256.
- Davies K, and Sadler B. *Environmental Assessment and human health: Perspectives, approaches, and future directions*. Ottawa: Health Canada, 1997.
- Dorfman L, Wallack L, and Woodruff K. More than a message: Framing public health advocacy to change corporate practices. *Health Education & Behavior* 2005; 32:320–336.
- Dow WH, Schoeni RF, Adler NE, and Stewart J. Evaluating the evidence base: Policies and interventions to address socioeconomic status gradients in health. *Annals of the N Y Academy of Science* 2010; 1186:240–51.

- Elliot E, and Francis S. Making effective links to decision-making: Key challenges for health impact assessment. *Environmental Impact Assessment Review* 2004; 25:747–757.
- Evans G, and Marcynyszyn LA. Environmental justice, cumulative environmental risk, and health among low- and middle-income children in upstate New York. *American Journal of Public Health* 2004; 94:1942–1944.
- Farchi S, Molino N, Rossi PG, Borgia P, Krzyzanowski M, Dalbokova D, Kim R, and the European Road Accident Indicator Working Group *BMC Public Health* 2006; 6:183. doi:10.1186/1471-2458-6-183.
- Farhang L, Bhatia R, Comerford-Scully C, Corburn J, Gaydos M, and Malekfzali S. Creating tools for healthy development: Case study of San Francisco's eastern neighborhoods community health impact assessment. *Journal of Public Health Policy & Management* 2008; 14:255–65.
- Fehr R. Environmental health impact assessment: Evaluation of a ten-step model. *Epidemiology* 1999; 10:618–25.
- Fischer F. *Citizens, Experts and the Environment: The Politics of Local Knowledge*. Durham, NC: Duke University Press, 2000.
- Fredsgaard MW, Cave B, and Bond A. *A Review Package for Health Impact Assessment Reports of Development Projects*. Ben Cave Associates Ltd. 2009. Available at : www.hiagateway.org.uk
- Gakidou EE, Murray CJL, and Frenk J. Defining and measuring health inequality: An approach based on the distribution of health expectancy. *Bulletin of the World Health Organization* 2000; 78:42–54.
- Graham, H. Where is the future in public health? *Milbank Quarterly* 2010; 88:149–68.
- Harris-Roxas B, and Harris E. Differing forms, differing purposes: A typology of health impact assessment. *Environmental Impact Assessment Review* 2011; 31:396–403. doi:10.1016/j.eiar.2010.03.003.
- Hays L, and Kitcher C. An analysis of the benefits of a cross-sectional approach to a prospective health impact assessment of a container port development. *Environmental Impact Assessment Review* 2004; 24:199–206.
- Healthy Places Act of 2006*, H. R. 5088, 109th Congress. (2006).
- Hertz-Picciotto I. Epidemiology and quantitative risk assessment: A bridge from science to policy. *American Journal of Public Health* 1995; 85:484–91.
- Hilding-Rydevik T, Vohra S, Ruotsalainen A, Pettersson A, Pearce N, Breeze C, Hrnarova M, Liekovska Z, Paluchova K, Thomas L, and Kemm J. *Health Aspects in ELA*. European Commission, 2006.
- Hill AB. The environment and disease: Association or causation? *Proceedings of the Royal Society of Medicine* 1965; 58:295–300.
- Kakwani N, Wagstaff A, and van Doorslaer E. Socio-economic inequalities in health: Measurement, computation, and statistical inference. *Journal of Economics* 1997; 77:87–103.
- Kawachi I, and Berkman LF. *Neighborhoods and Health*. New York: Oxford University Press, 2003.
- Kemm JR, Parry J, and Palmer S. *Health Impact Assessment: Concepts, Theory, Techniques, and Applications*. New York City, NY: Oxford University Press, 2004.
- Lakoff G, and Morgan P. *Framing social issues: Does "the working poor" work?* Oakland, CA: Rockridge Institute, 2001.
- Laws DW, and Sagar AD. Perspectives on human health impact assessment. *Environmental Impact Assessment Review* 1994; 14:311–319.
- Marmot M, and Wilkinson R. *The Social Determinants of Health*. New York City: Oxford University Press, 2006.
- Miller A, and Cuff W. The delphi approach to the mediation of environmental disputes. *Environmental Management* 1986; 10:321–330.
- Mindell J, Biddulph JB, Boaz A, Boltong A, Curtis S, Joffe M, Lock K, and Taylor L. *A Guide to Reviewing Evidence for Use in Health Impact Assessment*. London: London Health Observatory. 2006. Available at: www.lho.org.uk/download.aspx?urlid=10846&urlt=1
