

Making Healthier Decisions about Disaster Recovery: Opportunities for the use of Health Impact Assessments¹

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Contents

- 1.0 Preamble
- 2.0 Information sources and report format
- 3.0 Background
 - 3.1 Health and disasters
 - 3.2 Health Impact Assessment
 - 3.3 Disaster Policy
 - 3.4 Disaster Recovery
 - 3.5 The Disaster Recovery System
 - 3.6 The Federal Framework of Responses to Disasters
 - 3.7 Common decision points
- 4.0 What is already known about disaster-related HIAs?
 - 4.1 Few HIAs completed but more needed
 - 4.2 Linkage with key decision points
 - 4.3 Narrow purview of alternatives
 - 4.4 Relation to Environmental Impact Assessments
- 5.0 Institutional readiness for employing disaster recovery HIAs
 - 5.1 Federal Agency roles in assisting disaster recovery
 - 5.2 State and Other Intermediate Level Institutions
 - 5.3 Recovery Decision Making at the Local Level
 - 5.4 Advocacy: Use of HIAs by grass roots community organizations
 - 5.5 Summary
- 6.0 Expert opinions: Thought leader perspectives
 - 6.1 Department of Health and Human Services Workshop
 - 6.2 Thought Leader Meeting (Washington, DC)
 - 6.3 40th Natural Hazards Workshop
- 7.0 HIA case studies in New Jersey
- 8.0 Recommendations
 - 8.1 Awareness
 - 8.2 Pivots of application
 - 8.3 Appraisal of recovery alternatives
 - 8.4 Guidance for choosing among HIAs
 - 8.5 Grassroots technical support
 - 8.6 Broadening and Integration

Making Healthier Decisions about Disaster Recovery: Opportunities for the use of Health Impact Assessments

1.0 Preamble

Successful recovery from disasters and improvement of human health are two important objectives of national policy in the United States. Expert analysis, popular opinion and common sense suggest they should be mutually reinforcing activities, but discourse and actions have long proceeded more or less separately in both arenas, often in ways counterproductive to the achievement of policy objectives.² The systematic process of Health Impact Assessment (HIA)³ and its products (known individually as Health Impact Assessments or HIAs) show great promise as a way of connecting these themes to mutual advantage. This report offers guidance about how to bring that outcome about.

At the outset to avoid confusion, it is important to point out that the term Health Impact Assessment is subject to different interpretations. Most commonly it refers to the assessment of health outcomes of disasters or the assessment of immediate emergency responses (e.g. medical measures intended to treat injuries or detect potential disease outbreaks. In contrast, *the present report examines prospects for using HIAs as an aid to long-term disaster recovery* and makes recommendations for encouraging widespread use. Herein the focus is on health impacts of decisions about actions such as: redesigning, rebuilding or relocating buildings and infrastructure; restoring and revitalizing damaged ecosystems; reinvesting in economic development; and strengthening the social fabric of affected communities; among others. Opportunities for improving health exist in all of these sectors and beyond; HIAs are one means of ensuring that healthier outcomes are recognized, included in the public agenda and encouraged.

Disasters that are triggered by natural phenomena, especially severe floods and storms, are fertile ground for the use of HIAs. They are important foci not just because of the current scale of their impacts on health, safety and wellbeing, and the major opportunities for changing built and human environments they present, but also because of the prospects of worse to come, if current climate projections and vulnerability trends are sustained.

² Ensuring better human health is rarely a goal of natural hazard management plans and the health dimensions of natural hazards are almost never included within the purview of community health improvement plans. For example, in New Jersey health receives barely a mention in the State's current Hazard Mitigation Plan (New Jersey Office of Emergency Management 2014) while county community health improvement plans are heavily focused on reducing rates of obesity, cancer, cardiovascular disease and substance abuse. (New Jersey Department of Health and Senior Services 2010)

³ Housing Impact Analysis also carries the HIA acronym. (Daquisto and Rodda 2006)

HIAs can be viewed as value-neutral decision-support tools or as advocacy instruments. The former view dominates among health and hazard professionals whereas the latter interpretation is more frequently encountered among community organizers, interest group activists and others with a stake in local empowerment. (Pursell and Kearns 2013) These orientations mirror long-standing differences, among scholars and practitioners, about the value of technocratic versus democratic approaches to public participation in decision-making. Herein it is argued that both perspectives are valid and provide valuable insights into ways of making better use of HIAs in support of disaster recovery.

2.0 Information sources and report format

Although this report is a stand-alone document, for those not familiar with existing literature on HIAs and disasters, it may be advantageous to read the Appendix before progressing further.

The present report draws on four different sources of evidence. These include: (a) a review of published literature on natural disaster-related Health Impact Assessments; (b) a status report on the present and projected use of HIAs in public institutions with health improvement and/or disaster reduction responsibilities; (c) a survey of expert opinions among a selection of thought leaders in the fields of Health, Disaster Management and Health Impact Assessment; and (d) a summary of experience with two disaster recovery-related HIA cases in New Jersey. Both the literature review (a) and the New Jersey case studies (d) are only briefly summarized herein because each is the subject of more detailed reports elsewhere.

Subsequent sections of the report are organized as follows. Section 3.0 supplies background information about health impact assessment and disaster recovery. The present U.S. Disaster Recovery Framework is outlined and the range of recovery-related decisions, for which HIAs might be appropriate support instruments, are identified. Section 4.0 provides an updated summary of a Spring 2015 report on the use of HIAs in relation to U.S. natural hazards and disasters. (Appendix) Section 5.0 includes information about the HIA readiness of federal agencies and other organizations with disaster recovery responsibilities. Section 6.0 discusses the views of expert “thought leaders” on the use of HIAs as aids to disaster recovery decision making. Section 7.0 highlights the experience of two case study HIAs carried out within the larger project of which this report is a part. Section 8.0 provides a list of recommendations for action.

Throughout the document the focus is on natural disasters (especially flood and storm disasters) in United States but some of the findings and conclusions are also relevant to other countries.

3.0 Background

Health improvement and disaster recovery are separate bodies of knowledge and action that have not previously been much in contact. It is helpful to understand how each has evolved as a prelude to assessing prospects for mutual engagement

3.1 Health and Disasters

Health is a concept that stretches well beyond the absence of disease in humans to encompass physical and mental wellbeing, as well as the social, economic and environmental factors that influence wellbeing.⁴ Although the notion of health is primarily associated with humans it can also be applied to economic and environmental systems. (U.S. Department of Agriculture 2016) Economic health and ecological health are of comparable importance to human health in the fashioning of sustainable lifestyles and communities. (Douglas 2008)

The relationship between human health and natural disasters is complex. (Few 2007) Storms, floods and the like have long been recognized as significant agents of death and injury, especially in developing countries, but in the U.S. associated mortality rates have been relatively low and evidence about long-term health impacts among survivors has been scarce.

In the wake of recent devastating hurricanes like Katrina, Irene and Sandy negative physical and mental health outcomes are increasingly recognized (Adams et al 2011; Calvo et al 2014; Lindell 2013; Wells et al 2013; Walsh et al 2015; Abramson et al 2015). Continuing problems of certain vulnerable groups are particularly noteworthy in part because they are often more exposed to physical risks but also because they already suffer from health deficits that are exacerbated by - and persist well after - emergencies. (Baker and Cormier 2015; Tate et al 2016) For example, poverty, old age, minority ethnicity, immigrant status and other indicators of deprivation are known to be associated with disaster vulnerability as well as poor health. (Collins et al 2013) Furthermore, it is clear that most disaster-affected communities are inadequately prepared to address a wide range of long-term health recovery problems. It is also clear that careful management of disaster recovery can significantly improve the long-term health of human populations (Institute of Medicine 2015), although opportunities to do so are often frustrated by cost-benefit analyses of recovery measures that ignore human health. (Tate et al 2016; Brown and Frahm 2016) Fig. 3.1 includes some of the main short-term and long-term problems that have been recognized by health specialists. It is an incomplete list that probably understates health effects both because secondary stressors persist long after floods and storms end and also because the extreme events exacerbate existing health problems.

⁴ Here the definition of human health combines safety (i.e. protected against harm) and wellbeing (i.e. physical health and mental health) < <http://www.cdc.gov/hrqol/wellbeing.htm>>

Fig. 3.1

Human health effects of storm and flood disasters

IMMEDIATE	CLEANUP	DELAYED (long-term)
Injuries	Accidents	Mental health problems*
Allergies	Dehydration	Stress-related disorders*
Disease outbreaks	Heat exhaustion	Nutritional diseases
Diarrheal diseases	Allergic reactions	
Respiratory conditions	Asthma exacerbation	
Hypothermia		
Poisoning		

* Typical problems (recognized to varying degrees by health specialists) include: PTSD, substance abuse, anxiety, depression, suicide ideation and isolation/anomie.

After: Few 2007, Stanke et al 2012 and Collins, Jimenez and Grineski 2013

The shaping of places to ensure good human health is an established practice. (Learmonth and Curtis 2013) Just as - in the late 19th century - improved urban sanitation helped to reduce death rates in Europe and the United States, the layout and provisioning of rebuilt neighborhoods that had been devastated by disasters, and the social rearrangements for living, can be accomplished in ways that not only make the community more resilient to future storms and floods but also reduce health problems like childhood obesity and diabetes or combat isolation and other health stressors. These problems are often endemic among underprivileged populations exposed to environmental extremes and deprived of physical exercise, decent food, unpolluted air, public support networks and access to adequate health care. Nor are the benefits confined to disadvantaged populations; more privileged groups also seek out safe and salubrious environments. (Douglas 2008)

Despite the benefits to be obtained by linking recovery and health improvement, **arrangements for making health-conscious redevelopment a prominent element of decision-making during recovery are generally lacking.** Health Impact Assessment promises to help fill this gap by taking account of both negative health outcomes of disasters and health improvements that may be facilitated by well-designed recovery measures.

3.2 Health Impact Assessment

Health Impact Assessment (HIA) is a methodological innovation that is intended to provide public and private decision-makers with guidance about the health outcomes of prospective human actions and to encourage the adoption of alternatives that foster healthier populations and environments. It is a process of community engagement, usually voluntary, that involves expert and lay stakeholders in a collaborative exchange of their knowledge, concerns and expectations and their aspirations for improved health. These objectives are sought via a systematic procedure that begins with the selection and bounding of specific decisions and concludes with evaluations of recommendations for

achieving improved health objectives after the decisions are taken. Its six steps include: (1) screening, (2) scoping, (3) assessment, (4) recommendations, (5) reporting, and (6) monitoring and evaluation.

During the past 30 years HIAs have been widely used internationally, in Europe and less developed countries, as well as more recently in the USA. The basic process has become sufficiently standardized that it is now codified in handbooks and training programs published by a number of professional organizations. (Bhatia 2011; Bhatia et al. 2014; American Planning Association 2015a, 2015b; World Health Organization 2016) A small number of HIAs have been employed in the wake of natural disasters but they focus almost entirely on the assessment of losses and other immediate consequences. With the exception of a very few quasi-experimental examples ***HIAs have not been employed to assess measures that are intended to assist long term recovery and the prevention, avoidance or reduction of future losses.*** This kind of HIA will require simultaneous attention to health improvement, disaster mitigation and public engagement; a three part task that is ambitious but eminently worthwhile.

3.3 Disaster policy

In the 21st century three highly disruptive events have had a disproportionate effect on shaping national policy for disasters in the United States. These include: (a) the terrorist attacks of September 11, 2001; (b) Hurricane Katrina, especially its effects on New Orleans, Louisiana (2005); and (c) Hurricane Sandy in the greater New York metropolitan region (2012). The terrorist attacks prompted a shift of attention from mitigating natural disasters to preparing for and managing ongoing human-forced emergencies. They also led to strengthened roles for “first responders” and emphasized the importance of “command, control and communication” as necessary features of successful “incident management”. In some respects this was a return to the kind of civil defense preparedness that had marked public policy on disasters during the years following World War II. (Mitchell 2003) Hurricane Katrina refocused attention on natural environment risks, highly exposed places, the plight of vulnerable populations (especially poor ethnic minorities), degraded ecosystems, fragile local economies and imperfect management responses. (Mitchell 2006) The policy effects of Hurricane Sandy are still being worked through but the storm has underlined a mismatch between existing policies for disaster recovery and the needs of local communities, as well as the growing importance of previously ignored climate change risks, the potential for “green engineering” as a complement to bricks and mortar reconstruction, and the need to incorporate goals of resilience and sustainability into preparations for the future. Following Sandy a number of innovative programs were introduced that are still ongoing and whose consequences are also likely to be significant (e.g. Rebuild by Design; National Disaster Resilience Competition). **Health Impact Assessment arrives at a time when the door for new departures in public policy is open and prospects for new departures are ripe.**

Responses to natural hazards and disasters are strongly affected by factors of time and geographical scale. Public programs are mobilized in a temporal sequence that reflects

different stages of the so-called disaster cycle⁵. Geographical scale is important because any one locality in the USA experiences relatively few disasters throughout its existence but the nation, as a whole, experiences disasters of varying kinds more or less continuously. Thus, the U.S. disaster management system possesses a high degree of hierarchical, decentralized organization. Different organizations at different administrative levels are allocated different responsibilities. Mechanisms for collaboration and coordination of hazards management activities are of crucial significance.

The federal government is mainly responsible for: setting national policy; funding a large share of the major disaster management programs; providing expert scientific and technical information; training specialized emergency management personnel; and coordinating the efforts of other governmental units and aid organizations during disasters.

All U.S. states have passed laws that make their policies on disasters compatible with (but not necessarily the same as) federal policies. State governments oversee the execution of state policies and those aspects of federal policies that have been delegated to them, including, among others: preparation of requests for federal assistance; mobilization of National Guard units for emergency duty; creation and staffing of state emergency operations centers; formulation of state plans for emergency management and hazard mitigation; and oversight of local emergency agencies. They also play important roles in regulating public utilities and other “lifeline” infrastructures and they share with local governments responsibilities for the conduct of evacuations.

Local (i.e. city and county) governments have direct authority over so-called “first responders” in the emergency services (e.g. police, fire, medicine) and over the regulation of construction and land uses within their boundaries. Some are now also appointing officials to manage their flood plain lands. Whereas most federal and many state disaster personnel are trained professionals, local emergency and flood plain managers are more likely to be part-time appointees who perform other government functions during non-emergency periods.

