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Health Impact Assessments Are Needed In Decision Making About Environmental And Land-Use Policy

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ABSTRACT The importance to public health of environmental decisions—including those about land use, transportation, power generation, agriculture, and environmental regulation—is increasingly well documented. Yet many decision makers in fields not traditionally focused on health continue to pay little if any attention to the important health effects of their work. This article examines the emerging practice of health impact assessment and offers real-world examples of its effective implementation, including studying the impact of nearby highways—a major source of air pollution—on proposed new housing for seniors. The article argues that officials at the federal, state, and local levels should consult health experts and consider using health impact assessments when their decisions on such issues as urban planning, land use, and environmental regulation have the potential to directly affect the conditions in which people live and work.

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Environmental health, urban planning, and environmental regulation have common origins in efforts to address urban crowding, infectious diseases, and industrial pollution. However, these disciplines have diverged and today generally operate in separate domains.[1,2] Yet research over the past decade has revealed connections between public health and a wide range of environmental factors such as transportation systems, land use, parks and other open space, housing, and energy production. These factors have been linked to most of the leading causes of illness and death in the United States, including obesity, diabetes, asthma, injury, cardiovascular disease, and cancer.[3–5]

This body of research gives rise to a fundamental challenge for public health: Many important influences on health are determined by decisions made outside the jurisdiction of health agencies and, frequently, without input from public health experts. This challenge is behind an increasingly urgent call for cross-sector approaches to health promotion.[6,7] It is the underlying motivation for recent high-level policy efforts such as California's executive order to include "health in all policies," and the new US cabinet–level National Prevention, Health Promotion, and Public Health Council.[6,8,9]

Ultimately, however, successfully engaging government agencies—such as energy and environmental regulators, transportation and land-use planners, and housing departments—in efforts to improve public health will require practical tools for integrating health into the specific procedures that officials use to make decisions, develop regulations, and revise plans. This article focuses on the emerging field of health impact assessment—an approach that is showing early promise as a way to include health considerations in decisions that otherwise would not have taken health into account.[10]

Health Impact Assessment

Health impact assessment is a structured process that brings together scientific data, public health expertise and principles, and stakeholder in-

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put to identify the potential health effects of a proposed policy, program, project, or plan and to craft health-based recommendations (Exhibit 1).[11] An assessment can be initiated and led by health officials, community-based organizations, officials in agencies directly responsible for the proposed policy or project, or private developers.

Health impact assessments are most commonly applied to decisions made outside the health sector—for example, those concerning urban land use and transportation planning and permit issuing; energy and environmental regulating and permit issuing; and social policies such as providing a state energy assistance program or setting minimum wage requirements—where important health effects might be overlooked or ignored.

One example is the health impact assessment of a decision regarding funding for the Massachusetts Low Income Housing Energy Assistance Program. The assessment highlighted several previously unrecognized health considerations for children, including the risk of burns and carbon monoxide poisoning when families turn to unsafe heat sources (such as ovens and space heaters) for economic reasons, and adverse effects on nutrition when winter heating costs make it difficult for families to purchase adequate food.[12]

Health impact assessments focus on multiple determinants and dimensions of health; inform a current decision-making process; apply mainly to proposals in which the health effects are not prominent or central; engage multiple stakeholders from the affected community, elected decision makers, and parties with an economic stake in the outcome; examine and consider vulnerable populations and equity issues; and employ multiple data sources and both qualitative and quantitative analytic methods.[13–16] The team leading an assessment typically includes people with public health expertise as well as experts in other fields, such as urban planning, transportation, or air quality.

Health impact assessment is a pragmatic approach to informed decision making. To provide timely input to inform a decision-making process, it is often necessary to make predictions and recommendations in a short time, and some-

EXHIBIT 1

The Steps Of Health Impact Assessment (HIA)