- Mindell J, Hansell A, Morrison D, Douglas M, and Joffe M. What do we need for robust, quantitative health impact assessment? *Journal of Public Health Medicine* 2001; 23:173–178.
- Mindell J, Joffe M, Lock K, Curtis S, Boaz A, and Biddulph J. Improving the use of evidence in health impact assessment. *Bulletin of the World Health Organization* 2010; 88:543–550.
- Mitchell G. Forecasting environmental equity: Air quality responses to road user charging in Leeds, UK. *Journal of Environmental Management* 2005; 77:212–26.
- Moore JL. *Cost-Benefit Analysis: Issues in Its Use in Regulation*. Washington DC: Congressional Research Service, 1995.
- Morgan R. *Environmental Impact Assessment: A Methodological Perspective*. Springer 1998.
- Morgan RK. Health and impact assessment: Are we seeing closer integration? *Environmental Impact Assessment Review* 2011; 31:404–411.
- NEPA (National Environmental Policy Act). H.R. 91-190, 42nd Congress. (1969).
- North American HIA Practice Standards Working Group (Bhatia R, Branscomb J, Farhang L, Lee M, Orenstein M, Richardson M). *Minimum Elements and Practice Standards for Health Impact Assessment, Version 2*. North American HIA Practice Standards Working Group. Oakland, CA: November 2010. Available at www.humanimpact.org/news/24-hiapracticestandards
- NRC (National Research Council). 2009. *Science and Decisions: Advancing Risk Assessment*. Washington, DC: National Academies Press.
- O'Connell E, and Hurley F. A review of the strengths and weaknesses of quantitative methods used in health impact assessment. *Public Health* 2009; 123:306–310.
- Office of the Controller Office of Economic Analysis (OEA). *Requiring Air Quality Assessment and Ventilation in Certain Urban Infill Residential Developments: Economic Impact Report*. San Francisco: Office of the Controller, 2008.
- Ozonoff D. Conceptions and misconceptions about human health impact analysis. *Environmental Impact Assessment Review* 1994; 14:499–515.
- Petticrew M, Cummins S, Sparks L, and Findlay A. Validating health impact assessment: Prediction is difficult (especially about the future). *Environmental Impact Assessment Review* 2007; 27:101–107.
- Quigley R, den Broeder L, Furu P, Bond A, Cave B, and Bos R. *Health Impact Assessment, International Association for Impact Assessment, International Best Practice Principles*. Special publication series No. 5 2006. Available at: <http://www.iaia.org/publicdocuments/special-publications/SP5.pdf>
- Revesz RL. Environmental regulation, cost-benefit analysis, and the discounting of human lives. *Columbia Law Review* 1999;99:941–1017.
- Rothman KJ, and Greenland S. Causality and causal inference. In *Modern Epidemiology*, pp. 7–28. Philadelphia, PA: Lippincott-Raven, 1998.
- Sabel C, Fung A, and Karkkainen B. *Beyond Backyard Environmentalism*. Boston, MA: Beacon Press, 2000.
- Steinemann A. Rethinking human health impact assessment. *Environmental Impact Assessment Review* 2000; 20:627–645.
- Stevenson A, Banwell K, and Pink R. Assessing the impacts on health of an urban development strategy: A case study of the greater Christchurch urban development strategy. *Social Policy Journal of New Zealand* 2006; 29:146–163.
- Stuart AL, Mudhasakul S, and Sriwatanapongse W. The social distribution of neighborhood-scale air pollution and monitoring protection. *Journal of the Air Waste Management Association* 2009; 59:591–602.
- Susser M. Rules of inference in epidemiology. *Regulatory Toxicology and Pharmacology* 1986; 6:116–28.
- Taylor L, Gowman N, Lethbridge J, and Quigley R. *Deciding If a Health Impact Assessment is Required* (screening for HIA.) NHS Health Development Agency. 2003. Available at: http://www.iaia.org/publicdocuments/pubs_ref_material/Screening%20for%20HIA%20pdf.pdf
- Terris, M. A social policy for health. *American Journal of Public Health* 1968; 12:5–12.
- Unfunded Mandates Reform Act*. 2 USC 1501. 104th Congress. (1995)
- USEPA (US Environmental Protection Agency). *Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses*. Washington DC: USEPA, 1998. Available at: <http://www.epa.gov/compliance/environmentaljustice>
- USEPA (US Environmental Protection Agency). *Consideration of Cumulative Impacts in EPA Review of NEPA Documents*. May 1999.
- USEPA (US Environmental Protection Agency). *Final Guidance for Consideration of Environmental Justice in Clean Air Act 309 Reviews*. Washington, DC: USEPA, 1999.