It is important to realize that there are exceptions to the preceding pattern of policy and management responsibilities. For example, the scale and sophistication of emergency management systems in large wealthy cities (e.g. Los Angeles; New York) often rivals (and occasionally exceeds) that of the state and national systems. Also, the federal government controls the use of large parts of the western United States that are publicly-owned national property and it has significant powers over the regulation of certain kinds of private lands (e.g. floodplains) everywhere in the United States. In addition, some states (e.g. North Carolina, Hawaii, California) have extensive powers over general land regulation that put them in a strong position to affect the use of hazardous areas.

⁵ The cycle includes several major stages: Mitigation, Preparedness, Response and Recovery. For theoretical background see Alexander 2002. A survey of its recent application to recovery planning in specific communities is provided by Watson et al. 2014.

There also exist an increasing number of intergovernmental organizations and organizations composed of governmental and non-governmental groups. These usually address matters that cut across jurisdictional boundaries or require mediation among competing interests.

3.4 Disaster Recovery

In the past disaster, recovery has been defined as the process by which a community seeks to return to its pre-disaster state, including the repair and/or replacement of damaged buildings and infrastructure as well as the restoration of everyday livelihood activities and customary patterns of living⁶. (Sundnes and Birnbaum 2003, p. 54) Today, a broader and more inclusive definition is becoming accepted that recognizes the impossibility of reproducing the *status quo ante* and instead embraces the aspiration to “build back better” in pursuit of a “new normal” that is also adapted to cope with *future* risks⁷. Mitigation is thus an important component of recovery plans that look to being better prepared to prevent, avoid or, reduce the effects of future disasters. Moreover, activities of preparedness, recovery and mitigation, that were once regarded as separate but sequentially overlapping, are increasingly recognized as closely intertwined, often occurring simultaneously - or sometimes not at all.

Recovery is the stage of disaster about which researchers know least and shortcomings of the recovery process are one of the most criticized aspects of disaster policy. (International Journal of Mass Emergencies and Disasters 2012) **“Holistic recovery” has emerged as an attractive integrating concept that connects disaster management with larger themes of sustainability, resilience and equity** that have become prominent in a range of national and international policy arenas during the last two decades. At the center of this concept is the added value to be obtained by integrating formerly separate streams of physical recovery, environmental recovery and economic recovery. Holistic recovery programs are already ongoing in some cities and countries (e.g. New Zealand) and the notion is spreading. (Corbin 2015) **“Health” is a concept that applies to and transcends all three of the holistic recovery arenas (built, natural, socioeconomic)**. Not only is improved health important as a goal in its own right, it also offers a principle around which separate initiatives in different strands of the recovery process may be organized and focused for maximum mutual benefit. HIAs go a long way toward translating that principle into a usable tool for achieving favorable outcomes.

It has become accepted wisdom among disaster experts that by far the best way to reduce losses is to anticipate and take actions for preventing, avoiding or mitigating them, rather than reacting after the event. Accordingly, **such post-disaster recovery strategies as may be necessary should be crafted, tested and ready to activate well before a**

⁶ Business interest groups employ a more restrictive use of the term “disaster recovery” that refers to rapid restoration of the electronic information and information exchange networks that are increasingly necessary for commercial operations. See, Disaster Recovery Journal < <http://www.drj.com> >

⁷ Sometimes described as the achievement of “transformative resilience”. (Gotham and Campanella 2010)

disaster threatens, not put together in times of emergency. Unfortunately, this rarely occurs. **Heavy reliance on reactive post-disaster recovery measures is still the norm.**

The aftermath of disaster is a congested - and often contested - period for public decision-making. Among complicating factors in local communities are: (1) the large number of decisions that must be taken by governments, private institutions and affected publics; (2) strong pressures for a return to “normal” - often under tight time constraints; (3) reduced decision-making capacity, brought about by absences or displacement of key personnel, damaged public buildings, and uncertainties about authority and resources; (4) a complex and rapidly changing information environment, including speculation and rumors as well as upper level policy changes that may introduce previously untried procedures and institutions; and (5) shortages of some resources (e.g. housing) with a (temporary, though often delayed) surfeit of others (e.g. external funds on such a scale that the situation is described as “drinking from a fire hose”). In small municipalities, such as those that typify the U.S. coast, the likelihood of finding ones with the capacity for these tasks is limited, so intergovernmental and non-governmental organizations have sometimes stepped into the gap to supply necessary expertise and resources. (Kutner, 2015, p.3) By extension it is argued that **post-disaster HIAs fall into the category of activities that may be beyond the capacity of local governments; arrangements for external assistance and collaboration across jurisdictional lines are warranted.**

3.5 The disaster recovery system

The U.S. disaster recovery system has historically been fragmented among many public and private institutions. Even today, after major efforts to provide a comprehensive overarching administrative structure, it remains a highly decentralized patchwork of laws, programs and institutions of varying specificity and at all levels of government, with strong roles for Non-Governmental Organizations and private sector bodies, often acting through the medium of public-private partnerships. There are at least 26 federally administered recovery funding programs, as well as a host of state government partners, plus money, expertise, personnel and other forms of help offered by a dizzying array of research and development groups, professional associations, philanthropic foundations, corporations, community organizations, volunteers and ad hoc bodies that spring up to in response to specific disasters. (Philipps 2009; Institute of Medicine 2015, pp.137-142.) While federal government grants are particularly important recovery enablers, insurance firms are also major actors in the financing of recovery and reconstruction activities and there is an increasing role for private marketplace investors. (Iowa Department of Homeland Security and Emergency Management 2013; Filitova 2014; Andress, McGrath, West and Wilson 2015a;b)

3.6 The Federal Framework of Responses to Disasters

After the terrorist attacks of September 11, 2001, there was a major reorganization of the federal government’s disaster-related responsibilities and activities within a common system known as the National Planning Frameworks. (U.S. Department of Homeland Security 2014) This system includes five separate sub-frameworks: Prevention; Protection; Mitigation; Response; and Disaster Recovery, of which the last is the one with which this report is most concerned. (Federal Emergency Management Agency 2015)

Human health effects have long been neglected in the U.S. disaster recovery system as they have been in the stages of preparedness, response and mitigation. This is beginning to change, thereby increasing prospects for wider adoption of HIAs as decision-support instruments. For example, the Recovery Support Function of the National Disaster Recovery Framework is intended to assist “...locally-led recovery efforts in the restoration of the public health, health care and social service networks to promote the resilience, health and wellbeing of affected individuals and communities.” (Federal Emergency Management Agency 2008) (Fig. 3.2) While most of the emphasis remains on addressing *immediate* health effects of disasters, part of this Recovery Support Function’s remit is to “protect the health of the populations and response and recovery workers from the *longer-term effects* of a post-disaster environment” (emphasis added). In other words there is promise of greater government attention to seeking ways of improving public health while at the same time planning for and mitigating downstream problems of disaster.



Fig. 3.2: Health within the Context of the National Disaster Recovery Framework

Officials and others with formal responsibilities for health and wellbeing are not prominent among the large number of decision-makers who share responsibilities for the planning and execution of disaster recovery projects. A recent study of six examples of recovery identified 19 different groups of actors involved in recovery and another 16 in mitigation. (Fig. 3.3) No health groups appeared among the mitigation actors though EMTs, mental health and human services personnel were included among recovery actors. This is a telling omission because mitigation offers some of the best opportunities for improving human health and wellbeing by reducing the likelihood of future disasters through holistic recovery strategies that seek to create a mutually reinforcing health trifecta that includes healthy economies and healthy ecosystems as well as healthy human populations.

Fig. 3.3: Key Actors in Recent Disaster Recovery and Mitigation Events

Mitigation	Recovery
Elected Officials	Federal Agencies* (with various functions)
County	Community planning
Municipal	Capacity Building
Planners	Economic recovery
City planners	Housing Recovery
Transportation planners	
Disaster planners	
Managers	Local and state agencies
City managers	Fire
Emergency managers	Police
GIS managers	Social workers
Public works professionals	EMTs
Parks and Recreation officials	Mental health agencies
	Code enforcement officers
Private	Finance/treasury/tax collection
Homeowners	
Construction companies	
Business leaders	
Non-governmental	
Civic Groups	
Environmental Professionals	

(After Watson 2014)

* Individual departments are not identified

3.7 Common Decision Points

Ideally HIAs would best be carried out in a crisis free setting, well before a disaster occurs. Many of the decisions that *anticipate* risks and hazards, and prescribe management actions, have strong health implications and would be suitable candidate for HIAs. Among them are plans and policies for: climate adaptation; warning and evacuation; emergency management; disaster communications; land use; hazard mitigation; historic preservation; open space; and risk and vulnerability assessments. In addition, any large-scale infrastructure plans (e.g. transportation, utilities, data networks) are likely to have implications for the future health and hazard-susceptibility of communities where they are located.

Depending on the severity of the disaster and the scale of recovery efforts, major long-term *recovery decisions* may be taken within a year or so of the initial disaster event, though research findings suggest that there is considerable variation in their timing and duration. Typically, there are decisions on a wide variety of recovery proposals affecting: policies, regulations, standards, siting, and plans, as well as specific design/create/operate type projects and programs. The bulk of these focus on certain topics that are characteristic of the long-term reconstruction phase of disasters. As identified by Lindell (2013) they include: hazard source control and area protection; economic development; infrastructure resilience; land use controls; historic preservation; building construction practices; environmental recovery; public and mental health initiatives; and disaster memorialization. Fig. (3.4) illustrates a range of common recovery measures for (coastal) storms and floods, the most frequent and expensive type of natural disaster to affect the United States.

The creation of formal *recovery plans* can be rapid with the amount of time required varying in rough proportion to the size of the subject community. Pre-disaster long-term recovery plans tend to identify responsibilities and emphasize procedures; they can take years to create. Fairfax, Virginia's required 2 years and New York State's 2006 plan, between 3 and 6 years. Recovery plans put together in the wake of a disaster take less time and emphasize specific recovery actions. The federal recovery plan for Hurricane Sandy was released within 9 months after the storm. (Hurricane Sandy Rebuilding Task Force 2013) Four recent ones, adopted by small-to-medium sized cities that experienced less severe events, took between twelve weeks and six months. (Watson 2014) In other words, **for a post-disaster HIA to have an effect on major recovery planning decisions it might have to be completed within three to nine months but if it is conducted pre-disaster the time available for completion would likely be substantially longer.**

Fig. 3.4: Policies, plans and programs with long-term implications for hazards and health

Redevelopment strategies (e.g. fortify, accommodate, retreat etc.)
 Building elevation and flood-proofing requirements
 Acquisition, demolition, relocation of structures and sites (including buyouts)
 Flood insurance regulations
 Low income and special needs housing
 Climate adaptation
 Emergency warnings, evacuation, sheltering
 Disaster communications
 Hazard mitigation
 Historic preservation
 Open space acquisition, designation and use
 Risk and vulnerability assessments
 Energy efficiency

Master Plans
 Rezoning
 Setback lines
 Building codes

Retrofitting
 Dune management
 Storm water management

Infrastructure - replacement, rebuilding and protection:

Transportation: bridges, roads, causeways, subway stations, rail yards,
 bus depots, airports

Public utilities: water lines, pump stations, sewer lines, WWTPs, power
 substations, power lines, communication lines

Hazard protection works: shore protection structures, beach
 replenishment, green/grey/soft infrastructure

Standards

Reconstruction of damaged structures and infrastructure

Worker safety

Information disclosure

Demonstration projects (e.g. RBD, Resilience competition)

The menu of possible recovery decisions that could be foci of HIAs is too long to address here, BUT **certain alternatives that have proven to be pivotal in the past are worthy of close attention**. These include: flood insurance maps, rates and elevation requirements; land acquisition and relocation projects; Community Development Block Grants (CDBGs); model coastal ecosystem resilience projects; hazard protection structures; hazard mitigation plans; and decisions that require formal Environmental Assessments. In addition, climate adaptation plans and other sustainability and resilience initiatives have great potential importance. Various hybrids that combine elements of several of these (e.g. the Rebuild by Design projects after Hurricane Sandy) are also possible.

In summary, disasters often shake up the public decision-making system as well as the lives of affected populations. Post-disaster Health Impact Assessments need to take this into account because it imparts higher levels of uncertainty to the HIA process. HIAs are likely to have maximum value when streamlined, simplified and coordinated with different stages of recovery decision-making (that are themselves in flux). In a predominantly top-down federal system that is designed to funnel external aid to local communities, HIAs remind formal decision-makers that health is a bottom-line concern of humans and they can act as counterweights that foreground the knowledge, preferences and expectations of local disaster-affected populations about past experiences and future desires for acceptable outcomes.

4.0 What is already known about use of disaster-related HIAs?

A lengthy review of the status of disaster-related HIAs that were carried out in the United States is provided in the Appendix to this report. The following is a brief updated summary of the main points.

4.1 Few HIAs completed but more needed

Only a few (c.5%) of the 350 or so completed or ongoing HIAs have engaged with the topic of natural disasters and/or disaster recovery and those mostly as a secondary aspect of the main inquiry. Disaster implications of development projects have been marginalized or not included in many of the HIAs undertaken to date, even though they may be significant. Where hazards or disasters are included they tend to be chronic, having usually affected vulnerable populations over long periods without rising to the level of officially declared disasters. The natural hazards that are addressed cover a wide spectrum from hurricanes, heat waves, wildfires and droughts to slope failures and earthquakes, with floods and storms predominating. The societal sectors that receive most attention include housing, (water and energy) infrastructures, and forestry.