HIA step	Elements of HIA practice
Screening	Determines whether an HIA is needed and likely to be useful Considers factors such as the relevance of the decision to health; whether data and resources are available to allow an adequate analysis; and whether there is an opportunity for health information to be used in the decision-making process
Scoping	Develops a plan for the HIA, including the identification of potential health risks and benefits; communities and subgroups likely to be affected; stakeholder concerns; and available data sources Relies on a combination of stakeholder input (for example, through focus groups, surveys, community meetings, or stakeholder advisory panels), literature review, and expert opinion
Assessing	Drawing on multiple data sources, describes the baseline health status of affected communities; identifies vulnerable populations; and describes existing conditions that influence health, such as air quality, access to safe places to exercise, and proximity to grocery stores Analyzes the potential health effects of the decision—analysis can involve a range of methods and data sources, such as literature review; focus groups and stakeholder input; quantitative modeling; qualitative analysis or description; and expert opinion
Recommending	Develops recommendations that are feasible in the political, economic, regulatory, and technical context of the project, program, or policy being assessed Considers stakeholder input and any available evidence of the proposed intervention's effectiveness Develops a plan for implementing recommendations and ongoing monitoring (often referred to as a "health management plan")
Reporting	Disseminates the findings to decision makers, affected communities, and other stakeholders, via a written report and other vehicles such as community meetings, meetings between health officials and the decision-making agency, and community-based advocacy for actions to protect or improve health
Monitoring and evaluation	Process evaluation assesses the process of carrying out the HIA and its fidelity to any applicable best practices or standards Impact evaluation focuses on the impact of the HIA on the decision-making process Outcome evaluation assesses how the implementation of the final decision affects health or determinants of health such as air quality. Monitoring collects information to inform each type of evaluation.

SOURCE Note 43 in text. Bhatia R, Branscomb J, Farhang L, Lee M, Orenstein M, Richardson M. Minimum elements and practice standards for health impact assessment, version 2 [Internet]. Oakland (CA): North American HIA Practice Standards Working Group; 2010 Nov [cited 2011 Apr 1]. Available from: http://www.humanimpact.org/doclib/finish/11/9 **NOTE** Although the names and number of HIA steps vary somewhat in the available guides and peer-reviewed literature, descriptions of the elements of HIA are relatively consistent.

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times based on incomplete data. For this reason, expert judgment may play an important role in the assessment of impacts and the identification of practical solutions.[17] Assessments also develop metrics for use in quantifying and tracking changes in health outcomes or health determinants—such as air quality or access to safe places to exercise—as decisions are implemented.

Health impact assessment has developed in at least two distinct contexts. First, the governments of Canada and Australia and international development institutions such as the World Bank led early efforts to incorporate health considerations more broadly into the well-established practice of environmental impact assessment.[18,19] This approach—often referred to as environmental, social, and health impact assessment, or ESHIA—is now part of widely accepted standards for international development loans and is increasingly accepted by large corporations as a best practice.[20,21] Second, in Europe the use of health impact assessment grew as part of efforts to build health goals more explicitly into social policy and urban design.[19]

Health Impact Assessment In Practice

In the United States many decision-making processes allow for or require a consideration of health. But few laws specifically require health impact assessments, and there are no generally accepted criteria for when an assessment should be conducted. As a result, the decision to initiate an assessment is often an ad hoc, when public health advocates in government, academe, or the community recognize that it could be an effective way to promote the consideration of health in a decision that would otherwise have ignored it. Many health impact assessments are also conducted in response to community concerns or requests.

Although there are no official registries of these assessments, their use appears to be growing rapidly in the United States: Researchers found twenty-seven publicly available health impact assessments in 2008;[15] in 2010 the Health Impact Project identified approximately sixty-five.[22] The Appendix lists the number and diverse range of topics that have been addressed during this period.[23] To date, health impact assessments have been completed in at least twenty states and have addressed a range of decisions, concerning such topics as requirements for paid sick leave and living wages, environmental regulations, and land-use planning.[22]

Two contexts in which health impact assessments have occurred are environmental impact assessments and land-use planning. As shown in the examples from these contexts below, environmental impact assessments and land-use decisions can have far-reaching implications for a population's overall health and for many specific health issues, such as rates of asthma, obesity, diabetes, cardiovascular disease, mental health, and injury.

ENVIRONMENTAL IMPACT ASSESSMENTS The National Environmental Policy Act of 1969 guides all federal executive-branch decisions that have a potential for major effects on what section 102 of the act refers to as the "human environment." The regulations that were developed to implement the law defined *human environment* as "the natural and physical environment and the relationship of people with that environment."[24] The act establishes the environmental impact assessment as the method by which such effects are measured. Twenty states and US territories have now enacted similar laws.[25]

Each year more than 500 environmental impact statements (the federal term for a complete environmental impact assessment) are now completed at the federal level, as are thousands of similar assessments under related state-level environmental impact assessment laws. The broad spectrum of activity subject to the National Environmental Policy Act and related state laws affect decisions about, for example, fuel economy standards; planning for highways and mass-transit projects; urban growth, zoning, and redevelopment; the location of power plants; natural resource development; and the regulation of genetically modified crops and pesticide use. Although many of these decisions may have substantial health effects, as the practice of conducting environmental impact assessments has evolved, health experts and officials have rarely been involved, and health considerations have either been narrowly defined—often limited to exposures to toxic substances and the risk of cancer or traffic-related injuries—or ignored altogether.[13,16,26,27] Clearly, decisions that are guided by environmental impact assessments constitute an important opportunity to protect and improve public health that is being missed.