- USEPA (US Environmental Protection Agency). *Guidelines for Preparing Economic Analysis*. Washington DC: USEPA, 2000.
- US Environmental Protection Agency (USEPA). "Regulatory impact assessment". 2006 *National Ambient Air Quality Standards for Particle Pollution*. 2006.
- US Environmental Protection Agency (USEPA). *Scoping a Health Impact Assessment (HIA) for the Ports of Los Angeles and Long Beach*. Available at : <http://www.epa.gov/region9/nepa/portsHIA/>. (Accessed October 5, 2010.)
- Veerman JL, Barendregt JJ, and Mackenbach JP. Quantitative health impact assessment: Current practice and future directions. *Journal of Epidemiology & Community Health* 2005; 59:361–370.
- Veerman JL, Bekker MP, and Mackenbach JP. 2006. Health impact assessment and advocacy: A challenging combination. *Social and Preventative Medicine* 2006; 51:151–152.
- Veerman JL, Mackenbach JP, and Barendregt JJ. Validity of predictions in health impact assessment. *Journal of Epidemiology & Community Health* 2007; 61:363–366.
- Walker G. Environmental justice, impact assessment and the politics of knowledge. The implications of assessing the social distribution of environmental outcomes. *Environmental Impact Assessment Review* 2010; 30:312–318.
- Washington State Legislature. *Hiring a Mediator to Help the Department of Transportation Develop a State Route Number 520 Expansion Impact Plan*. S.B. 6099. Washington State Legislature. 2007.
- Weed DL. Weight of evidence: A review of concept and methods. *Risk Analysis* 2005; 25:545–1557.
- Wernham A. Inupiat health and proposed Alaskan oil development: Results of the first integrated health impact assessment/environmental impact statement of proposed oil development on Alaska's north slope. *Ecohealth* 2007; 4:500–513.
- Wernham A. Building a statewide health impact assessment program: A case study from Alaska. *Northwest Public Health* 2009; 26:16–17.
- West Oakland HIA Working Group and UC Berkeley Health Impact Group. *Principles of Collaboration for the Port Of Oakland Health Impact Assessment*. October 22, 2007.
- Wier M, Sciammas C, Seto E, Bhatia R, and Rivard T. Health, traffic, and environmental justice: Collaborative research and community action in San Francisco, California. *American Journal of Public Health* 2009; 99(S3):S499–S502.
- Wier M, Weintraub J, Seto E, Humphreys E, and Bhatia R. An area-level model of vehicle-pedestrian injury collisions with implications for land use and transportation planning. *Accident Analysis & Prevention* 2009; 41:137–145.
- Wismar M, Blau J, Ernst K, and Figueras J, eds. *The Effectiveness of Health Impact Assessment: Scope and Limitations of Supporting Decision-Making in Europe*. Copenhagen: European Observatory on Health Systems and Policies, World Health Organization, 2007.
- World Bank. "Environmental management plans." *Environmental Assessment Sourcebook Update No. 25*, Washington DC: World Bank, 1999.
- WHO (World Health Organization). *Ottawa Charter for Health Promotion*. First International Conference on Health Promotion, Ottawa: WHO, 1986.
- WHO (World Health Organization). *Health Promotion Glossary*. Geneva: WHO, 1998.
- WHO (World Health Organization). *Health Impact Assessment: Main Concepts and Suggested Approach*: Gothenburg consensus paper. Brussels: European Center for Health Policy, 1999.
- WHO (World Health Organization). Working Group. Evaluation and use of epidemiological evidence for environmental health risk assessment: WHO Guideline Document. *Environmental Health Perspectives* 2000; 108:997–1002.
- WHO (World Health Organization). *Closing the Gap in a Generation: Final Report from Commission on the Social Determinants of Health*. Geneva: WHO, 2008.
- Yost N. *NEPA Deskbook*, 3rd edition. Washington, DC: Island Press, 2003.

Minimum Elements and Practice Standards for Health Impact Assessment

North American HIA Practice Standards Working Group

VERSION 2, NOVEMBER 2010

■ Authorship and Acknowledgments

This document represents a revision of version one of Practice Standards for Health Impact Assessment (HIA) published by the North American HIA Practice Standards Working Group in April 2009. This review and revision was conducted by a working group including the following individuals: Rajiv Bhatia,¹ Jane Branscomb,² Lili Farhang,³ Murray Lee,⁴ Marla Orenstein,⁴ and Maxwell Richardson.⁵ In producing this document, the working group solicited review and comment from participants attending the second annual HIA in the Americas Workshop held in Oakland, California, in March 2010.

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■ **Endorsements**

The following HIA practitioners and organizations are committed to utilizing these working practice standards, to the greatest extent possible, in their health impact assessment practice. These organizations are listed below:

Environmental Resources Management

Georgia Health Policy Center

Habitat Health Impact Consulting Corp.

Human Impact Partners

San Francisco Department of Public Health

University of California Berkeley, Health Impact Group

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Introduction

Health impact assessment (HIA) is a practice to make visible the interests of public health in decision-making. The International Association of Impact Assessment defines HIA as *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.* With roots in the practice of environmental impact assessment (EIA), HIA aims to inform the public and decision-makers when decisions about policies, plans, programs, and projects have the potential to significantly impact human health, and to advance the values of democracy, equity, sustainable development, the ethical use of evidence, and a comprehensive approach to health.