While disasters provide opportunities to get HIAs on the agenda of recovery organizations, it is widely recognized that much more attention needs to be paid to this topic. Authors of climate adaptation, energy and transportation infrastructure plans have been particularly vocal about the need for HIAs that address environmental risks, hazards and disasters. (e.g. City of New Orleans 2015; Delaware Cabinet Committee on Climate and Resilience 2014; Washington State Department of Transportation 2014)

4.2 Linkage with key decision points

HIAs have been most effective as tools to achieve disaster reduction when linked directly with an organization's regulatory or funding decisions. One illustrative example is EPA's use of an HIA to support its permitting process for the small chronically flood prone Proctor's Creek watershed in the Greater Atlanta region. **When screening potential candidate HIAs guidance about those that most closely connect with key recovery decision points would be a useful aid.**

4.3 Narrow purview of alternatives

HIAs have a reputation for transparency, independence and fairness that may be compromised when they fail to fully assess alternatives to proposed decisions. This can occur when some alternatives have either not been considered by the decision making body or rejected because they fall outside its jurisdiction. Communities engaged in major disaster recovery efforts confront this situation with some regularity because external funding agencies (e.g. US Army Corps of Engineers, HUD) have restricted terms of reference that often direct choices down well-traveled paths towards familiar solutions. The same may be true of local government decision-making. As the former mayor of San Francisco once said

about ill-advised rebuilding proposals after the 1989 Loma Prieta earthquake “Don’t let the bureaucrats insist that your situation fit their rules. Make the rules fit your situation.” (Farmer 2013) **Given the variety of local contexts in which disasters and the wide range of responses with which they may be matched, assessment of alternatives should be a major element in disaster recovery-related HIAs.**

4.4 Relation to Environmental Impact Assessments

Many observers have noted similarities of purpose between HIAs and Environmental Impact Assessments and explored possibilities for merging these two assessment instruments. (Cole et al 2004; Bhatia and Wernham 2008; Harris and Haigh 2015; Reis et al 2015) Whatever the advantages of a unified approach in non-disaster settings (Washington State Department of Transportation 2014), **the history of environmental impact assessment suggests that the resulting hybrid would not likely be suitable for the time-constrained setting of disaster recovery. As discussed below (Sections 7.0 and 8.0) it may be more effective to modify the existing HIA process for use in post-disaster contexts.**

5.0 Institutional readiness for employing disaster recovery HIAs

Attendance at workshops, consultation with experts and analysis of documents provided windows into the mid-2015 status of efforts by federal agencies to make use of HIAs in carrying out their missions, especially in the context of disaster recovery planning and management. Prospects for increased use of HIAs by similar state and local decision making bodies were not systematically analyzed though comments, based on available information, are also included below.

5.1 Federal Agency roles and activities

As the lead agency for the Health and Social Service Recovery Support function, the **U.S. Department of Health and Human Services (DHHS)** has made major strides to raise the visibility of disaster recovery as a necessary focus of agency operations, not least by convening a 2015 Recovery Workshop to work out the organizational strategy for coming to grips with this task. As part of the President's Climate Action Plan the department will launch a plan to create sustainable and resilient hospitals. (U. S. Department of Health and Human Services 2013a; Fink 2016) In a separate but intersecting initiative DHHS's **Centers for Disaster Control and Prevention's** (CDC) Health Community Design Initiative has been exploring the use of HIAs to articulate the health concerns of vulnerable populations; CDC has also signed cooperative agreements with state and city health agencies that are designed to improve communication, education and vulnerability mapping in support of HIAs that take account of prospective climate change risks. (U.S. Department of Health and Human Services 2013b) These are positive beginnings; **development and use of HIAs that take account of long term health improvement and disaster recovery needs, jointly in a single procedure, would be a valuable next step.**

Other federal agencies that have health-related responsibilities during disasters have also shown interest in HIAs. The **Environmental Protection Agency (EPA)** has undertaken a systematic review of HIA practice in the United States and is exploring its further use. Although most of EPA's attention is on human-made hazards (e.g. pollutants), natural disasters have received peripheral attention especially storm-water runoff that brings contaminated debris into contact with vulnerable populations. (U.S. Environmental Protection Agency 2013) Pollutants can pose long-lasting hazards to human health and EPA's focus is primarily on reducing continuing risks (e.g. frequent waterlogging and other small scale flooding) rather than recovering from acute disasters like major floods. EPA also publishes an EnviroAtlas (U. S. Environmental Protection Agency 2015) that supports HIAs by mapping data about the contributions of different ecosystems to health risk reduction. **The underlying thesis of this atlas (i.e. natural and managed environments perform valuable health services for humans) might provide a model for bringing disaster recovery measures that also affect human health within the purview of the HIA process.** (U.S. Environmental Protection Agency 2015)

The **Federal Emergency Management Agency (FEMA)**, coordinates a number of health-related disaster services including crisis counseling, training courses for hospital personnel, and guidance on other public health activities, but these tend to focus on immediate emergency needs. (e.g. Federal Emergency Agency 2008; 2011b) FEMA also administers the National Flood Insurance Program (NFIP), which is arguably the most important *regulatory mechanism* available to federal authorities with which they can play a direct role influencing future patterns of housing and health in flood risk communities. The great majority of Presidential Disaster Declarations are issued for floods and the salience of floods is only likely to grow under predictions of higher sea levels and greater storminess associated with climate change. Under the NFIP, properties in designated flood risk zones are required to be elevated above expected flood levels in order to qualify for flood insurance. Owners of heavily or repeatedly damaged properties may qualify for buyouts that permit them to relocate homes and other buildings outside the flood zones. Property owners in municipalities that enact flood reduction measures may also qualify for reduced insurance rates through the Community Rating Program. However, home elevation requirements can be difficult to implement (especially among elderly and low income groups), buyouts have not historically been generously funded, and municipalities typically engage in only a few types of flood reduction measures from among the range that is available.

In view of FEMA's broad coordinating authority for the delivery of disaster services, especially through the work of Federal Disaster Recovery Coordinators, Tribal Disaster Recovery Coordinators and Local Disaster Recovery Managers (Federal Emergency Management Agency 2015), **a higher profile for HIAs as an integral part of FEMA's recommended tool sets would be a welcome development.**

In the past the **Department of Housing and Urban Development (HUD)**'s role in disaster recovery was significant, especially with respect to providing new, repaired or replacement housing for low-income victims and other disadvantaged populations. HUD's responsibilities expanded significantly in the wake of Hurricane Sandy (2012) and it is now arguably the single most important *disaster recovery agency*. For example, the Sandy Rebuilding Task Force was established under HUD leadership and made a large number of recommendations for improving the recovery system in innovative ways. (Hurricane Sandy Rebuilding Task Force 2013) It also created a Rebuild by Design competition "...to promote innovation by developing regionally-scalable but locally-contextual solutions that increase resilience in the region." (Martin 2015) Rebuild by Design projects attracted entries from a swathe of international partnerships among architects, landscape ecologists, planners and other experts. Taken as a whole RBD projects demonstrate the importance of injecting sustainable measures to reduce future losses into policies that previously may have assisted recovery but also tended to reproduce existing vulnerabilities. Many of these projects are financed with money from HUD's Community Development Block Grant Disaster Recovery Program, one of the largest public funding sources for recovery projects. (U.S. Department of Housing and Urban Development 2016a). Drawing on the experience of Rebuild by Design HUD now also administers the National Disaster Resilience Competition. (U.S. Department of Housing and Urban Development 2016b) It makes grants to communities that adopt innovations that will enable them to resist and recover from disasters, rapidly

and with a minimum of external assistance. Finally, HUD is a proponent of Climate Change Adaptation planning (U.S. Department of Housing and Urban Development 2014), one of whose key features is seeking to harness recovery activities in pursuit of sustainable coping measures. It is notable that most of the HUD initiatives focus on low-income communities that also tend to be more at risk to disaster and to suffer from greater health inequities than other places. **Although HUD has not explicitly embraced Health Impact Assessment, it is developing a Healthy Communities Index and a Health Communities Assessment tool that provide foundations on which HIAs could build.** (Institute of Medicine 2015)

Many of the other federal agencies that play roles in the nation's disaster management and response system include few responsibilities for the improvement of human health and/or few responsibilities for disaster recovery actions. Among others, these include the National Oceanic and Atmospheric Administration, the U.S. Geological Survey, the U.S. Army Corps of Engineers, the Federal Highway Administration and the Department of Agriculture.⁸ This does not mean that HIAs might not be employed systematically by such agencies as part of the project approval and review processes or in other capacities. For example, the U. S. Army Corps of Engineers regulates wetland dredge and fill activities and has authority over the disposal of disaster debris as well as operating the national dam safety program. Rebuilding, repair or removal of dams damaged by disasters, alteration of wetlands through dredging of navigation channels filled with sediments eroded from beaches by storms, and disposal of building debris created by windstorms or storm surges all have potential long-term health implications. (See section on HIAs and NEPA below, National Research Council 2011, p. 155).

Climate change is a front rank issue for a variety of federal, state and local government entities and its health impacts have been one of the leading concerns driving recent efforts to change public policy. They include rising temperatures and changing precipitation regimes as well as worsening storms, floods, and droughts and shifts in disease patterns likely to be associated with these trends. A variety of inter-agency committees, task forces and action plans led by the White House has highlighted not just the need for better mental health services to deal with problems of stress, anxiety and depression among others, but also for wise rebuilding after disasters, the creation of sustainable and resilient hospitals and the provision of tools for encouraging climate resilient investments – all actions with broad health implications. Some of the federal agencies (e.g. EPA) have begun to incorporate climate adaptations into post-disaster redevelopment plans. (White House 2014; Leggett 2015; Environmental and Energy Study Institute 2015) While HIAs do not explicitly feature in any of the federal initiatives, new niches for the use of HIAs are rapidly being created as offshoots of climate adaptation planning. Some state health officials (e.g. in Minnesota) advocate conducting HIAs as part of the broad process of environmental review mandated by the state's Environmental Policy Act. (Patton, Muellman and Ross 2012) **To the extent that climate change planning is incorporated into the disaster recovery work of FEMA, HUD, EPA and DHSS there will be further useful opportunities for employing HIAs.**

⁸ A more complete list of federal agencies with some involvement in disaster recovery can be found in Phillips 2009, (p. 71).

5.2 State and Other Intermediate Level Institutions

Below the federal level there exist various state agencies and programs for: channeling federal government recovery aid to localities; regulating land uses in hazardous areas; supplying and coordinating emergency services; developing model plans, standards and regulations; managing public lands and protected ecosystems; and other matters. In addition, as pointed out by Smith and Sandler (2012), states (and localities) often create new disaster recovery organizations to supplement existing ones: “...Post-disaster recovery organizations can take several forms, including a commission or task force, a legislatively authorized state office of disaster recovery, or the designation of an existing state agency as the lead recovery office.” (p. 19) Local Resilience Partnerships, as proposed by the Sandy Rebuilding Task Force (2013) but not formally created, are another example. Typically, most of these are inter-governmental structures that include representation of relevant public agencies from different communities in the disaster affected area but they can also provide venues for grass roots organizations that spring up in the wake of disaster. As such they occupy a middle ground between the executive agencies that use HIAs to assist formal decision-making and special interest groups (e.g. lobbies, activists etc.) that may view them as useful levers for advancing broader agendas.

Alaska is one state that has made significant progress toward institutionalizing the use of HIAs in public decision-making. The effects of anticipated climate change on permafrost melting, subsidence, erosion and flooding have been assessed in many places, especially native American communities in the Arctic. A suite of HIAs that focus on the health impacts of these hazards has already been completed but none of these addresses the health impacts of prospective relocation or rebuilding measures that might be taken in response. (Brubaker et al 2010; 2014 a, 2014b, 2014c) However, **President Obama’s recently announced set of energy efficiency investments that are intended to help reduce climate hazards is a potential candidate for the latter kind of HIA.** (The White House 2015)

Other states (Massachusetts, Washington, Maryland, California) are making progress toward incorporating HIAs into various aspects of public policy-making but again, natural hazards and disasters are conspicuous by their absence in these efforts. (Health Impact Project 2015)

5.3 Recovery Decision Making at the Local Level

“All disasters are local” is a familiar catchphrase in the hazards research and management community. (Becker 2009; Bundy and Jensen 2015) This is usually interpreted to mean that disaster impacts fall disproportionately on particular places and particular groups thereby placing heavy responsibilities for responding on local communities. In the National Disaster Recovery Framework an impressive list of broadly defined tasks falls on the shoulders of local leaders. (Federal Emergency Management Agency 2011a) Among others these include: creating the organizations that will drive local recovery; organizing the recovery process; developing a recovery plan that is publically supported, feasible and appropriately funded; ensuring that it is socially inclusive; requiring that it includes

mitigation, sustainability, resilience, and accessibility measures; and collaborating with all the other public and private stakeholders. Unfortunately, there is no part of the disaster management system that is less understood, staffed, developed or funded than local disaster recovery. Much is expected of local institutions during the recovery period but their capacity to deliver is usually quite limited.

HIA would be a valuable addition to the tools available to municipalities and other local government units. (Carnegie et al 2015) More than half (54%) of all HIAs conducted in the United States have informed decision-making at the local level. (Lenhart 2015) They provide a tool that is of use to governments struggling to decide whether to adopt a specific recovery measure and they involve ordinary citizens in decisions about the recovery process. They are also compatible with some of the new community planning and development guidance tools that are appearing in local municipalities. For example, Indian River County, Florida has prepared a detailed post-disaster redevelopment plan that functions as a “standing” document ready to be acted upon in the event of an emergency. (Indian River County 2013) Charrettes, focus groups, community preferences surveys and other “visioning” tools are already in use to construct this and similar plans. In intent and form they are similar to Health Impact Assessments and – in pre-disaster periods - might well be conducted jointly with them. This approach would be much less feasible if a community lacked a pre-arranged recovery plan and was required to produce one in the wake of disaster.

5.4 Advocacy: Use of HIAs by grass roots community organizations⁹

Earlier it was noted that HIAs could be viewed as decision-support tools or advocacy instruments. Most of the preceding sections have addressed the first of these contexts. Now let us turn briefly to the second. In the last two decades a noteworthy trend in disaster policy has been towards asking populations at risk to play a larger role in their own protection. (Lakoff 2010) Privatization of recovery decisions through increased reliance on insurance is a prominent example of this trend. Decentralizing some responsibilities downwards and outwards from the federal government and the public sector to local (mainly private) actors raises questions about whether local actors possess the capabilities to shoulder these new burdens. It also implies that local actors may want greater power to direct their own futures. **The articulation of local knowledge, preferences and expectations is a key property of HIAs so it is reasonable to recognize that they may be advocacy instruments as well as value-neutral aids to decision-making.** Groups that advocate reforms of policies on race, class, poverty and environment are prominent among the organizations that testify at hearings and other meetings convened to collect public opinions about recovery. (Corbin 2015).