The historical lack of attention to health in environmental impact assessments might suggest that the National Environmental Policy Act was not intended to focus on human health effects. In reality, however, the core legislative objective spelled out in section 2 of the act was to "stimulate the health and welfare of [humans]," and its regulations specify that health is one of the effects that must be analyzed in an environmental impact assessment.[24] Recently, health impact assessments in states such as Alaska, California, and Oregon have been used to meet the

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National Environmental Policy Act's intent with regard to public health.[1,16,27]

One prominent example from Alaska exemplifies this development. In 2006 the Bureau of Land Management began an environmental impact statement to evaluate a proposed plan to lease oil and gas rights in northern Alaska. Local Alaska Native communities expressed concerns because the region under consideration was an important source of food for them. To ensure that these concerns were addressed, the North Slope Borough—the local government—became a "cooperating agency," a term used for a federal, tribal, state, or local agency that helps prepare an environmental impact statement. The borough successfully made the case for including a more robust health analysis, citing the regulations governing environmental impact statements and the health-related concerns that had been repeatedly expressed by community members in testimony on prior leasing decisions. The North Slope Borough Health Department undertook a health impact assessment, which the Bureau of Land Management integrated into the final environmental impact statement.

This may well have been the first environmental impact statement at the federal level to incorporate a health impact assessment.[28] The assessment helped improve relations between the bureau and the local community, which had considered litigation to stop the leasing plan. The assessment also led to the creation of several new protections that were widely accepted by the North Slope Borough, tribal members, and the Bureau of Land Management, including a decision to withhold parts of the area from leasing to protect the local wildlife and food supply, and new requirements for pollution monitoring.[16,28]

The precedent established by this project and similar work at the state level is helping increase the number of environmental impact statements that include health impact assessments in the United States.[16] In Alaska, several federal agencies have undertaken such assessments. For example, the Environmental Protection Agency included one in a recent environmental impact assessment of mining in the state through a cooperating agency agreement with regional tribal governments.[29] A working group involving representatives from federal, tribal, and state agencies is developing guidance on using health impact assessments for natural resource development in Alaska.[1]

In Los Angeles, a coalition of community groups and public health advocates argued that a health impact assessment should be carried out in conjunction with an environmental impact assessment for the proposed expansion of Interstate Highway 710. They convinced the agencies overseeing the environmental impact assessment process that the project had the potential to affect a range of health issues, including rates of asthma, diabetes, and injury.[30] The Environmental Protection Agency has also funded preliminary work to consider the need for a health impact assessment of the proposed expansion of the Port of Los Angeles.[31] Finally, in Atlanta, the Centers for Disease Control and Prevention and the Environmental Protection Agency's Region 4, which oversees the southeastern states, recently signed a pilot agreement to increase the consideration of public health in environmental impact assessments required by the National Environmental Policy Act.[2]

LAND-USE PLANNING Recent interest in incorporating health-based design principles into land-use planning decisions and the growing body of data linking those decisions to a range of health problems—such as injury, asthma, obesity, and diabetes—is inspiring renewed collaboration between these fields.[3,32,33] Health impact assessments are a promising way to bring a health focus to land use and transportation planning.[3,32,33] Such assessments of land-use plans and permit decisions for proposed development have addressed a range of health determinants (Exhibit 2). Although some of these determinants are routinely included in land-use planning, the community rates of relevant health outcomes—such as cancer, obesity, asthma, and diabetes—at baseline and the health implications of proposed transportation and land-use plans are rarely considered without a health impact assessment.

For example, one health impact assessment considered a proposed housing development for low-income seniors, to be located near two major freeways and a major shipping port—all substantial sources of air pollution.[34] The assessment noted that the project's location and design could expose residents to unhealthful levels of noise and to indoor air of poor quality because the building's intake vents were located near the freeways—issues that had not been noted in the initial planning for the project. The health impact assessment suggested solutions, including adding central air filtration and a courtyard and entryway designed to buffer noise, and these were incorporated into the developer's final design.