While available guidance documents for HIA describe the procedural steps and products of each stage of the HIA process, there exists considerable diversity in the practice and products of HIA due to the variety of decisions assessed, diverse practice settings, and the nascent evolution of the field. This document, a collective product of an HIA practitioners' workgroup in North America, intends to translate the values underlying HIA along with key lessons from HIA practice into specific "standards for practice" for each phase of the HIA process. Participants at the first North American Conference on Health Impact Assessment held in Oakland, California, in September 2008 identified the development of standards as a priority need for the field. Subsequent to the 2008 conference, participants collectively developed the first version of these practice standards. This document reflects the second version of those standards, and has been revised to include a set of "minimum elements" of HIA practice.

In this document, "Minimum Elements" answers the question of "what essential elements constitute an HIA"; this is distinct from "Practice Standards," which answers the question, "how to best conduct an HIA."

Minimum Elements can serve as a basis to identify and promulgate examples of HIA within the field of practice and in broader social discourse, distinguishing HIA from other practices and methods that also aim to ensure the consideration of and action on health interests in public policy. These *Minimum Elements* apply to HIA whether conducted independently or integrated within an environmental, social or strategic impact assessment.

The *Practice Standards* are not rigid criteria for acceptability but rather guidance for effective practice. A practitioner may use the *Practice Standards* as benchmarks for their own HIA practice, to stimulate discussion about HIA content and quality, and to evaluate this emerging field.

These standards are intended to support the development and institutionalization of HIA, and are aligned with the central concepts and suggested approaches described in the World Health Organization's 1999 Gothenburg Consensus Paper on HIA, a guiding document in the HIA field. The members of the North American HIA Practice Standards Working Group recognize that real-world constraints and varying levels of capacity and experience will result in appropriate and ongoing diversity of HIA practice. Every practice standard in this document may not be achieved in every example of HIA. Overall, we hope that these standards will be viewed as relevant, instructive, and motivating for advancing HIA quality.

Minimum Elements of HIA

A health impact assessment (HIA) must include the following minimum elements, which together distinguish HIA from other processes. An HIA:

1. Is initiated to inform a decision-making process and conducted in advance of a policy, plan, program, or project decision;
2. Utilizes a systematic analytic process with the following characteristics:
 - i. Includes a scoping phase that comprehensively considers potential impacts on health outcomes as well as on social, environmental, and economic health determinants, and selects potentially significant issues for impact analysis;
 - ii. Solicits and utilizes input from stakeholders;
 - iii. Establishes baseline conditions for health, describing health outcomes, health determinants, affected populations, and vulnerable sub-populations;
 - iv. Uses the best available evidence to judge the magnitude, likelihood, distribution, and permanence of potential impacts on human health or health determinants;
 - v. Rests conclusions and recommendations on a transparent and context-specific synthesis of evidence, acknowledging sources of data, methodological assumptions, strengths and limitations of evidence and uncertainties;
3. Identifies appropriate recommendations, mitigations and/or design alternatives to protect and promote health;
4. Proposes a monitoring plan for tracking the decision's implementation on health impacts/determinants of concern;
5. Includes transparent, publicly accessible documentation of the process, methods, findings, sponsors, funding sources, participants, and their respective roles.

■ *HIA Practice Standards*

Adherence to the following standards is recommended to advance effective HIA practice:

GENERAL STANDARDS FOR THE HIA PROCESS

1. An HIA should include, at a minimum, the stages of **screening, scoping, assessment, recommendations, and reporting** described below. Monitoring is an important follow-up activity in the HIA process. The HIA should include a follow-up monitoring plan to track the outcomes of a decision and its implementation.
2. Evaluation of the HIA process and impacts is necessary for field development and practice improvement. Each HIA process should begin with explicit, written goals that can be evaluated as to their success at the end of the process.
3. HIA should respect the needs and timing of the decision-making process it evaluates.
4. HIA requires integration of knowledge from many disciplines; the practitioner or practitioner team must take reasonable and available steps to identify, solicit, and utilize the expertise, including from the community, needed to both identify and answer questions about potentially significant health impacts.
5. Meaningful and inclusive stakeholder participation (e.g., community, public agency, decision-maker) in each stage of the HIA supports HIA quality and effectiveness. Each HIA should have a specific engagement and participation approach that utilizes available participatory or deliberative methods suitable to the needs of stakeholders and context.
6. HIA is a forward-looking activity intended to inform an anticipated decision; however, HIA may appropriately conduct or utilize analysis, or evaluate an existing policy, project, or plan to prospectively inform a contemporary decision or discussion.
7. Where integrated impact assessment is required and conducted, and requirements for impact assessment include responsibility to analyze health impacts, HIA should be part of an integrated impact assessment process to advance efficiency, to allow for interdisciplinary analysis, and to maximize the potential for advancing health promoting mitigations or improvements.
8. HIA integrated within another impact assessment process should adhere to these practice standards to the greatest extent possible.