The recognition and redress of health inequities have been important drivers of the HIA movement and social justice advocacy groups are among the most

⁹ This section of the report is not intended to be a detailed analysis of HIA use by advocacy groups. Such would only be possible after a lengthy investigation that was not feasible within the terms of reference and the resources available.

enthusiastic proponents of HIAs. That movement shares with other health-centered initiatives reliance on techniques of community participation and expert/lay engagement to improve disaster resilience. (Wells 2013) Inequities are also central to vulnerability-centered explanations of disaster; not only is the vulnerability of underprivileged or marginalized groups regarded as a powerful disaster-forcing factor but the gap between groups with higher and lower levels of vulnerability is viewed as growing wider and, as a consequence, the plight of the disadvantaged is becoming worse. In other words, health inequities and differential disaster vulnerabilities are related concepts in professional discourse; inequities in health outcomes and access to health services frequently exist between groups that have differing vulnerabilities to risks and hazards¹⁰.

About a quarter of all the HIAs currently completed or ongoing in the United States have been initiated and/or sponsored by non-governmental organizations that represent various local or regional interest groups. Many of these organizations are among the strongest proponents of HIAs, especially as vehicles for publicizing and redressing health inequities or environmental injustices that might be ignored or exacerbated by proposed plans, programs and projects. These organizations operate under a variety of names including: neighborhood associations, community advocacy groups, advisory councils, alliances, partnerships, institutes and public interest consulting firms. They often advocate on behalf of certain goals or interest groups that have a stake in the outcome of a proposed project. At least some – and perhaps many - view HIAs, first and foremost, as a means of democratizing public decision-making, not necessarily just for a particular action but as a strategy to encourage broader reforms of governance. Accordingly, they may raise awareness about issues connected with a proposed action but deemed peripheral to it by official decision makers, perhaps because of jurisdictional limits or other restrictive terms of reference. **HIAs offer opportunities to include a wider range of public inputs than is typically tapped by conventional mechanisms for soliciting citizen inputs** (e.g. meetings of local governing bodies, advisory board proceedings, public hearings, workshops, hotlines, opinion surveys).

Tensions between advocacy and impartiality prompt questions about how best to harness the knowledge, energy and talents of advocacy groups within the disaster recovery HIA process. Local community organizations that are involved in disaster recovery clearly include a wide range of types; the non-governmental ones cannot readily be assigned roles in the National Disaster Recovery Framework like their national and state government counterparts. Some are creations of insurgent grass roots social action movements. Most are voluntary and many are temporary, emerging in the wake of a disaster and fading away thereafter (e.g. various “rebuild” committees). Taken together these community-level NGOs are part of the social capital that is increasingly being called into play as a resource for reducing disaster impacts.

¹⁰ A competing explanation of hazard points to the worsening of risks occasioned by climate change and the workings of a global economic system that destabilizes communities that had developed long-term adaption strategies for living with hazards. (Mitchell 2015a)

Disaster researchers and professional practitioners are collaborating in support of improved recovery but a considerable working gap still separates them from laypersons. (Huggins et al 2015) Although there is widespread recognition that risk knowledge is increasingly co-produced by expert and lay communities, laypersons inputs are mainly sought for purposes of validating or fine tuning expert contributions, rather than as empowered actors in the decision making process. Since HIAs are crafted around principles of broad community engagement, it is likely that there will be some tension between the expert and lay communities.

In the aftermath of disasters, local residents are usually preoccupied with an array of tasks that leave little room for debating alternative proposals for reshaping their communities. Yet this is the time when HIAs might make the greatest contributions to ensuring safer and healthier futures; futures that will be difficult to secure without active “buy ins” by affected populations. This argues for a measure of **expert technical support for any local grass roots group that seeks to mount an HIA though with safeguards to protect scientific integrity**. Awareness raising meetings, training, handbooks and other devices that are tailored to the needs of grass roots advocacy organizations might be developed. Advocates might be included in bodies that advise HIA teams sponsored by public entities.

5.5 Summary

Despite limited awareness of Health Impact Assessment among hazards management organizations, when this tool is made known to them there is significant receptivity toward its use in support of disaster recovery decisions and there are active efforts to accommodate it within existing practice. These actions are currently best developed in federal government agencies at the top end of the administrative pyramid though decisions that have the most direct health implications – and the ones that are more readily comprehended by lay populations - take place mainly at the base of the pyramid in local municipalities. There the functions of HIAs are more complex than among the federal agencies. In addition to informing local populations about prospective health outcomes of proposed recovery measures, they provide local governments with valuable non-expert information about interpretations, preferences and expectations that affect the potential for successful recovery. This information reinforces trends towards the co-production of knowledge and it democratizes decision-making, both necessary components of a U.S. policy system that increasingly relies on the public to play larger roles in their own protection against storms, floods and other risks. In addition the HIAs offer a means for addressing inequities in the burdens of vulnerability that are borne by different groups and in the distribution of protective services that are available for redress. The reduction of inequities is becoming a prominent item on the hazards management agendas of governmental agencies but efforts to counter these problems still draw heavily on the activism of local advocacy organizations. HIAs appear to be sufficiently flexible to accommodate productive partnerships between science-based public agencies and advocacy-oriented organizations that also employ non-scientific means for advancing their goals.

6.0 Expert Opinions: Thought leader perspectives

Information was gathered at special sessions of national professional and scholarly meetings and additional inputs were received at separate “thought leader” gatherings convened by the project organizers. In chronological order, the principal meetings included: (1) the U.S. Department of Health and Human Services Recovery Workshop, Washington, D.C., March 3-4, 2015 (U.S. Department of Health and Human Services 2015); (2) the National Health Impact Assessment Meeting, Washington, DC, June 16-18, 2015 (Pew Charitable Trusts 2015) and (3) the 40th Annual Natural Hazards Research and Applications Workshop, Broomfield, Colorado, July 19-22, 2015 (Natural Hazards Center 2015). Findings from these meetings are summarized below.

6.1 Department of Health and Human Services, ASPR Workshop on Recovery (March 3-4, 2015)

The purpose of this workshop was: “...to discuss systematic approaches to recovery, to identify gaps or challenges from recent experiences, and to promote promising practices in an effort to establish a national dialogue for the health and social services emergency management community.” Approximately 100 people attended, most drawn from federal government agencies but with significant representation from other health interest groups. The meeting format combined formal panel presentations followed by simultaneous breakout discussion sessions whose participants rotated among different topic groups throughout the meeting.

Panelists pointed out that health issues, including health recovery, have historically received little attention from experts in the North American hazard research and management community. Likewise, American health professionals and health researchers have tended to ignore disaster issues, especially those connected with long-term post-disaster recovery. **Few attendees appear to have heard of Health Impact Assessment, especially in the context of disaster recovery.** Some (e.g. members of the Centers for Disaster Control and Recovery/U.S. Public Health Service) used the term HIA to refer to methods of identifying immediate health care *needs* in the wake of disaster and had considerable experience with those efforts; but they did not assess *responses* (i.e. plans, programs or projects) aimed at promoting longer term recovery.

One presenter suggested that the disaster recovery system was relatively well defined at its top and bottom (i.e. national and local) levels but uncertain at the intermediate level; there intergovernmental organizations, philanthropic foundations, financing bodies, the mass media, professional associations, community development corporations, and other entities were increasingly influential but uncertainties about their roles, capabilities and responsibilities were high. Another presenter remarked that disaster recovery is not typically addressed by local emergency managers, on whom the bulk of preparedness, warning, evacuation, rescue and sheltering functions ultimately devolve.

Loss of funding for public health programs, especially those that provide mental health services was mentioned by many participants as severely limiting what might be done to improve health during what are often long recovery trajectories. After the 2008 recession approximately \$8 Billion was removed from the national budgets for mental health care.

Priority needs identified by participants were those that are basic to the creation of most large scale public policy initiatives: granting statutory authority for disaster recovery interventions; providing funding necessary to take necessary actions; and institutionalizing (standardized) procedures and tools necessary for executing them.

6.2 Thought Leader Meeting (Washington, DC)

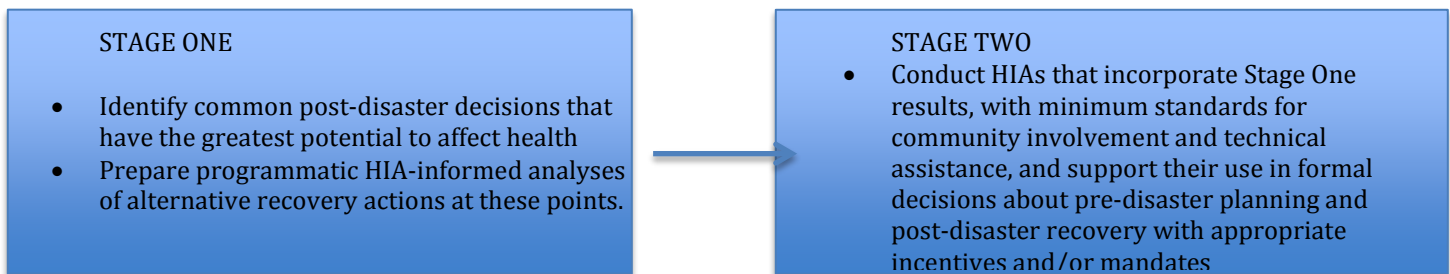
The primary purpose of this meeting on June 18, 2015 was to gather information from national policy and management professionals who have experience of disaster recovery programs and operations and a selection of other user groups. Fifteen experts drawn mainly from federal government agencies, research organizations and academia participated in a meeting of thought leaders that was held after the 3rd National Health Impact Assessment Meeting.¹¹ There seemed to be agreement that **a more structured approach to making health an integral element of disaster recovery planning is necessary and that some form of HIA could play an important role in this initiative.** Participants pointed out limitations to existing cost-benefit analysis tools employed for choosing among alternative recovery measures, especially neglect of poor health's broad social costs. They also drew **distinctions between HIA as a broad and malleable process for ensuring greater attention to health issues across the span of public decision-making and HIA as an off-the-shelf standardized tool for systematic use by particular agencies** or municipalities. It was urged that **implementation of disaster recovery HIAs should be pursued in ways that neither slow the process of recovery nor divert attention away from the larger goal of promoting inclusion of "Health In All Policies" (HIAP).** The degree to which decision makers accept that good health is important will likely determine the success or failure of HIAs; evidence of its cost effectiveness when implemented during recovery might be particularly persuasive. **A generally healthier community should be a planned outcome of recovery activities not just a spinoff benefit of choosing the least unhealthful alternative.** Local laypeople were often better at illuminating the merits and disadvantages of particular alternatives rather than suggesting additional (new) alternatives.

Most of the expert group expressed interest in a two-stage approach that combined elements of both perspectives. Initially, a programmatic HIA might be conducted, for

¹¹ Among others the following were represented: U.S. Department of Housing and Urban Development (HUD); U.S. Department of Health and Human Services (HHS); Environmental Protection Agency (EPA); American Planning Institute (API); U.S. National Academies; Mt. Sinai Hospital, New York; Madison County Wisconsin; George Washington University; Georgia State University; Rutgers University.

purposes of assessing the health impacts of the full range of existing and potential recovery measures. This might best be described as an HIA-informed analysis of alternative actions, and it could be executed without significant community engagement, at any time, including in the absence of disaster. Once a disaster occurred, a more detailed HIA would be implemented with strong community engagement and customization of the alternatives assessed in the programmatic HIA. This second-stage HIA should be employed at certain existing decision points, where the information that it provides would have the largest effect on recovery rates and outcomes. The use of HIAs could either be mandated or incentivized. Opinions about appropriate insertion points, included, among others: via information and education initiatives mounted by the White House Office of Science and Technology Policy; during the formulation of hazard mitigation plans; when local communities were preparing applications for federal funding; as part of the National Flood Insurance Program's Community Rating System. Other avenues are also likely. Fig. 6.1 summarizes the main elements of a two-stage disaster recovery HIA process.

Fig. 6.1: A Two stage HIA process for Disaster Recovery Contexts



The advantages of a two-stage approach are considerable. An HIA-informed analysis of alternatives could be mounted in the absence of a disaster and its findings would be capable of application to any disaster thereafter, needing only periodic updating to take account of new kinds of recovery measures, or new kinds of data or improved analytic methods, as these became available. It would provide useful guidance for the application of the second stage HIA by suggesting alternatives that might not otherwise be considered either by public officials or affected populations. Thought leaders mentioned that initial decisions about appropriate recovery measures, made expediently after disaster, often foreclosed many alternatives that might have been adopted. The first stage HIA could help to counteract that tendency. **It will be important to create incentives and/or mandates for: (1) carrying out disaster recovery HIAs with minimum standards for community engagement and, (2) for ensuring that they receive consideration in the formal decisions that are taken in support of recovery.**

6.3 40th Annual Natural Hazards Workshop, Broomfield, CO, July, 2015

The purpose of this meeting was to solicit inputs about disaster recovery HIAs from a cross-section of leading U.S. professionals and scholars whose work focuses on research and management of natural hazards. Approximately 450 specialists attended the parent Workshop and about forty of these, with special interests in the health dimensions of disaster, participated in an hour-long special session focused on Health Impact Assessment. Half of the special session participants came from academia with the remainder divided between public agencies of federal, state or local government and private consulting forms. Half of the session was devoted to presentations by a panel of experts and half to comments and questions from the audience.

Panelists pointed out a general **absence of health considerations in existing arrangements for managing disaster recovery as well as insufficient vertical or horizontal integration among different parts of the recovery system**. Because recovery needs are diverse and recovery problems are experienced unevenly within populations at risk, **an across-the-board perspective, keyed to average community needs, is less useful than a focus on vulnerable groups that bear disproportionate burdens and require special kinds of attention**. Recovery projects should not reproduce existing health inequities and local governments should be held accountable for the use of state resources that are earmarked for recovery. HIAs that are flexible and adaptive to emerging issues are strongly preferred. Several changes to the national disaster recovery system would facilitate optimal use of HIAs. These include: (1) clear definitions of operating concepts (e.g. health, health recovery, holistic approaches) and improved measurement of local needs; (2) evaluation of resources available to address those needs; and (3) ability to track changes in benchmarks and resource flows over time. **Informal HIAs were already being done by a few innovative disaster recovery organizations and a more formal public process is now desirable**.

Questions raised by the audience revealed **very limited knowledge about Health Impact Assessments among members of the hazards research and management community**, but significant interest in the potential that they might offer. Many questions inquired about the basics of HIA execution (e.g. timing, duration, and data needs). Some sought information about the breadth of application of HIAs; for example, might they be adapted for use with ongoing diseases and epidemics as well as in the aftermath of storms, floods and non-biological hazards? Attendees were especially curious about **the degree to which HIAs could be “mapped onto” the National Disaster Recovery framework** because it is organized around the provision of aid at critical times and for different periods. They also wanted **evidence that implementation of HIAs could facilitate quicker recovery paths**. Some of those with practical experience of recovery from major disasters were concerned that **HIAs might add to the workload of recovery personnel** and thereby produce delays that would widen the perceived disconnect between agency personnel preoccupied with assessment activities and victims clamoring for action.