Exhibit 3 lists some of the specific results of health impact assessments in land-use decisions. These examples point to a number of potential benefits from the assessments that are consistent with outcomes reported in published evaluations of the tool.[35,36]

As emphasized by these examples, health impact assessments are typically used not to slow or

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EXHIBIT 2

Examples Of Health Determinants In Health Impact Assessments (HIAs) Of Decisions Relating To Land Use And Transportation

Area of concern	Specific issues
Environmental contamination	Air, water, and soil pollution
Transportation systems	Availability of a mix of transportation options (such as roads, public transportation, and bike lanes) that are safe and affordable and that offer an opportunity for exercise
Traffic safety	Roadway and sidewalk design, vehicular traffic flow and speed, and patterns of pedestrian traffic
Safe places to exercise	Access to sidewalks, open spaces, trails, and bike lanes
Goods and services that support health	Access to grocery stores or farmers' markets that stock reasonably priced fruits and vegetables; health care; social services; and police, fire, and emergency services
Neighborhood-level risk factors	Density of liquor stores, fast-food outlets, and places for gambling
Housing characteristics	Affordability and quality (including design and safety considerations, type of flooring, and presence of mold and lead paint)
Social cohesion	Social connections between community members; social integration of different ethnic and socioeconomic groups; presence of crime and violence
Employment	Availability and security of employment, job safety, and occupational risk

SOURCE Note 22 in text.

stop development, but rather to contribute suggestions that lead to improved plans. More broadly, the assessments lead to new collaborations between health and planning departments and greater attention to health in future decision making. For example, as a result of collaborative work on several health impact assessments, the San Francisco Planning Department now commonly solicits and incorporates input from the city's Department of Public Health on major planning and zoning decisions.[16,33] Health impact assessments that focus on the built environment are not limited to analyzing changes in traffic flow, sidewalks, and air quality, for instance; they can also address a range of socioeconomic impacts. For example, several assessments have highlighted the health risks of housing displacement, in which increasing property values push people to move away from their homes to other locations. Particularly for low-income residents, displacement can result in homelessness or living in substandard or overcrowded housing, which increases the risk of a range of health problems such as injury and respiratory infections. Other assessments have led to the adoption of requirements that future developments include a certain percentage of affordable housing.[27,33]

EXHIBIT 3

Examples Of Recommendations From Health Impact Assessments (HIAs) Adopted In Land Use Decisions

Area of concern	Result of HIA
Goods and services that support health	Land dedicated for community gardens or farmers' markets to give residents better access to fresh produce[a]
Neighborhood design and amenities that encourage exercise	Plans for improvements to pedestrian and cycling infrastructure, such as creating or improving sidewalks, crosswalks, and bike lanes; and implementing traffic-calming measures, including speed bumps and narrower streets[a,b,c] Neighborhood development plans in which housing and essential goods and services are located within walking distance[a] Construction of trails to serve communities with limited access to safe places to exercise[d]
Environmental contamination	Federal funding for brownfield remediation[d]
Housing characteristics	Constructing public housing units with solid flooring rather than carpet to minimize allergens for asthmatics[e] Using mitigation measures—such as centralized air filtration systems—to improve indoor air quality for new buildings near congested roadways[b,f] Using noise reduction measures such as soundproofing in buildings and street designs that reduce traffic speed[a]

SOURCES Full sources are provided in the Appendix (see Note 23 in text). [a]Clark County Community Planning Department 2008, Clark County Public Health Department 2008. [b]Human Impact Partners 2008. [c]Center for Quality 2007. [d]Ross 2007, Health Impact Project 2009, Lalli et al. 2010. [e]San Francisco Department of Public Health 2009. [f]Note 34 in text.

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STREAMLINING AND INSTITUTIONALIZING STANDARDS Health impact assessments have also been used to develop health-based performance criteria and design standards that can be applied in future cases. A health impact assessment of a proposed neighborhood rezoning in San Francisco generated a detailed set of health-based indicators—like those in Exhibit 2—to measure a wide range of factors that are based on land use and influence health.[33] These indicators were used to develop a Healthy Development Measurement Tool,[37] which is now being used to guide other plans in the region and has also been adapted by municipalities outside California.[33] A county health department in Michigan developed and implemented a checklist-based health impact assessment tool that uses similar indicators and that has been well received by both planners and developers.[38]

The checklist approach may offer important benefits. It has the potential to use less time and fewer resources than undertaking a complete health impact assessment for every new proposal. It may appeal to private-sector constituents such as developers, who often prefer predictable standards to more complex processes, such as in seeking permits.