STANDARDS FOR THE SCREENING STAGE

1. Screening should clearly identify all the decision alternatives under consideration by decision-makers at the time the HIA is considered.
2. Screening should determine whether an HIA would add value to the decision-making process. The following factors may be among those weighed in the screening process:
 - i. The potential for the decision to result in substantial effects on public health, particularly those effects that are avoidable, involuntary, adverse, irreversible, or catastrophic;
 - ii. The potential for unequally distributed impacts;
 - iii. Stakeholder and decision-maker concerns about a decision's health effects;
 - iv. The potential for the HIA to result in timely changes to a policy plan, policy, or program;
 - v. The availability of data, methods, resources, and technical capacity to conduct analyses;
 - vi. The availability, application, and effectiveness of alternative opportunities or approaches to evaluate and communicate the decision's potential health impacts.
3. Sponsors of the HIA should document the explicit goals of the HIA and should notify, to the extent feasible, decision-makers, identified stakeholders, affected individuals and organizations, and responsible public agencies on their decision to conduct an HIA.

STANDARDS FOR THE SCOPING PHASE

1. Scoping of health issues and public concerns related to the decision should include identification of 1) the decision and decision alternatives that will be studied; 2) potential significant health impacts and their pathways (e.g., a logic model); 3) research questions for impact analysis; 4) demographic, geographical, and temporal boundaries for impact analysis; 5) evidence sources and research methods expected for each research question in impacts analysis; 6) the identity of vulnerable subgroups of the affected population; 7) an approach to the evaluation of the distribution of impacts; 8) roles for experts and key informants; 9) the standards or process, if any, that will be used for determining the significance of health impacts; 10) a plan for external and public review; and 11) a plan for dissemination of findings and recommendations.
2. The scoping process should establish the individual or team responsible for conducting the HIA and should define their roles.
3. Scoping should include consideration of all potential pathways that could reasonably link the decision and/or proposed activity to health, whether direct, indirect, or cumulative.

4. The consideration of potential pathways should be informed by the expertise and experience of assessors as well as perspectives of the affected communities, health officials, and decision-makers. The assessment team should solicit input from public health officials and local medical practitioners to ensure adequate representation by the entities responsible for and knowledgeable about health conditions. The assessment team should solicit input from members of affected communities or representative organizations via public meetings, written comments, or interviews to understand their views and concerns. The assessment team should solicit input from decision-makers to understand their views on the decision's relationship to health.
5. The final scope should focus on those impacts with the greatest potential significance, with regard to factors including but not limited to magnitude, certainty, permanence, stakeholder priorities, and equity.
6. The scope should include an approach to evaluate any potential inequities in impacts based on population characteristics, including but not limited to age, gender, income, place (disadvantaged locations), and race or ethnicity.
7. The HIA scoping process should identify a mechanism to incorporate new, relevant information and evidence into the scope as it becomes available, including through expert or stakeholder feedback.

STANDARDS FOR THE ASSESSMENT PHASE

1. Assessment should include, at a minimum, a baseline conditions analysis and qualified judgments of potential health impacts:
 - i. Documentation of baseline conditions should include the documentation of both population health vulnerabilities (based on the population characteristics described above) and inequalities in health outcomes among subpopulations or places.
 - ii. Evaluation of potential health impacts should be based on a synthesis of the best available evidence, as qualified below.
 - iii. To support determinations of impact significance, the HIA should characterize health impacts according to characteristics such as direction, magnitude, likelihood, distribution within the population, and permanence.
2. Judgments of health impacts should be based on a synthesis of the best available evidence. This means:
 - i. Evidence considered may include existing data, empirical research, professional expertise and local knowledge, and the products of original investigations.
 - ii. When available, practitioners should utilize evidence from well-designed and peer-reviewed systematic reviews.
 - iii. HIA practitioners should consider published evidence, both supporting and refuting particular health impacts.

- iv. The expertise and experience of affected members of the public (local knowledge), whether obtained via the use of participatory methods, collected via formal qualitative research methods, or reflected in public testimony, is potential evidence.
 - v. Justification for the selection or exclusion of particular methodologies and data sources should be made explicit (e.g., resource constraints).
 - vi. The HIA should acknowledge when available methods were not utilized and why (e.g., resource constraints).
3. Impact analysis should explicitly acknowledge methodological assumptions as well as the strengths and limitations of all data and methods used.
 - i. The HIA should identify data gaps that prevent an adequate or complete assessment of potential impacts.
 - ii. Assessors should describe the uncertainty in predictions.
 - iii. Assumptions or inferences made in the context of modeling or predictions should be made explicit.
 - iv. The lack of formal, scientific, quantitative, or published evidence should not preclude reasoned predictions of health impacts.