The hazards research and management community lacks experience of Health Impact Assessment and its members are ripe for receiving information and education about the use and potential of these decision-support mechanisms. Factors likely to affect adoption of this innovation include: funding, policies and regulations, and the social capital that is available to build capacity for undertaking HIAs. In addition, pre-event planning and preparedness is an essential complement to post-disaster recovery; both types of intervention present opportunities to introduce health considerations into decision-making to mutual advantage. Mechanisms for promoting the use of HIAs should be crafted in light of these constraints.

7.0 HIA Case Studies in New Jersey

Project staff teams carried out two case study HIAs in New Jersey communities that suffered serious losses during Hurricane Sandy. Detailed reports about these are available elsewhere. This section focuses on study findings that cast light on the fit between HIAs and the existing hazard policy and management systems.

The two cases featured respectively a (mainly) green infrastructure project and a property buyout/ relocation program; the former in a large highly urbanized municipality located opposite Manhattan on the New York harbor waterfront (Hoboken) and the latter in a small thinly populated semi-rural municipality on the shores of Barnegat Bay at the periphery of the New York metropolitan area (Little Egg Harbor). While these places have the advantage of illustrating two representative types of policy responses in two different kinds of community they also have some limitations as tests of the utility of HIAs that might aid decisions about disaster recovery.

The Hoboken HIA addressed health impacts associated with a storm water management program that was intended to cope with periodic “nuisance” flooding, not catastrophes like hurricane Sandy. It is one of a series of post-Sandy flood mitigation measures that together were part of a more comprehensive post-disaster package of initiatives in Hoboken. Other components of the package were not subject to HIAs mostly because of timing and cost issues. It was also observed that the research environment was sometimes congested. Other Hoboken initiatives were gathering information at the same time as the present study and, in practice it was difficult for local informants to distinguish among the different ongoing projects.

In Little Egg Harbor a buyout of flooded properties was proposed with a set of hypothetical scenarios. An HIA focusing on this choice was undertaken with the expectation that the proposal might be acted upon at some point in the near future. Participants, including local leaders, were unsure about whether a buyout program would eventually go into effect. This may have influenced the HIA process in, as yet unknown ways. **For purposes of testing the HIAs it would have been better if the Hoboken project had been initiated in response to a major disaster rather than a more routine hazard and it would have been better if a program of buyouts in Little Egg Harbor had been fully approved rather than still being discussed.**

In the United States physical reconstruction projects have historically dominated the process of long-term disaster recovery and they still account for a majority of public spending. The use of expert scientific and professional knowledge has also been a prominent feature. But these HIAs differ on both counts. Green infrastructure and buyouts are, to a significant degree, non-structural responses. The strong emphasis of HIAs on gathering structured inputs of information about health, risks and preferred community futures – from local laypersons as well as experts – also stands in contrast to other more expert-centered approaches. Perhaps because of their novelty, **sponsors, public officials**

and others active in different parts of the recovery process expected much of the case study HIAs.

The HIAs were positively revealing in several ways both about the HIA process itself and about the specifics of recovery choices. First, these studies demonstrate that **it is possible to execute a detailed HIA while disaster recovery is ongoing** and at a sufficiently early stage that its findings are available for decision makers to make use of. Before this project it was not clear that such was feasible. Second, an impressive **amount of high quality information about health status and outcomes was assembled and analyzed**. Third, the perceived **salience of mental health problems** was marked. Fourth, the HIAs showed **health improvement was a high priority recovery goal among leaders and local residents** in both communities, deserving of more attention than it usually receives. Fifth, the **HIAs increased the visibility of community health professionals and provided data they could make use of** as arbiters of health issues and advocates for increased attention to health-related recovery decisions. Sixth, they underscored **the gap between urgent public needs for assistance and a formal recovery system that was often slow and mismatched** with the problems at hand.

Public input to the HIAs also uncovered aspects of proposed recovery measures that were insufficiently anticipated, sometimes counterintuitive and occasionally unwelcomed by their proponents. For example, innovative environmentally friendly technologies that generally get high marks for public acceptability may have unexpected distributional equity impacts for some populations, such as people living downstream from where green infrastructures are installed (e.g. Hoboken). Coastal communities (e.g. Little Egg Harbor) are strongly associated with desirable amenities and salubrious living. Together with the passage of time and uncertainty about replacement land uses for vacated sites, these factors work against public acceptance of property buyouts. Among others, those findings highlight: (1) the value of HIAs as mechanisms for revealing weaknesses in recovery programs, especially those that rely on voluntary public compliance; (2) the usefulness of community “visioning” as an aid to HIAs; and (3) the importance of constraints on access to recovery programs that differentiate between those who can and cannot take advantage of them.

The studies also functioned as a kind of “stress test” of HIAs in a novel post-disaster setting, thereby highlighting issues and providing other insights into aspects of the HIA process that might prove problematic and require modification in future recovery HIAs. Among others these include: (1) screening; (2) the treatment of recovery alternatives; (3) data compatibility; (4) participation; and (5) the potential for weakening support for already decided actions.

The **initial screening stage of the HIA process presented major difficulties** for researchers. The number of candidates for study was large and varied, composed of different types of responses at various scales and on different schedules. Collecting information necessary to screen out the less likely candidates was a time consuming and at times frustrating task, usually conducted in a rapidly changing information environment, constrained by the available budget as well as by the opening and closing of opportunity

windows as new candidates appeared, old ones disappeared and those that remained were subject to design modifications or other changes. Six of the most viable candidates were eventually assessed in some detail. **The relative prominence of infrastructure projects and the difficulty of designing HIAs that would accommodate multipart projects in multiple jurisdictions were noteworthy features of the screening process.** Three candidates were infrastructure projects in single municipalities and the others were, respectively, a multijurisdictional effort to adopt flood plain management measures necessary to secure higher scores in the NFIP's Community Rating System; a six-part set of resiliency-building projects in one municipality; and a voluntary home buyout in another. The six candidates were eventually winnowed to the final two. **Changes continued to affect the Health Impact Assessment throughout the entire process and are likely to occur in similar post-disaster studies elsewhere;** as one investigator commented, "...choices that were there at the beginning may not be there at the end". As this report was being completed stories about strong local opposition to the building of seawalls that are intended to reduce flood penetration of Hoboken appeared in the press; it is not at all clear that the package of proposals of which the green infrastructure project that is the focus of our HIA is one component, would go forward. (*New York Times*, February 8, 2016)

A lack of attention to alternative recovery measures was also problematic. HIAs tend to assess specific proposed or agreed upon actions, which may or may not represent the best available choices as measured by criteria of healthfulness as well as other yardsticks (e.g. economic efficiency, environmental fit, social acceptability). It is possible to take account of alternatives in the recommendations component of a HIA, but this is not the same as assessing comparative health impacts across the broad range of possible actions. It might well be that the healthiest disaster recovery outcomes would be secured by a project different from the one under consideration. **Without guidance about the health consequences of alternatives the full value of an HIA may be missed.** There is a pressing need for more information to fill this gap.

The Little Egg Harbor HIA uncovered **potential weaknesses in the public engagement phase of HIAs that involve property owners who do not live permanently in the subject community (e.g. second home owners) or residents who use health facilities and other daily living services in jurisdictions outside the HIA's reference area.** The latter conditions are common in small oceanfront municipalities along much of the U.S. coast and they cause sampling and baseline data compatibility problems for analysts as well as limiting the participation of important stakeholder groups. In addition the departure of an HIA enthusiast who acted as liaison between the HIA team and local government illustrated how important such individuals are in small municipalities with limited staffs, and how difficult to replace. Finally, in Hoboken, the HIA uncovered a concern that its community engagement format might give scope for airing and exaggerating objections to a green infrastructure project that was already popular among scientists, local leaders and public interest groups¹². **Once there is widespread support for a given course of action, local leaders may be loathe to increase the scope for further debate**

¹² Similar misgivings have been voiced about the disproportionate publicity afforded skeptics of anthropogenic climate change in the United States and elsewhere.

by introducing information that might render the agreed choice less appealing. This argues for earlier introduction of HIA information in the decision-making process.

The two post-disaster HIA studies proved highly valuable for identifying systematic strengths and weaknesses of disaster recovery-related HIAs though the projects that were assessed did not provide an *ideal* test of their utility. In both cases the decisions under review were constrained by unique factors, or factors peculiar to each situation. However, in one overriding respect, both cases were highly reflective of reality. Disasters exemplify less-than-ideal circumstances. They rarely present decision makers with a standard menu of recovery choices. Contexts are specific and surprises are common; improvisation and “satisficing” decisions are the norm. The design and execution of post-disaster HIAs is no less bound by these constraints than the recovery measures.

8.0 Recommendations

The process of Health Impact Assessment needs no fundamental changes to make it useful in support of disaster recovery policies, plans and projects but it would greatly benefit from a combination of modifications to make it more appropriately fitted for that purpose. These include: becoming much better known among potential user groups; careful targeting to ensure that HIAs are applied at the points where they have the greatest potential to affect decision outcomes; strategic pre-screening of recovery alternatives that may or may not be part of candidate HIA projects; broadening to take account of all the health outcomes that might be captured by holistic recovery programs; and streamlining to provide the speed and flexibility necessary to perform successfully in a complex and dynamic post-disaster context. Toward those ends the following steps are recommended:

8.1

Recommendation 1: Awareness

Invest major effort to publicize HIAs among target user groups in communities of hazard and health professionals that have responsibilities, skills and/or interests in disaster recovery.

Lack of awareness of the HIA process and weak communications between health improvement and hazard management specialists are notable at present. There is evidence of commitment to closer engagement of health and hazards agencies at the **federal** level but practical steps to bring these communities – and especially their local counterparts - into fruitful interaction, are needed. The Pew Charitable Trusts and the Robert Wood Johnson Foundation might take the lead here, together with the Federal Emergency Management Agency, the U.S. Department of Health and Human Services and the U.S. Department of Housing and Urban Development.

Involvement of **local** disaster recovery actors is even more important. Given the rarity of municipal level disaster recovery personnel it may be best to target available experts in other phases of the disaster cycle, like Emergency Managers and Flood Plain Managers. They are often valuable repositories of knowledge about disaster risk management and health that are both known to, and trusted by, local populations. Where they exist, local resilience partnerships (typically comprised of local officials, researchers, non-governmental organizations), including especially those with involvement in climate adaptation work, would also be priority targets for education and outreach. There is already widespread acceptance of risk and vulnerability analyses as essential tools for planning disaster preparedness and response measures. At the time these are being undertaken it would be worthwhile to signal the value of HIAs as follow up actions in high risk and high vulnerability communities.

8.2

Recommendation 2: Pivots of application

Insert HIAs into the disaster recovery decision-making system at key points of application.

Mainstreaming HIAs throughout the National Disaster Recovery Process is certainly desirable and certain federal initiatives are disproportionately important in achieving successful recovery from disasters, especially through funding and regulatory mechanisms. Chief among these are: Federal Recovery Task Forces; the National Flood Insurance Program (NFIP); FEMA Public Assistance Program; Hazard Mitigation Plans; and the Community Development Block Grant (CDBG) program. Recent additions to this list, that may become significant in the future, include the National Disaster Resilience Competition and similar competitions (e.g. Rebuild by Design).

Given the number and variety of post-disaster recovery decisions taken by impacted communities, guidance about the optimal use of HIAs is not a simple matter. Recovery decisions that are broad in scope and early in the process are likely to have the greatest long-term impact on human health and wellbeing. Decisions taken by a Presidential or Gubernatorial rebuilding task force that is convened soon after a disaster can set general strategies that have far-reaching implications, as can decisions about flood insurance maps, regulations and FEMA's Community Rating System.

The value of assessing health outcomes of strategic decisions is considerable. Changes to NFIP regulations are illustrative. Requiring that homes be elevated after a disaster can be a problem for elderly or infirm residents who are accustomed to ground floor living, dependent on fixed incomes and unable to take on new mortgages. (Langan and Palmer 2012; Leckner et al 2016; Mitchell 2016; Brown and Frahm 2016) At the time of Hurricane Sandy FEMA was in the process of creating updated flood insurance rate maps and issuing new base flood elevation data, a situation that caused considerable confusion among populations at risk. Since the new maps do not take account either of hurricane Sandy (a record-setting event) or projections of likely sea level rise, it is possible that further modifications will be necessary during future storms. One or more HIAs that compare health effects of modified risk zones and modified base flood elevations in high risk and high vulnerability locations under future climatic conditions, would be particularly helpful as anticipatory decision-support tools.

In contrast to strategic decisions, local blueprint-like proposals tend to elicit stronger feelings among members of communities directly affected by the disaster. Local decisions about construction permits, or the location of protective structures, or open space acquisition, or changes to pre-disaster facilities, services and land uses, are far more likely to engender lively debates. Recent post-Sandy examples include proposals to raise the permitted heights of buildings and construct public seawalls across private property. Intermediate between the national/state strategies and local projects are other decisions like those associated with the Rebuild by Design projects after hurricane Sandy or

applications for Community Development Block Grants; these typically have both broad applicability (i.e. multi-municipal or regional in scope) and are more specific in intention and design. Finally, there are decisions about matters that are not directly about disaster recovery but - because of their indirect effects on life support systems, livelihoods and habitats - can have portentous implications for the health of humans and the management of places or peoples at risk. Energy plans¹³ and climate adaptation plans are representative examples.

Federal Task Forces might be valuable conduits for recommending wider use of HIAs by those who are engaged in making more detailed rebuilding decisions later in the recovery process. So might climate adaptation plans or packages of proposals submitted by states to the CDBG process. Given the relatively slow pace at which CDBG programs are organized they may be particularly strong candidates for HIAs. Likewise, proposals submitted to the Rebuild by Design process (or its successor Disaster Recovery Resilience Competition) are sufficiently specific to warrant the use of an HIA for each project. The same would be true of municipal level plans or other detailed local recovery initiatives.

8.3

Recommendation 3: Appraisal of recovery alternatives

Conduct a systematic analysis of the health impacts of the full range of disaster recovery alternatives, with a view to providing a databank of information about their comparative health outcomes as well as other consequences.