However, the checklist approach might not facilitate stakeholder engagement at each step of a planning or permitting decision. Nor does it necessarily involve a site-specific analysis for each new proposal, raising the possibility that relatively subtle issues might not be identified or addressed.

Expanding The Use Of Health Impact Assessments

Having uncovered a wide range of social, economic, and environmental risks that influence the prevalence and distribution of illness in the United States, the public health community must now create and implement a new multisectoral approach to addressing those risks.[7] Based on the early experiences presented above, health impact assessment offers a promising way to engage sectors outside of public health and ensure that they factor health into their new policies, programs, and projects. However, key issues related to training, funding, and legislation need to be addressed before health impact assessments will be widely adopted.

TRAINING AND CAPACITY Health impact assessments have not yet become part of public health professionals' standard tool kit. There are only two regular university courses on health impact assessment in the United States, and very few organizations that offer training in conducting the assessments in nonacademic settings. Organizations that have led efforts to build the field report a growing demand for training.[39]

Schools of public health and other formal training programs, such as preventive medicine residencies and the Epidemic Intelligence Service of the Centers for Disease Control and Prevention, should make health impact assessments a standard part of the curriculum. Students in other fields, including planning and natural resource management, would also benefit from training in how to conduct health impact assessments.

Professional organizations for public health, planning, environmental management, and related disciplines should offer health impact assessment training at national meetings and other appropriate venues. The independent training offered to date generally takes one to four days; for professionals with a strong background in public health, these courses appear to be an effective way to introduce the basic skills required.

SOURCES OF FUNDING Many health departments find it difficult or impossible to take on a new activity such as health impact assessments without additional funding. Current experience indicates that an experienced public health official dealing with a relatively simple decision—such as a proposal for a new housing development—can conduct an assessment in a few weeks. But assessments of larger and more complex policies, programs, or projects can take six months to a year, or even longer, and require a more substantial commitment of resources. Private foundations and small federal grants have funded many of the health impact assessments in the United States to date, but these sources cannot support widespread implementation of the tool.

Health departments seeking to use health impact assessments should investigate funding sources such as permit fees and agreements with agencies cooperating in the process. Some health departments have billed for the time they spend on an assessment for a land-use permit as a part of the fees charged by the permitting agency.[40] In addition, under the National Environmental Policy Act, federal agencies that are in charge of an environmental impact statement are sometimes able to reimburse cooperating tribal, state, or local agencies for major contributions to the analysis.[16]

Engaging partners outside the health sector, such as planners and environmental regulators, in health impact assessments may be an effective way to bring new resources to bear on pressing public health problems. From this perspective, building the capacity to conduct health impact assessments has the potential to be a cost-effec-

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tive investment.[33] To find agencies with which they might collaborate on health-oriented community planning, health departments and other organizations should investigate federal grant initiatives that fund regional planning and infrastructure development.[41]

LAWS AND REGULATIONS At present, few US laws refer explicitly to health impact assessments. Massachusetts is the only state that has required the assessments.[42] Nevertheless, the authorizing legislation, mission statements, and administrative and regulatory procedures that guide the actions of nonhealth agencies often contain implied or explicit mandates to protect public health.

The National Environmental Policy Act is an important example of a mandate for protecting public health that governs the actions of all executive branch agencies, but that has not been fully implemented. Many other decision-making procedures at the local, state, and federal levels may authorize or require a broader consideration of health than has typically occurred.

At the municipal level, transportation planning, zoning, and project permitting may present opportunities to incorporate health considerations. At the state level, similar opportunities may exist in the regulatory and permitting actions of, for example, departments of environmental quality, energy, and agriculture; in transportation planning and project development; and in state-level requirements for environmental impact assessments.

At the federal level, any action subject to the National Environmental Policy Act can incorporate health considerations. Even actions that are exempted from the act, such as some regulatory procedures of the Environmental Protection Agency, may also allow for a more robust and systematic consideration of their health implications. Thus, although there are few explicit mandates for health impact assessments, there may be many opportunities to use the tool to comply more fully with other requirements to take health issues into account.