STANDARDS FOR THE RECOMMENDATIONS PHASE

1. The HIA should include specific recommendations to manage the health impacts identified, including alternatives to the decision; modifications to the proposed policy, program, or project; or mitigation measures.
2. Where needed, expert guidance should be utilized to ensure recommendations reflect current effective practices.
3. The following criteria may be considered in developing recommendations and mitigation measures: responsiveness to predicted impacts, specificity, technical feasibility, enforceability, and authority of decision-makers.
4. Recommendations may include those for monitoring, reassessment, and adaptations to help manage uncertainty in impact assessment.

STANDARDS FOR THE REPORTING PHASE

1. The responsible parties should complete a report of the HIA findings and recommendations.
2. To support effective, inclusive communication of the principal HIA findings and recommendations, a succinct summary should be created that communicates findings in a way that allows all stakeholders to understand, evaluate, and respond to the findings.
3. The full HIA report should document the screening and scoping processes and identify the sponsor of the HIA and the funding source, the team conducting the HIA, and all other participants in the HIA and their roles and contributions. Any potential conflicts of interest should be acknowledged.

4. The full HIA report should, for each specific health issue analyzed, discuss the available scientific evidence; describe the data sources and analytic methods used for the HIA including their rationale; profile existing conditions; detail the analytic results; characterize the health impacts and their significance; list corresponding recommendations for policy, program, or project alternatives, design or mitigations; and describe the limitations of the HIA.
5. Recommendations for decision alternatives, policy recommendations, or mitigations should be specific and justified. The criteria used for prioritization of recommendations should be explicitly stated and based on scientific evidence and, ideally, informed by an inclusive process that accounts for stakeholder values.
6. Distribute HIA and/or findings to stakeholders that were involved in the HIA. The HIA reporting process should offer stakeholders and decision-makers a meaningful opportunity to critically review evidence, methods, findings, conclusions, and recommendations. Ideally, a draft report should be made available and readily accessible for public review and comment. The HIA practitioners should address substantive criticisms either through a formal written response or HIA report revisions before finalizing the HIA report.
7. The final HIA report should be made publicly accessible.

STANDARDS FOR THE MONITORING PHASE

1. The HIA should include a follow-up monitoring plan to track the decision outcomes as well as the effect of the decision on health impacts and/or determinants of concern.
2. The monitoring plan should include 1) goals for short- and long-term monitoring, 2) outcomes and indicators for monitoring, 3) lead individuals or organizations to conduct monitoring, 4) a mechanism to report monitoring outcomes to decision-makers and HIA stakeholders, 5) triggers or thresholds that may lead to review and adaptation in decision implementation, and 6) identified resources to conduct, complete, and report the monitoring.
3. Where possible, recommended mitigations should be further developed and integrated into an HIA (or other) management plan, which clearly outlines how each mitigation measure will be implemented. Management plans commonly include information on deadlines, responsibilities, management structure, potential partnerships, engagement activities, and monitoring and evaluation related to the implementation of the HIA mitigations. For greater effectiveness, HIA management plans should be developed in collaboration with, or at least with the input from, the entity responsible for implementing the plan. Management plans are living documents that will need to be revised and improved on an ongoing basis.
4. When monitoring is conducted, methods and results from monitoring should be made available to the public.

Sample HIA Scope

Note: *This example outlines the scope of an HIA for a hypothetical decision to widen a limited-access highway within an urban area. The identified health impacts and analytic methods in the example should not be considered exhaustive.*

DECISION: *Whether or not to widen a 10-mile stretch of highway by adding a lane.*

Scoping Question	Response
Roles	<ul style="list-style-type: none"> Local health department: Coordination, research, and report writing University: Research and impact analysis Project Sponsor: Research and report review Community oversight board: Report review, recommendation development, and stakeholder communications
Design alternatives	<ul style="list-style-type: none"> Adding a lane in each direction to an existing highway Ongoing maintenance of existing highway Redirection of construction and operation funds to municipal bus agency
Geographic and temporal limits	<ul style="list-style-type: none"> Impacts on residential communities living within 1,000 feet of the highway (on both sides) along the 10-mile stretch Current and future impacts over a 10-year period
Hypothesized impacts	<ul style="list-style-type: none"> Construction impacts on noise, air pollution, and accessibility Residential and business demolition and displacement along the corridor Increased vehicle air and noise emissions Pedestrian hazards in adjacent residential neighborhoods from increased traffic Increase stress, impairment of sleep and cognitive function, and hypertension from noise Respiratory and heart disease morbidity and mortality from air pollutant exposure Change of employment or school, loss of social networks, and loss of community services from displacement Property devaluation and resident migration due to increased hazards and reductions of neighborhood livability
Potentially vulnerable populations	<ul style="list-style-type: none"> Families living in housing adjacent to highway Low-income seniors from a nearby senior center that is close to the highway Students and staff at a community school adjacent to highway