The value of any impact assessment, whether a NEPA-mandated Environmental Impact Statement or a Health Impact Assessment or other, depends in part on the treatment of alternatives to the action that is the subject of assessment. Without a comparative analysis of alternatives it is difficult to confirm whether the contemplated course is the best possible or how far it falls short of that standard. If another alternative would produce better health outcomes, without incurring offsetting disadvantages, it would likely be a superior choice. Alternatives have been assessed in a handful of HIAs¹⁴ but these were generally confined to alternative routes or alternative locations for the same facilities. There is, as yet, nothing approaching a systematic comparative assessment of disaster recovery alternatives. Without this kind of study such disaster recovery HIAs as might be undertaken will provide only partial and possibly maladapted guidance to decision makers.

¹³ Valmeyer, IL, Pattonsburg, MO, Soldiers Grove, WI and Greensburg, KS are among communities that leveraged recovery with the assistance of federally funded energy efficiency programs. (IOM 2015). Alaskan rural communities at risk to permafrost melting, erosion and flooding are engaged in similar efforts at present. (White House 2015)

¹⁴ HIAs that considered alternatives include: California High Speed rail - San Jose to Merced Corridor; California State Gas Tax alternatives; I-5 Columbia River crossing alternatives; Metro West subway extension (Los Angeles); Portland to Lake Oswego (Oregon) transit alternatives; potential utility fee to fund Columbia transit; Power generation alternatives for the Michoud Natural gas plants; Tice Community connectivity; Trenton farmers' market; Treatment alternatives to prison alternatives.

Ideally, a Health Impact Assessment of recovery alternatives would function as a single reference source for use in subsequent disaster-recovery HIAs, thereby simplifying and speeding the screening stage of full scale HIAs, which has proven to be the most problematic part of the process¹⁵. It would also have value in the recommendations stage of the HIA process by providing decision-makers with data about alternatives that were not included in the project under evaluation. The study might focus on cases of disaster recovery that are already documented, with additional details gathered by interviews, focus groups and surveys of disaster-affected populations. In so doing it could provide an avenue of retrospective public input (albeit with a different population) to complement the prospective community engagement aspect of the HIA. The study should be periodically expanded and updated as innovative recovery alternatives are developed. If, as is sometimes suggested, HIAs were to be mainstreamed in NEPA-style Environmental Impact Assessments, the review would also provide a useful framework with which to facilitate that task. Assuming that such a study is undertaken all subsequent recovery-related HIAs would become, in effect, “**alternatives-informed HIAs**”.

8.4

Recommendation 4: Guidance for choosing among HIAs

Provide decision-makers and HIA users with better guidance for choosing among different kinds of HIAs in post-disaster contexts.

Decisions about long-term recovery that are taken in the wake of disasters pose stiff challenges for the HIA process. Post-disaster environments are usually marked by instability, uncertainty and urgency, factors that are not conducive to lengthy in-depth inquiries at a time when clear thinking is called for. At present there is only limited guidance about which of several different types of HIA (i.e. desktop, rapid, comprehensive, programmatic) might be best able to provide useful information to decision-makers, either alone or in combination, under different local circumstances. (Heller et al 2014) Timely knowledge that is sufficient for the task at hand is more useful than better knowledge that arrives late. In addition, the choice of HIA variants is likely to be influenced by the degree to which pre-disaster inquiries and planning have already filled in some of the unknowns (e.g. measures included in Hazard Mitigation Plans; grass roots community-wide “visions” about desired future health and hazards norms).

Community engagement that provides information inputs from disaster-affected populations is at the core of the HIA process. Therefore it is imperative that such be facilitated to the greatest extent possible, though managing community participation that is representative and informed is perhaps the most time-consuming and potentially fraught part of the process. It is recognized that a scientifically valid analysis of alternative HIAs is likely to be difficult because they have heretofore been undertaken on an ad hoc basis rather than systematically. Nonetheless, the availability of guidance about the selection of

¹⁵ A recent analysis of the impacts of HIAs on public decision-making concluded that screening is also the stage that is most crucial for overall success. (Bourcier 2014)

appropriate HIA types would go a long way toward enhancing their use in post-disaster contexts.

8.5

Recommendation 5: Grassroots technical support

Provide appropriate technical support for local advocacy groups that seek to use HIAs for the joint reduction of health inequities and disaster vulnerabilities.

HIAs have tapped into a latent demand for lay participation in public decision making. Perhaps their central value is that they uncover and articulate grass roots perceptions and knowledge pertinent to proposed public choices. In this respect they are similar to other types of co-produced knowledge seeking that are now beginning to enhance public decision-making. Among these are: participant mapping using GPS and GIS technology; volunteered geographic information that employs social media and cloud sources; and real time remotely sensed imagery of ongoing events. Each of these other instruments has found innovative applications in support of post-disaster decision-making. (Henry-Nickie et al 2008; Picou 2009; Zook et al 2010; Horita and de Albuquerque 2013) The central problems they confront are similar to those that arise in Health Impact Assessment, namely how to assure the reliability of lay information inputs and how to reconcile data that is volunteered by laypersons with data that has been collected and compiled by systematic scientific means. In non-disaster situations the accuracy and reliability of scientific information is generally high relative to that of lay populations and there is less need to interrogate its validity. But the same is not necessarily true in the wake for disasters, where there may be gaps in existing information banks and insufficient time to gather the data necessary to plug them, especially at the scale where local decisions about recovery are made. There is significant potential for cross-learning between these other technical innovations and HIAs. It is recommended that research, education and training efforts be mounted to achieve those ends.

Some technical support is already available to local communities to assist them with tasks of disaster recovery as well as the solicitation and management of broad-based public participation in governmental decision-making. For example the National Charrette Institute (<http://www.charretteinstitute.org>) supplies help in executing public information gathering and visioning exercises associated with hazards and disasters (Watson and Adams 2011) and the American Planning Association deploys Community Planning Assistance Teams (CTAPs) that can deliver specialized guidance to disaster stricken and at-risk communities. (Schwab 2014)

8.6

Recommendation 6: Broadening and integration

Encourage research organizations to develop methods for integrating health impact assessments with economic and environmental impact assessments.

Almost a century of research on human responses to natural hazards and disasters has shown that decision-making under conditions of environmental uncertainty is a complex task subject to multiple evaluative criteria. For a long time in the United States economic and technological criteria have tended to dominate public choices among adjustments to risk and disaster but it is now common to also give major attention to ecological (i.e. ecosystem) factors. This is reflected in the emerging acceptance and operationalization of concepts like environmental sustainability and holistic recovery. Now health is becoming a further evaluative criterion¹⁶. The effect of disaster response measures on human health is one aspect of a larger set of decisions about health assessment applications. Already there are calls for integrating several of these tools and such demands will likely grow. Because of its strong emphasis on public participation in the shaping of decisions about health outcomes, Health Impact Assessment is a novel instrument that will pose unusual challenges to the task of integration. It is not too soon to begin thinking about the role of HIAs in this process, particularly how society should mediate and weight health considerations in the broader balance of social choices. It is a research puzzle with strong practical consequences and the aftermath of disasters provides a testing context for working out the governance arrangements that will be necessary.

¹⁶Others that might be in the offing include various human rights that are aspired to and codified in documents like the Universal Declaration of Human Rights.

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¹⁷ All electronic sources were accessed during February 2016.

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Appendix 1
**Health Impact Assessment and Natural Disaster Recovery:
 A Literature Review¹⁸**

James K. Mitchell

Preamble

This review focuses on scholarly and professional literature about the long-term effects of natural disasters on human health in the United States and on the roles that Health Impact Assessments (HIAs) play, or might play, during the long-term process of recovery. There is a growing global literature on HIAs as an aid to public decision-making for a wide range of purposes, but **most HIA publications do not circulate widely outside the health research community.** In particular there has been only limited communication with natural disaster researchers and managers whose policy guidance exerts a powerful effect on how society responds to those disruptions. Moreover, few of the extant publications on HIA mention anticipatory planning for future disasters and even fewer makes reference to disasters triggered by natural phenomena (i.e. floods, storms, droughts, earthquakes). Rapid assessments of immediate health effects, undertaken during the emergency phase of the disaster, and intended to assist emergency response and preparedness, dominate the literature. Goals of hazard mitigation, prevention, avoidance or reduction are rarely addressed. The number of publications about HIAs that focus on long-term recovery projects, proposed or begun in the wake of natural disasters, is very small. In view of burgeoning concerns about health effects of climate change and the increasing prevalence of natural disasters, (Kovats et al 2005; Patz et al 2008; Patz and Hatch 2013; Kim et al 2014) the paucity of disaster recovery HIAs and the low visibility of HIAs among disaster experts are deficiencies that warrant redress.

Organization

The review encompasses literature published since the 1990s. It is organized as follows. The health dimensions of natural disasters are first examined (I). HIAs are then defined, their evolution sketched in and various types of HIAs are identified (II). A continuing emphasis on short-term health impacts of disasters is noted in the third section (III). Trends in the development of HIAs are then briefly examined in the context of two larger processes: (a) a thrust towards integrated, holistic and comprehensive tools for the evaluation of multiple policy actions taken by large institutions (IV); and (b) the emergence of co-produced knowledge as an input to public policy making and management (V). Next comes a survey of the experience of undertaking HIAs, as reported by users and analyzed by researchers (VI). Finally, principal findings from the literature review are identified and commented upon as they pertain to the current Rutgers research project (VII).

¹⁸ Note: No attempt is made to review the voluminous literature of disaster recovery. Ways of integrating health considerations into post-disaster planning are addressed in the recent Institute of Medicine Report on "Healthy, Resilient, and Sustainable Communities after Disasters" (2015)

I: Evolving perspectives on human health in and after disasters

Health issues play an ambiguous role in disasters, especially natural ones. Given the threat that floods, storms, droughts, earthquakes and similar events pose to human lives it is not surprising that health concerns have often loomed large in the mass media and that health protection has been a high priority among governments and the organizations of civil society. (Center for Disaster Philanthropy 2015) However, **the salience of health issues in disaster policies and programs has been significantly diminished by competing public priorities.**

Long before the reduction of hazard-related deaths and injuries and other humanitarian concerns prompted action by the federal government, the primary drivers of U.S. hazard and disaster policies were desires to protect trade and facilitate land settlement by improving transportation facilities, enhancing communication and growing economic assets. These preferences are still in evidence today; it is telling that a recent review of the health effects of disasters highlighted the impact of catastrophic health emergencies on interstate *commerce* as a primary reason for seeking changes in federal policy. (Greenberger 2006) A persuasive case can be made that human health and security are still not dominant drivers of American hazard policy. For example, the protection of buildings, infrastructure and other investments in locations at risk (not people) is the leading goal of U.S. flood policies. Moreover, owners of homes and small businesses are the primary beneficiaries of the National Flood Insurance Program, not the poor tenants and homeless populations that are most vulnerable and most likely to be killed or injured by floods or inadequate attention to flood-related health impacts in their aftermath. Though per capita death rates from hurricanes, tornadoes, floods and most other natural disasters have fallen in the USA over the last century this has been accomplished largely as a result of mass warning and evacuation programs that do not significantly improve the health of evacuees, but simply move them to temporary safer locations.

Importantly, the legal and institutional means by which health improvement is included in U.S. national policies and programs do not generally rest on legislative mandates that are specific to health. Instead, eschewing the prioritization of health by means of high visibility health-centered laws, advocates of improved public health have preferred to embed health protection measures in existing institutional arrangements for other sectors of society (e.g. transportation, housing), where they might receive support from multiple diverse constituencies. (Blanchet 2013) Finally, at a time when the health of ecosystems and the health of economies are considered closely linked to human survival (Horwitz and Finlayson 2011), there has been a failure to integrate human health into the larger discourse of sustainable development that animates many important public policy deliberations - especially policies about hazard management and disaster response. (Winkler et al. 2013)

The low salience of health issues in national policies on disasters might be attributable to competing priorities among many different U.S. government departments and political interest groups but even the more **specialized health agencies have not given much weight to environmental disasters.** For example, in the *National Prevention Strategy*, a far-reaching statement on the nation's health improvement priorities, the

emphasis is heavily on chronic threats that stem from modern lifestyles; (natural and technological) disasters are mentioned only once whereas obesity appears 116 times. (Surgeon General 2011) Likewise, in the influential National Research Council report *Improving Health in The United States: The role of Health Impact Assessment*, there is again a single mention of disasters with obesity appearing 38 times. (National Research Council 2011) Moreover, published research on the health dimensions of disasters has been meager with the bulk consisting of case studies of efforts to identify and measure prompt impacts. (Youssef et al 2014; Fewtrell and Kay 2008b; Klein Rosenthal 2014; Paranjothy et al. 2011; Nataria et al. 2014) In light of these circumstances, it is fair to say that the salience of health as a topic relevant to studying, planning for and managing disasters is far less than it deserves to be.

But that situation is changing. There has lately been an upsurge of interest among researchers and public leaders in the relationship between extreme environmental events and human health, partly prompted by the ascent of climate change to a high priority on the national agenda. This has encouraged the development of pre-disaster preparedness assessments with a view to improving emergency management and encouraging adaptive “green” building and planning responses that complement efforts to reduce greenhouse gas emissions. (Houghton 2011) However, most studies of climate and health focus on matters like heat stress, air quality mortality and morbidity, and water and vector-borne disease epidemics. (Kinney et al 2010) In other words they engage with health consequences of shifts in (macro-scale) means of temperature and precipitation rather than fluctuations of extreme (meso-scale) atmospheric phenomena like storms, floods and droughts. Yet, global shifts in temperature and precipitation regimes may trigger larger, more frequent, more intense storms or send them to parts of the world that were relatively untouched in the past, thereby precipitating disasters like Hurricane Katrina (2005) and Hurricane Sandy (2012) that many believe are harbingers of worse to come. Concern about climate risks has also been reinforced by worries about other kinds of sudden onset events, particularly terrorist attacks and accidents involving contamination by hazardous materials (e.g. *Deepwater Horizon* oil spill; Fukushima earthquake/tsunami/radioactivity crisis). Taken together these events have revealed the limitations of existing programs for the protection of people and property and therefore of human health.