Agencies may be reluctant to add health to a planning or regulatory process, such as an environmental impact assessment, that already requires a substantial investment of time and resources. They may also fear that health information might be used to delay or obstruct planned activities. The lack of health expertise in nonhealth agencies and, conversely, the lack of experience with the National Environmental Policy Act, planning, and environmental regulation among health departments may also be barriers to incorporating a more robust consideration of health in the decisions of nonhealth agencies.

The next section presents a practical approach to addressing these barriers.

WHEN HEALTH IMPACT ASSESSMENTS MAKE SENSE Given the range of decision making that can be important to health, one challenge is simply how to determine when health impact assessments should be considered or carried out. A first step toward addressing this challenge—and toward encouraging the use of the assessments when needed—is for policy makers in disciplines such as urban planning, housing, transportation, energy, environmental regulation, and agriculture to consult public health experts more routinely on decisions likely to have a major effect on the conditions in which people live and work.

Such consultation does not imply that every decision needs a complete health impact assessment. Consulting health experts should be viewed as an opportunity to streamline and improve planning and permitting activities by identifying new sources of data, proactively addressing public concerns that might otherwise lead to protests or litigation over decisions, and developing new metrics by which to gauge the performance of agency initiatives.[16,43]

Officials in nonhealth agencies should view health impact assessments as an approach that may increase compliance with existing mandates. An assessment can provide a structured way to identify and address health effects, determine baseline conditions in affected communities, identify vulnerable populations, and develop appropriate actions to improve the health-based performance of major agency initiatives.

Health officials and public health advocates should also identify legal requirements and procedures that support addressing health concerns outside the health sector, such as the planning and permitting activities of departments of transportation, planning, natural resources, and environmental protection, and environmental impact assessments at the state and federal levels. This information can be a starting point for efforts to advocate for a more robust consideration of health.

To encourage more interdisciplinary efforts to improve health, nonhealth agencies should also consider hiring staff with public health expertise. Equally, health departments would benefit from hiring staff with expertise in planning, environmental regulation, and the provisions of the National Environmental Policy Act.

A National Academy of Sciences Committee on Health Impact Assessment is developing a "framework and guidance" for the assessments.[44] The report will be a valuable resource for agencies at all levels of government.

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Building A Multisectoral Approach To Public Health

The Institute of Medicine found that "public health agencies alone cannot assure the nation's health," articulating a growing consensus that efforts to improve the health of Americans will continue to fall short until all sectors of the economy assume responsibility for their role in shaping the conditions in which people live and work.[7] Progress in this direction will require leadership by public health officials and advocates. It will also require practical approaches that facilitate integrating health into administrative and legislative decisions outside the health sector. The examples presented in this article, and other early results in the United States, suggest that health impact assessments provide an effective way to meet this challenge. ■

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Aaron Wernham is the director of the Health Impact Project.

In this issue of *Health Affairs*, Aaron Wernham attests to the importance of public officials' using health impact assessments to set policies in various sectors, including agriculture, transportation. and development. The environmental conditions in which people live and work directly affect their health, and health impact assessments of policy proposals could allow for collaborative efforts to improve public health using existing laws and procedures, he says. Surprisingly, he notes, the biggest impacts on health can come from relatively easy, commonsense changes—such as relocating the air intake for a planned new building to protect indoor air quality.

Wernham is the director of the Health Impact Project, a collaboration of the Robert Wood Johnson Foundation and the Pew Charitable Trusts. The project recently announced that it will fund up to eight initiatives to conduct health impact assessments to help policy makers and community members identify and address potential health implications of policy proposals.

Prior to joining Pew, Wernham was a senior policy analyst with the Alaska Native Tribal Health Consortium, where he led the first successful effort in the United States to formally integrate health impact assessments into the federal environmental impact statement process. Wernham notes that his experience working with Alaska Native and low-income communities illustrated how important living conditions are to a person's health. For example, although he could teach children to use their asthma medicine correctly, the treatment wouldn't make much difference if they lived in substandard housing with mold and poor ventilation.

Wernham is board certified in family medicine. He received a medical degree from the University of California, San Francisco, and a master's degree in health and medical sciences from the University of California, Berkeley. He was formerly a member of the clinical faculty in the University of California, Davis, family medicine residency program at Contra Costa Regional Medical Center.

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