Scoping Question	Response
Data for baseline conditions assessment	<ul style="list-style-type: none"> • Existing environmental quality measures (e.g., noise, air pollution) from regulatory agency monitoring and available environmental documents • Traffic volume data from local and state transportation agencies • Traffic injury data from law enforcement agency • Data on neighborhood health status from local health status or hospital records • Complaint data records with the environmental health agencies • Map of community businesses, public services, and other neighborhood resources • Demographic data and trends from census data • Property values and trends from local tax assessment data
Impact analysis methods	<ul style="list-style-type: none"> • Modeled current and predicted noise levels using FHWA (Federal Highway Agency) Traffic Noise Model • Predicted impacts of noise levels on community annoyance, sleep disturbance, school outcomes, and hypertension • Modeled current and predicted air pollutant concentrations of particulate matter and nitrogen oxides using physical dispersion models • Predicted impacts on pollutant levels on premature mortality and asthma exacerbations • Qualitative analysis of traffic volume effects on pedestrian hazards and barriers to access • Demographic analysis of impact burdens • Economic analysis of property tax values
Potential mitigations	<ul style="list-style-type: none"> • Measures to reduce noise emissions (e.g., road surface treatments or speed reductions) and to mitigate exposure (e.g., sound walls or residential window retrofits) • Measures to reduce air pollution exposures inside residences (e.g., ventilation system retrofits) • Engineering measures to reroute or calm traffic in residential areas • Mitigation fund to relocate displaced residents or businesses within community
Experts and key informants	<ul style="list-style-type: none"> • Traffic engineers, noise and air quality modelers, environmental epidemiologists, school and senior center officials, local city legislator, residents, neighborhood center director
HIA Timeframe	<ul style="list-style-type: none"> • Assessment to be completed within 3–4 months in order to submit to transportation board who will be deciding whether or not to proceed in 6 months
Public review	<ul style="list-style-type: none"> • Community advisory body to review assessment and alternatives analysis • Public hearing to share results organized by community advisory board • Public comment period

Sample Collaboration Agreement

Principles of Collaboration for the Port Of Oakland Health Impact Assessment
October 22, 2007

- Whereas University of California at Berkeley, School of Public Health, Health Impact Assessment Group (“UCBHIG”) intends to do a Health Impact Assessment (HIA) as part of a class in order to teach students about HIA by conducting a timely and relevant practice example;
- Whereas UCBHIG represents the students taking the HIA class at UC Berkeley;
- Whereas UCBHIG has chosen to conduct an HIA on the Port of Oakland’s health impacts on the West Oakland neighborhood, including impacts on WO residents employed at the Port, based on stakeholder interest and the health-significance of California’s Goods Movement Policy;
- Whereas limited research exists on many of questions regarding the impacts, both positive and negative, of goods movement on the health of communities neighboring ports;
- Whereas the scope of the current CARB (California Air Resources Board) Diesel Exhaust Health Risk Assessment does not include all potentially significant health impacts of Port Operations on the West Oakland community;
- Whereas an HIA focused on Port Operations might contribute both policy-relevant evidence and help identify gaps in knowledge needed to make healthy policy decisions;
- Whereas the best practice of HIA includes the meaningful and inclusive participation of affected stakeholders to enhance the quality relevance and utility of HIA findings;
- Whereas the organizations involved in the West Oakland Health Impact Assessment Working Group (“the WO HIA WG”) are interested in helping guide this HIA and in potentially using the results of the HIA in advocacy work to improve the health impacts of the Port;
- Whereas Human Impact Partners (HIP) and West Oakland Toxics Reduction Collaborative (WOTRC) convene the WO HIA WG;
- Whereas the WO HIA WG has decided to guide and collaborate with the UCB class on Port HIA;
- Whereas these various groups share the goals of correcting health inequities and improving health in West Oakland;

- And whereas these various groups share values of justice, equality, democracy;
- Be it resolved that the WO HIA WG and UCBHIG will endeavor to work in a partnership to advance an HIA on Port Operations on the West Oakland Community, including West Oakland residents employed at the Port;
- Further be it resolved that the WO HIA WG and UCBHIG will conduct the HIA with the following understanding of Roles and with the following principles of collaboration.

■ ***Expectations of Roles in Each Stage of HIA***

SCREENING

- Both UCBHIG and WO HIA WG have determined that on the health impacts of Port Operations on the West Oakland Community, including those on West Oakland residents employed at the Port, has the potential to contribute valuable, timely, and policy-relevant knowledge.
- Both UCBHIG and WO HIA WG understand that because there has been limited research on questions on the Port's health impacts and because of constraints and time, data, and resources, the envisioned HIA may not address all questions, may provide only preliminary answers to some questions, and may identify additional questions for future research.

SCOPING

- UCBHIG has drafted a scope for the HIA based on available documentation of community health concerns and their own public health expertise.
- The WO HIA WG will give feedback on draft scope and help prioritize research questions.
- WO HIA WG will help UCBHIG identify sources of data and/or contribute data for the research.
- A final scope of the HIA will include input from the WO HIA WG and contributions facilitated from other organizations through members of WO HIA WG.
- HIP will coordinate interactions between UCBHIG and the WO HIA WG to reach consensus on scope.