Despite increasing concern about disasters in the *health research* community, health considerations have not figured prominently in the *disaster research* literature. This was recently noted by Gavin Smith, a leading scholar in the field of disaster recovery planning who has been closely associated with new recovery initiatives at the U.S. Department of Health and Human Services. (Smith 2015) Nor do health issues receive significant attention in flagship publications on disaster recovery theory and practice produced by other authors from a wide range of academic and professional disciplines (Smith 2011; *International Journal of Mass Emergencies and Disasters* 2012; Gall, Nguyen and Cutter 2015).

In summary, unprecedented storms and accidents have raised awareness of disaster-related threats to health, fostering the fear that **we may be transitioning to a world where more disasters will likely occur. Therefore there will be greater needs for recovery programs and projects, and the institutions of recovery will play a bigger role in**

shaping communities. This is already happening in Christchurch, New Zealand where a post-earthquake reconstruction agency has become the city's pre-eminent public institution, reshaping health policies and other institutional arrangements as well as the physical landscape. (Gawith 2012) Reflecting judgments about the onset of a riskier future, the Rand Corporation has also begun to explore the implications of disasters that leave some communities to fend for themselves in the immediate aftermath and others to face uncertain and protracted periods of recovery to a "new normal" that may be less secure than the *status quo ante*. (Chandra et al. 2011) With this as background let us now turn to consider publications about the research and management innovations known as Health Impact Assessments.

II. Health Impact Assessment

Health Impact Assessment (HIA) has been defined as: "*a systematic process that uses an array of data sources and analytic methods, and considers inputs from stakeholders to determine the potential effects of a proposed policy, plan, program, or project on the health of a population and the distribution of those effects within the population. HIA provides recommendations on monitoring and managing those effects.*" (National Research Council 2011)

HIAs now follow a six step process that involves: (1) screening, (2) scoping, (3) assessment, (4) recommendations, (5) reporting, and (6) monitoring and evaluation. This process is sometimes embedded in a larger strategy known as "Health in all policies". (Nolen 2014; Gawith 2012) HIAs are comparatively recent innovations. They have been used in Europe and in many developing countries for approximately three decades but did not appear in the USA until 1999. (Fewtrell and Kay 2008a; Singleton-Baldrey 2012) There are now approximately 350 known HIAs, completed or ongoing, in the USA.

The main intellectual lineage of HIAs can be traced back to provisions of the U.S. National Environmental Policy Act (1969) that instituted Environmental Impact Assessments (EIAs) in advance of major actions contemplated by the federal government that might have undesirable environmental outcomes. (O'Mullane 2013, p. 17) Initially EIAs were intended to include impacts of proposed projects on human health but, throughout the world and in the USA, this component was largely overlooked in favor of documents that typically focus on actions that affect plants, animals and non-human ecological systems, particularly actions that involve the release of toxic materials. (Bhatia and Wernham 2008; Harris, Vilianni and Spickett 2015) Some analysts have favored incorporating HIAs into EIAs because they would strengthen considerations of cumulative impacts and environmental justice but others argue that the results would introduce greater uncertainties and produce bulky documents while also burdening HIAs with the procedural and legal emphasis of EIAs. (Cole et al. 2004)

A second intellectual source of HIAs lies within the community of health researchers and practitioners that has progressively widened the definition of health to include social, economic and physical environmental factors that are conducive to human wellbeing. (Public Health Agency of Canada 2012; Georgia Tech Center for Quality Growth and

Regional Development 2015) As reported by one set of authors: “The main changes (in HIAs) have been gradual moves from a biomedical to a socio-economic or environmental model of health; from consideration of toxic, infectious and other hazards to wider determinants of health, such as employment, transport and housing; and considering the health impacts not just of specific projects but also of broader programmes and policies. More recent resources (sic) are based on other HIA approaches, rather than being a direct development from EIA or policy appraisal” (Mindell, Boltong and Forde 2008) The growth of a “One Health” paradigm for the teaching of medicine as an integrated practice, that is strongly affected by contexts of place, time and society, has also begun to take hold. (Katz et al 2014; Zinsstag et al 2015) This shift provides fertile ground for undertaking disaster-related HIAs that integrate human health, ecological health and economic health. (Barrett and Osofsky 2014)

As reported by Morgan (2008): “There is no single, agreed, model of health impact assessment.” He identified several different types that reflect: (1) how they balance the goals of health protection versus health promotion; (2) the degree to which they emphasize unanticipated health outcomes versus desired health outcomes; and (3) the decision-making level at which they are applied. The variability in perspectives and approaches that Morgan noted in 2008 is still visible today and it “..has contributed to problems in communication between practitioners, and affects the prospects for effective institutionalization of HIA.” (see Section III below)

The link between a redefinition of health and the role of HIAs as an enabling procedure is clear from a recently published Institute of Medicine report (2015) that ties healthy people to healthy places: “*A healthy community is one in which a diverse group of stakeholders collaborate to use their expertise and local knowledge to create a community that is socially and physically conducive to health. Community members are empowered and civically engaged, assuring that all local policies consider health. The community has the capacity to identify, address, and evaluate their own health concerns on an ongoing basis, using data to guide and benchmark efforts. As a result, a healthy community is safe, economically secure, and environmentally sound, as all residents have equal access to high quality educational and employment opportunities, transportation and housing options, prevention and healthcare services, and healthy food and physical activity opportunities.*” (p. ix) The parallels between this statement and the definition of HIAs (first paragraph of section II above) could not be clearer. Nor the desire to merge health, economic and environmental factors in a holistic strategy. In the words of one hazards expert: “Recovery is now linked to the concepts of resilience and community renewal, with social, economic, institutional, infrastructural, ecological and community dimensions.” (Comerio 2014) Given the thoroughly place-based character of natural disasters and the emphasis on holistic recovery that is now prevalent among hazards experts, disasters come more appropriately than ever within the purview of health researchers and managers.

A full-fledged HIA would ideally be distinguished by its broad vision, long time perspective, and commitment to improving not just the health of individuals but also the environmental and societal arrangements that will encourage and sustain healthy lives in healthy places. A disaster recovery HIA would ideally function as a decision-support tool for guiding recovery strategies and specific recovery measures to a sustainably healthier future

over periods of years to decades, as distinct from disaster relief actions intended to address immediate needs for survival.

III. Short-term bias of current HIAs

Some researchers have shown that disasters can have long-term health impacts (Erikson 1976; 1994; Kirmayer et al. 2010) but, historically, the health community's gaze has fallen elsewhere. When disaster health concerns have appeared on the public agenda, they have almost always been about short-term problems such as reducing traumatic deaths and injuries from sudden onset events and from disease epidemics that are feared by survivors because of unburied bodies, contaminated land and water, and compromised food supplies. (Pan American Health Organization 2000; World Health Organization 2012, 2013; Ratnapradipa et al 2012; U.S. Department of Health and Human Services 2014) This encouraged researchers to emphasize the cataloging of prompt health impacts associated with sudden onset disasters and to stress the need for early intervention to guide crisis responses. (Carr et al 1996; Vilain et al 2015; Rosenkotter et al 2010; WHO 2013) These kinds of HIAs are the functional equivalent of damage assessments that focus on health. (Pew Charitable Trusts 2015)

For example, in 2007 the *European Journal of Public Health* published a series of short papers on European experiences with Health Impact Assessment of disasters. (Verger et al 2007a, 2007b, 2007c; Russell and Saunders 2007; Ruijten 2007) These surveyed experience in France, the United Kingdom and the Netherlands and focused heavily on technological accidents such as aircraft crashes, spills and explosions involving hazardous materials, as well as terrorist attacks. Findings emphasized rapid post-disaster monitoring, sampling and analysis of affected places as well as the speedy collection and public dissemination of scientific information during the immediate post-disaster stages of recovery. Best practices currently adopted or recommended included: a single source for authoritative information; an integrated mental health care program; and systematic use of HIAs to provide guidance about appropriate responses.

Also illustrative of the short-term approach, the Centers for Disaster Control and Prevention (CDC) are currently funding a series of pilot studies that are intended to help develop a systematic risk assessment procedure for the purpose of improving preparedness for a range of health problems that emerge in disasters. (CalPrepare 2015) CDC's concerns include: animal and insect bites, carbon monoxide leaks, mold, injuries sustained during cleanup of debris, contaminated food and water, power outages, and mental health traumas. (Centers for Disease Control and Prevention 2014) Of these only the last is likely to be a continuing problem that persists well into the recovery stage of disasters and beyond. Despite guidelines that favor a longer-term definition of disaster recovery needs (Florida Department of Economic opportunity and Florida Division of Emergency Management 2010) similar restricted health foci can be found in other disaster recovery planning documents (Florida Department of Economic Opportunity and Florida Division of Emergency Management 2012.)

Remedial measures undertaken in light of these immediate concerns generally leave

affected populations no healthier than before the disaster, nor are they better prepared to prevent, avoid or reduce the impacts of future threats. While this situation is most often encountered in poor developing countries, a preoccupation with immediate health effects of disasters is also common in the United States and other affluent countries. There, such disaster-related health assessments (Fewtrell 2011), are often accompanied by calls for improved emergency preparedness (Luband 2006). When long-term recovery is mentioned at all it is usually to express doubts about the ability of existing extended care programs to address the challenges posed by major disasters (Kinney 2006) and recommendations in support of a shift of policy emphasis towards addressing long-term impacts. (Hajat et al. 2003) Necessary as short-term responses might be, they do not constitute comprehensive solutions to worsening disasters.

Indeed it is the long run problems that are of greater concern to governmental and non-governmental organizations responsible for planning, administering and counseling the communities that survive disasters but live with the losses - and their significant social, economic, psychological, and other consequences - for decades to come; consequences that undermine the health of people, economies and ecosystems, thereby burdening the entire society, as well as nurturing the vulnerabilities that lead to future disasters. Disaster researchers, and organizations like federal and state agencies, the American Planning Association and the American Association of Retired Persons are prominent advocates of the shift to longer time perspectives. (American Association of Retired Persons 2014; Schwab 2014; New Jersey Department of Community Affairs 2013)

IV. Differentiation and integration in the evolution of HIAs

HIAs are now one component in an array of Impact Assessment techniques that has emerged to address the effects of different kinds of events and actions on people and environments. (Table 1) Not surprisingly, as types of assessment proliferate, so do calls for integration and the creation of unifying concepts and methods that permit engagement with larger and more complex problems. (British Medical Association 1998; Mahmoudi et al 2013) **Future efforts to develop disaster recovery HIAs will be affected by integrative impulses.**

The first generation of Impact Assessments focused on non-human environment effects of specific *projects* but these were later joined by *programmatic* Strategic Impact Assessments and then by a suite of specialized procedures that addressed Social, Health and Ecological Diversity impacts. More recently, Sustainability Assessments that seek to organize and integrate the various kinds of Assessment types have also appeared. (International Association for Impact Assessment 2009; Harris-Roxas and Harris 2011) While most Impact Assessments are intended to apply prospectively (i.e. in anticipation of potential impacts), confusion can arise when the term is applied to retrospective assessments (i.e. in the wake of a major impact) that might better be described as damage assessments. All types of Impact Assessments overlap with closely related tools like Risk Assessments, Vulnerability Assessments, Technology Assessments and Policy

Table 1: THE RANGE OF IMPACT ASSESSMENT TOOLS

ASSESSMENT TOOL
Environmental Impact Assessment (EIA)
Strategic Environmental Assessment (SEA)
Social Impact Assessment (SIA)
Sustainability Assessment
Climate Impact Assessment
Ecological Impact Assessment
Cultural Heritage Impact Assessment
Regulatory Impact Assessment
Integrated Impact Assessment
Health Impact Assessment (HIA)
Health Equity Impact Assessment

Sources: Mindell et al. 2003; Renda 2006; Public Health England 2007; Haber 2010; Mendell 2010; Centers for Disease Control and Prevention 2012; Pope et al 2013; World Bank 2011; Acharibasam and Noble 2014.

Assessments¹⁹; problem sets that require broader analytic perspectives. Among others these larger contexts are framed by concepts of Sustainable Development, Social Justice, Adaptive Governance and Holistic Recovery. Moreover, the analysis of society-environment interactions and futures forecasting is difficult because of constraints of complexity, uncertainty and ambiguity.

Integration of assessment concepts and methods across different disciplines and professions is an inherently problematic task that produces many terminological disputes and misunderstandings. (Hacking and Guthrie 2008) Nonetheless, **conceptual and methodological integration has proceeded apace, more so in other fields than the health sciences.** (Brouwer and van Ek 2004; Mahmoudi et al. 2013; Salcito et al. 2014; Negev et al. 2012) As Gall points out “...the limited integration of the health sciences is contrasted by an increasing integration of physical, social and engineering sciences as measured by publications in disaster- and hazard-related journals.”(Gall, Nguyen and Cutter 2015)

The thrust toward integration also has broad theoretical and practical implications, including some that favor the adoption of HIA techniques and some that pose special problems for disaster-related HIAs. Multicausality, maintenance of stakeholder participation after the crisis has passed and non-linearity of adaptive responses are among the problems that hamper adapting conventional HIAs to disaster contexts. (Briggs 2008) For this reason the entire suite of assessment techniques is increasingly adopting assumptions of “post-normal science” wherein uncertainty about the limits of scientific expertise is accepted and accommodated by procedures that give more weight to the knowledge and preferences of laypersons and other non-scientific experts. (Bond et al

¹⁹ A distinction is sometimes made between evaluations that are designed to determine whether policies are meeting their objectives (i.e. Policy Assessments) and assessments of unintended consequences or side effects in the application of policies (i.e. Impact Assessments). (European Centre for Health Policy 1999)

2015). The range of policy alternatives that are taken into consideration has also been greatly broadened. (Patz et al 2008)

V. Co-production of knowledge

In the past, scientific and professional experts controlled the supply of specialized knowledge that was used to develop and assess the hazards and disaster policy choices endorsed by public leaders. (Trainor and Subbio 2014) Lay citizens might be queried about the problems they faced or about their opinions of available responses but were not expected to offer credible alternatives. HIAs have been noteworthy for adopting a different approach that routinely democratizes the decision-making process by marrying information from experts with inputs from local populations that are impacted by the development projects or programs that are being assessed. However, the pressure of unprecedented hazard events and the Information Revolution is redefining the roles of experts, laypersons and public leaders. On the one hand increasingly complex hazards may require increasingly specialized knowledge and expertise that are not readily comprehensible to laypersons, thereby creating barriers to effective public participation in decision making. (Negev 2012) On the other hand, it is also clear that, because of the Information Technology revolution, laypersons have greater access to the knowledge of experts than ever before and are also able to apply their own vernacular knowledge of local conditions and unique personal experiences to the mix. **It is now increasingly evident that much knowledge about hazards and disasters is already, and will increasingly be, co-produced by experts and laypersons working in tandem.** (Mitchell et al 2015) The implications for disaster recovery HIAs cannot be specified at this time but are likely to be profound. It is not inconceivable that future debates about how best to shape public policy may be characterized by a more equally balanced three-way dialog among public leaders, scientific experts and newly empowered lay publics rather than the expert-led perspectives of the past.