ASSESSMENT

- UCBHIG will conduct the assessment for the HIA, including data gathering and analysis, and synthesis.
- The WO HIA WG will help ground-truth the research results in community reality by meeting with UCBHIG to review preliminary research during the assessment phase.
- Members of the WO HIA WG will share existing data relevant to the research that data with the UCBHIG, as possible.

- The WO HIA WG may also help coordinate and will work to ensure participation in focus groups described further below.
- Working on behalf of WO HIA WG, HIP will organize approximately four focus groups (with stipends, if possible, e.g., \$20 gift certificates) and other key informant interviews as possible. The focus groups will be some combination of West Oakland neighborhood residents, ACORN or APEN base groups, and/or Port workers, staff, and truckers. Focus group participants will be asked about how they would like to be further involved in the HIA. At a minimum, the HIA results will be mailed to the participants and UCBHIG may be asked to present their findings at a presentation to focus group participants.
- HIP will offer to carry out HIA training for focus group participants.

REPORTING AND PUBLIC COMMUNICATION

- UCBHIG and the WO HIA WG will work together to publicize the fact that this HIA is being done and discuss the importance of this HIA with the Port, elected officials, and other government employees.
- UCBHIG will produce draft and final written reports (with research findings and feasible mitigations).
 - a. The WO HIA WG will review the draft report within 14 days;
 - b. The WO HIA WG will have an opportunity to review the final report prior to public dissemination;
 - c. If needed, HIP will facilitate a meeting between WO HIA WG and UCBHIG to resolve differences on findings in the HIA;
 - d. All drafts will be kept confidential until a final report is released;
 - e. The final report will be released by UCBHIG by March 2008;
 - f. If a media release is mutually desired, UCBHIG and WO HIA WG will jointly announce the release of the final report;
 - g. UCBHIG will post the final report on its website and members of the WO HIA WG may do so as well.
- UCBHIG will not take independent advocacy positions on policy debates and decisions but contribute testimony to explain the findings of the HIA if asked by WO HIA WG or others.
- The WO HIA WG may use the findings in the written report to proactively inform decision-makers in developing and taking positions on policy debates. This could include:
 - Sending out the report and/or letters based on the report to elected officials, agencies, healthcare groups, or others;
 - Having meetings with elected officials, agencies, health care groups, or others;
 - Presenting the report in public meetings.

- UCBHIG will not actively seek to engage other groups in advocacy using the report unless requested to do so by the WO HIA WG.
- The report could be used by WO HIA WG members to inform the scope EIR on expansion of the Port, infrastructure funding for the Port, amendments to the city charter of the Port.
- Since the report will be publicly available, it is recognized that other organizations not party to this agreement may use it for their own advocacy.
- If either the UCBHIG or the WO HIA WG wishes to publish the work in a peer reviewed journal or other type of publication (e.g., as part of a media campaign) or present the work at a conference or other in another venue, the groups should consult with each other prior to doing so with regard to content, authorship, and the intent of doing so.

EVALUATION AND MONITORING

- If resources are available, UCBHIG, HIP, ACPHD (Alameda County Public Health Department), or the WO HIA WG may evaluate the process and document the process in a written case study.
- The WO HIA WG will monitor the effectiveness of HIA in making changes at the Port.

■ ***Decision-Making***

Both UCBHIG and the WO HIA WG will make good faith efforts to come to agreement by consensus. They will attempt to bring issues forward to each other's attention to avoid making unilateral decisions. They will recognize and consider different perspectives. However, if consensus cannot be reached after such consideration, the WO HIA WG will have the authority to make final decisions about the priorities for research in scoping and the use and communication of HIA findings; UCBHIG will have authority to make final decisions about data quality and adequacy, research methods, and assessment judgments and findings. Efforts will be made to document differences in positions in findings where needed.

■ ***Additional Principles***

- UCBHIG will attend and present progress at the WO HIA WG meetings on October 24 and November 28, and at additional meetings as needed.
- The WO HIA WG may apply for funding to carry out their part in this collaboration. HIP may also receive funding to carry out their role.
- UCBHIG and the WO HIA WG will endeavor to credit the appropriate groups for their work.
- [Signatories to this Agreement are omitted]

Health Impact Assessment

A GUIDE FOR PRACTICE

Health Impact Assessment (HIA) is an emerging practice that aims to bring a greater understanding of human health consequences to public policy and decision-making. The awareness and use of HIA in the United States is rapidly increasing, and this Guide aims to support practitioners in the field, by describing the key tasks and activities for HIA as well as the issues and challenges that arise in the course of practice. The Guide includes illustrative examples from practice, as well as suggestions for stakeholder participation and the integration of health analysis in the environmental impact assessment process.