In light of both the pressures toward holistic thinking and changing roles in public decision-making, the evolution of HIAs is difficult to predict. Opportunities for applying them in the unexplored arena of disaster recovery require taking account of these trends and negotiating a productive way forward.

VI. Completed or Ongoing HIAs in the USA

Few HIAs have been conducted in the aftermath of recent natural disasters or are linked in other ways with recovery from earlier disasters. This is true for Canada as well as the United States. (Mendell 2010) Available disaster-related HIAs yield findings that are suggestive rather than definitive but the record is generally positive, indicating good potential for wider application of the HIA technique in disaster recovery contexts. Staffers of HIAs have also pointed out the need for more systematic attention to HIAs that assess projects intended to regulate or reduce natural hazards and disasters. For example, in a personal communication to this researcher, one of the principles in an HIA that assessed proposed waterfront developments along the shores of Lake Ontario (without given significant attention to flooding), was conscious of the importance of commissioning hazard-

related HIAs: “... for several years, I’ve been telling everyone who will listen that an HIA on floodplain regulations would be critical.” (Korfmacher 2015; Korfmacher et al. 2015)

There are major opportunities for making use of HIAs in the aftermath of disasters. Since 1953 an annual average of 60 events have been designated disasters by the U.S. government and the long-term trend is towards more each year. For example, in 2011 there were 99 Major Disaster declarations, 29 Emergency declarations and 114 Fire management declarations – a total of 242 events. In addition many other events may not reach the level that warrants a Presidential Disaster Declaration but may nonetheless be locally catastrophic for limited numbers of people or specific societal functions or may add incrementally to the global burden of losses and environmental impairments. Not all disasters spur major projects or programs of recovery but most have prompted rebuilding and redevelopment actions that recreate the potential for future losses by replacing destroyed buildings and infrastructure without additional protection or adequate mitigation of existing risks, in the same vulnerable places.

Not surprisingly there have also been few evaluations of the experience and effectiveness of hazards and disaster-related HIAs to date. One exception is a recent Ph.D. dissertation that evaluated 54 HIAs to determine whether they used quantitative health risk-assessments and methods as well as the degree to which they affected public decision-making. (Singleton-Baldrey 2012) Natural hazards and/or disasters played some role in five (5) of the deliberations though recovery from disaster was not a reason for conducting any of the HIAs. Three HIAs made recommendations about disaster reduction measures that were eventually implemented by responsible authorities. These included: (1) creation of an emergency preparedness plan in Yellowstone County/Billings, Montana; (2) denial of a proposed use permit for a facility in Bernalillo County, New Mexico that the HIA judged would hinder emergency evacuation; and (3) use by the U.S. Environmental Protection Agency of an alternative developed during the HIA to craft a stormwater discharge permit for a mining extension in Alaska. A fourth HIA included recommendations in favor of a health-focused general plan for Merced County, California that were turned down by county leaders; reduced emergency response times were one of the rejected plan’s components. Hazard considerations played a different kind of role in the fifth HIA. It was judged to have been limited (but not necessarily invalidated) by lack of appropriate data about power disruptions caused by extreme weather. The data was necessary for the assessment of risks posed by automatic metering systems to elderly vulnerable populations served by the Commonwealth Edison Company (Illinois).

Reviewers of draft HIAs also mention omissions of hazards and disasters from inventories of health factors considered relevant, and limitations of hazard data for those that were addressed. For example, one reviewer of an HIA that involved an oil drilling project in Hermosa Beach, California questioned the omission of flooding, sea level rise, fire and extreme weather (including heat waves) as factors that could reasonably be expected to affect the area targeted for development. (Intrinsic 2014) In the HIA Scoping Workshop for a different project, in California’s Coachella Valley, another reviewer pointed out the absence of hydraulic modeling and engineering data that would be pertinent to developments in the project’s 100-year flood zone. (Coachella Association of Governments

and Riverside County Department of Public health 2014) These kinds of omissions also occur in other HIAs without being recognized. For example, flooding and natural disasters are mentioned by stakeholders in the HIA of Hawaii County's Agricultural Development Plan but are not included in an analysis that restricts its interests in hazards to food borne illnesses and childhood obesity. (Kohala Center 2012)

The list of HIAs in the United States that is maintained by the Pew Charitable Trusts provides another source of data about disaster-related HIAs (Pew Charitable Trusts 2015) Of the 350 plus US-based HIAs on this inventory fewer than 20 are known to have significant connections with natural disaster risks or responses. (Table 2) These were initiated in ten different states within the last few years, so most are still in progress or have been completed so recently that evaluations of their outcomes are not yet available. For most, connections to the goal of alleviating natural hazards are peripheral rather than central to their main purposes. Likewise, the hazards involved tend to be chronic problems, having usually affected vulnerable populations over long periods without rising to the level of officially declared disasters. The natural hazards that are addressed cover a wide spectrum from hurricanes, heat waves, wildfires and droughts to slope failures and earthquakes, with floods and storms predominating. The societal sectors that receive most attention include housing, (water and energy) infrastructures, and forestry.

Despite the limitations of this database, follow up publications that are available for some projects are particularly deserving of scrutiny because the experiences and/or the lessons learned have broader relevance for efforts to develop disaster recovery HIAs.

The experience of researchers who employed HIAs as part of a larger "Health in all Policies" approach to post-hurricane redevelopment plans for Galveston, Texas is especially useful. (Nolen 2014) The following trenchant observations were made by one of the principles in this endeavor (here slightly modified for purposes of clarification).

1. Disaster recovery programs are often designed in ways that have negative impacts on health and health equity.
2. Disaster recovery involves so many players that it is difficult to include representation of all potential contributors in an HIA.
3. In the post-disaster emergency period numbers and confusion complicate the funding and execution of HIAs.
4. The main federal agency with responsibility for coordinating disaster response (FEMA) is less focused on problems of people than on buildings and infrastructure.
5. The post-disaster period brings visibility and investments in health improvement but introduces divisions that frustrate the creation of a unified community vision for recovery.

Table 2
HIAs with hazard/disaster connections

Goal	Location	Hazard/Disaster linkage	Status
Disaster recovery	Galveston, TX	Replacement of public housing destroyed by hurricane Ike	In progress
Disaster recovery	Little Egg Harbor, NJ	Scenarios for buyouts of properties affected by hurricane Sandy	In progress
Disaster recovery	Hoboken, NJ	Comprehensive storm water management plan in the wake of hurricane Sandy	In progress
Hazard mitigation	Cana Martin Pena, PR	Dredging and sewer projects in chronically flood prone area	Due May 2014
Hazard mitigation	Proctor Creek, Atlanta, GA	Green infrastructure project in chronically flood prone area	Due March 2014
Hazard mitigation	Cole Creek, Omaha, NE	Use of vacant lots created by erosion control and flood buyout projects	Due 2013
Hazard mitigation	Ann Arbor, MI	Urban forestry as an aid to reduction of high temperatures	In progress
Hazard mitigation	Delaware County, OH	Storm water runoff from new shopping mall	Due September 2014
Hazard mitigation	Marin County, CA	Housing code enforcement in area subject to poor drainage	Due 2012
Hazard mitigation	Rochester, NY	Changes in storm water management near lakefront	Due May 2013
Hazard mitigation	Chicago, IL	Potential for smart utility meters to cut power to vulnerable populations during periods of extreme heat or cold	Due April 2012
Hazard mitigation	Placer County, CA	Biomass energy facility promotion of healthy forest management for reduction of wildfire risks	Due 2012
Hazard mitigation	Greenville, WI	Ground water contamination from hazardous materials storage facility	Due October 2011
Hazard mitigation	Fitchburg, WI	Flood reduction in vicinity of a golf course	Due 2014
Disaster preparedness	Alameda, Contra Costa, Marin, San Francisco, and San Mateo Counties, & City of Berkeley, CA	Earthquake effects in San Francisco Bay area	
Hazard mitigation	State of California	Drinking water alternatives in drought affected areas	Due April 2016
Hazard mitigation	State of Kentucky	Clean energy alternatives in surface mined area chronically subject to slope failures and floods	Due 2012

These points underscore the difficulties of carrying out post-disaster HIAs and echo some of the conclusions from New Zealand after the disastrous earthquakes of 2010-12. There the earthquakes interrupted ongoing HIAs that focused on transportation, land use and health service planning, as well as health inequity problems experienced by Maoris and other minorities, but did not have strong hazard or disaster components. The quakes froze HIA capacity-building efforts largely because the organizations that carried out training lost their buildings and had to be relocated and re-provisioned elsewhere. But they also provided opportunities to put HIAs on the agenda of many organizations that were involved in reconstruction of the city. (Gawith 2012) It is widely believed that the Canterbury Earthquake Recovery Authority is now the body with most ability to affect health outcomes in the city for the foreseeable future.

An HIA carried out in Puerto Rico illustrates a significant difference of perspective between hazard researchers and health impact researchers. The HIA addressed a comprehensive plan proposed by public officials for revitalizing a polluted waterway near San Juan that had been subject to frequent floods that affected poor families who made their homes nearby. (Sheffield et al 2014) While the HIA made useful recommendations aimed at delivering improved health to vulnerable groups it did not challenge the central thrust of the official plan that relied on dredging and structural engineering approaches that have increasingly fallen out of favor among hazards researchers and managers. The HIA staff seem to have ignored available research on flooding in poor Puerto Rican communities elsewhere on the island that: (a) built a strong case for privileging other health concerns above flooding-related ones; (b) questioned the priority given to structural engineering projects as adequate solutions to flooding; and (c) placed a high premium on supporting the protective measures that were already being made by local residents. (Lopez-Marrero 2010; Lopez-Marrero and Yarnal 2010) This experience raises the question of whether HIAs can be constructed that are authentically independent of (and able to distance themselves from) the assumptions and worldviews of the sponsors of programs, projects and plans they are applied to? When researchers from one expert field (in this case health improvement) interact with another one (here, disaster management) it is unlikely that they are aware of important theoretical, methodological and ideological issues that subdivide practitioners in that field. This underscores the importance of designing disaster recovery HIAs in close collaboration with a range of experts from the hazards/disaster community.

A final example of a disaster-related HIA shows some of the strengths of the process and its potential for successful application. Proctor's Creek is a small stream in metropolitan Atlanta that has a chronic problem with flooding from storm runoff that cannot be accommodated by the existing city sewer system. In framing the HIA the U.S. Environmental Protection Agency took a broad view of health and embraced the HIA as a regulatory assistance tool in support of its permitting process. The Agency visualized a chain of consequences triggered by floods that linked them, in turn, to property vacancy or abandonment, neighborhood dereliction, declines in mental health and loss of social capital necessary to sustain the wider community. They looked beyond conventional flood management alternatives to include Green infrastructure and innovative storm water management alternatives, thereby recognizing an overlap between ecosystem health and human health. They also examined pressures on jobs and businesses, seeking to address the

economic correlates of health. Finally, while acknowledging the merits of the proposed project on Proctor's Creek the HIA recommended adoption of similar measures throughout the entire watershed of Atlanta. The conceptual breadth of this HIA and its integrating into the formal decision making process of an established regulatory agency are among its formidable strengths. The outcome is as yet unknown.

VI: Findings for the literature - Reflections and Recommendations

1. **Partnership:** The use of HIAs to evaluate disaster recovery projects provides a potentially valuable new tool that could bring mutual benefits to health interest groups and disaster management ones. For this to occur, a better-balanced partnership between these two communities of experts should exist. At the moment the impetus for developing HIAs comes mainly from the health community; it needs to be better publicized among, and supported by, the disaster community. Most importantly, the two groups of experts should develop a closer working relationship.
2. **Agency:** Lay publics are consulted in the HIA process, and it is quite likely that their contributions to planning and managing hazards will become more important in subsequent decades as new information technologies expand access to specialized knowledge and provide laypersons with the ability to insert personalized local knowledge into the decision-making process. Given the centrality of public participation to the HIA process it might require adaptation to take account of these changes.
3. **Goals:** At present health equity issues that affect vulnerable populations are the leading point of entry for the conduct of HIAs. While various kinds of inequity are also important considerations for disaster policy-making they are by no means the only animating issues. Among others are the following: how to strike a balance between present safety and future sustainability goals; pressures to change the division of public/private and collective/individual responsibilities for funding and executing hazard management measures; controversies about structural versus non-structural technologies that impose different burdens on societies and environments; lack of a permanent public constituency in support of hazard reduction except at times of crisis; the emergence of new kinds of risks that raise unforeseen problems etc. If HIAs are to be attractive instruments for hazards managers it may be necessary to bring a wider range of motivating issues into their purview.
4. **Planning time horizon:** A commitment to using disaster recovery-related HIAs to identify impacts that can be reduced by improved (pre-disaster) preparedness, as well as emergency management and short-term (post-disaster) relief interventions, is already well established among some health research and management organizations (e.g. CDC). It may require considerable effort to expand this perspective to include long term hazard mitigation, prevention and avoidance measures that may take years to decades to become fully effective but offer more or less permanent solutions rather than temporary band aids.
5. **Institutional framework:** There is presently a strong drive to use existing strategies for national preparedness, recovery, mitigation and prevention to provide the master templates for disaster health initiatives, especially HIAs. Inserting disaster recovery HIAs into this framework runs the risk of reifying existing agency information silos

and reproducing bureaucratic concerns about the distribution of authority and funding that work against the adoption of optimal health improvement strategies. In designing disaster-recovery HIAs thought might be given to emphasizing the cross-cutting value of HIAs and the bottom-up perspectives that they encourage in the planning and decision-making process.

6. **Integration:** Although the health research and management community has begun to employ broader conceptions of health and health improvement, HIAs seem to be lagging in recognition of this change. It will be difficult to achieve improved human health without also buttressing the health of economic systems and ecosystems. Can disaster-recovery HIAs be modified to assist this transformation in outlooks and actions?

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