
Use of Health Impact Assessment in the U.S.

27 Case Studies, 1999–2007

Andrew L. Dannenberg, MD, MPH, Rajiv Bhatia, MD, MPH, Brian L. Cole, DrPH, Sarah K. Heaton, MPH, Jason D. Feldman, MPH, Candace D. Rutt, PhD

Objectives: To document the growing use in the United States of health impact assessment (HIA) methods to help planners and others consider the health consequences of their decisions.

Methods: Using multiple search strategies, 27 HIAs were identified that were completed in the U.S. during 1999–2007. Key characteristics of each HIA were abstracted from published and unpublished sources.

Results: Topics examined in these HIAs ranged from policies about living wages and after-school programs to projects about power plants and public transit. Most HIAs were funded by local health departments, foundations, or federal agencies. Concerns about health disparities were especially important in HIAs on housing, urban redevelopment, home energy subsidies, and wage policy. The use of quantitative and nonquantitative methods varied among HIAs. Most HIAs presented recommendations for policy or project changes to improve health. Impacts of the HIAs were infrequently documented.

Conclusions: These completed HIAs are useful for helping conduct future HIAs and for training public health officials and others about HIAs. More work is needed to document the impact of HIAs and thereby increase their value in decision-making processes.
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Introduction

The use of health impact assessment (HIA) has been increasing in the United States in recent years, fueled by a growing recognition among public health, planning, and transportation professionals that land-use and transportation-planning decisions can have a substantial impact on the public's health. HIA is a tool to help planners and other decision-makers better recognize the health consequences of the decisions they make. HIA is defined as "a combination of procedures, methods, and tools by which a policy, program, or project may be judged as to its potential effects on the health of a population, and the distribution of those effects within the population."¹

Health impact assessments have been widely used in Europe and elsewhere,² and methods are similar in Europe and the U.S. However, domestic examples are

needed: (1) to increase awareness of their use across the country, (2) to document that HIAs are applicable in U.S. settings, (3) to increase their political acceptability, (4) to serve as models for further HIAs, and (5) to be used as examples in U.S.-based HIA training courses. Fewer resources may be needed to conduct new HIAs if investigators can draw on the literature reviews and methods from similar HIAs previously completed in the U.S., noting the differences in local environment and project/policy specifications. For example, the U.S.-based analysis of the health impacts of additional income from a living wage ordinance^{3,4} may be useful as part of an analysis of health effects attributable to employment generated by a new commercial development in the U.S.; data on links between health and income from Europe would be less applicable for such an analysis because of differing social, economic, and political conditions.

In 2004, an expert panel examined the potential for increased use of HIAs in the U.S. and suggested next steps that could advance the use of HIAs.⁵ These steps included conducting pilot HIA projects, developing a database of completed HIAs, increasing the capacity to train people to conduct HIAs, developing practical forecasting methods, developing incentives to increase the demand for HIAs by decision-makers, and evaluating the impacts of completed HIAs on decision processes.⁵

From the National Center for Environmental Health (Dannenberg, Heaton, Feldman) and National Center for Chronic Disease Prevention and Health Promotion (Rutt), Centers for Disease Control and Prevention, Atlanta, Georgia; San Francisco Department of Public Health (Bhatia), San Francisco, California; and School of Public Health, University of California, Los Angeles (Cole), Los Angeles, California

Address correspondence and reprint requests to: Andrew L. Dannenberg, MD, MPH, Division of Emergency and Environmental Health Services, National Center for Environmental Health, CDC, 4770 Buford Highway, Mailstop F-60, Atlanta GA 30341. E-mail: acd7@cdc.gov.

This paper summarizes characteristics of 27 HIAs completed in the U.S. between 1999 and 2007. This assemblage of completed HIAs may be useful for public health professionals and others who are considering conducting an HIA.

Methods

The initial list was derived from HIAs in which the co-authors were involved as primary investigators or consultants. Additional HIAs were identified through networking at professional meetings and through inquiries received by the co-authors related to their previous publications and presentations about HIA. In September 2007, a literature search was conducted on Medline, SocIndex, TRIS (Transportation Research Information Services), Environmental Science and Pollution Management, and Google Scholar; a message was disseminated on the HIA-USA listserv⁶ requesting additional studies.

Details about the completed HIAs were obtained from the published literature, websites, and communication with the primary investigators. Key characteristics of each HIA report were abstracted, including year, location, type of project or policy, and information about who conducted and funded the HIA, and about the methods, scoping, assessment, recommendations, dissemination, and impacts of the HIA. A draft of the summary table was sent to the primary investigators for each HIA listed, with a request that they edit the appropriate section so the tabular information would accurately reflect their work. All investigators provided the edits as requested.

Results

The key characteristics of the 27 HIAs completed in the U.S. between 1999 and 2007^{3,4,7-31} are summarized in Table 1. The HIAs were conducted in California ($n=15$), Alaska ($n=3$), Georgia ($n=3$), Massachusetts ($n=2$), Colorado ($n=1$), Florida ($n=1$), Minnesota ($n=1$), and New Jersey ($n=1$). The types of policies and projects examined included wage policies, walk-to-school programs, residential and commercial redevelopment, after-school programs, land-use planning, farm policy, transportation, parks and trails, power plants, land-leasing policy for oil exploration, and public subsidies for housing and home heating.

Investigators for the HIAs included local and federal public health officials; faculty from schools of public health, medicine, and architecture; and private consultants. Decision-making organizations for the projects and policies examined in the HIAs included county and city councils and planning agencies, state agencies and legislatures, federal agencies and the U.S. Congress. Some of the HIAs were conducted with limited or no external funding by investigators within the scope of their health department positions,^{3,7-11,30,31} while others were conducted by volunteers^{12,14,15} or with funding from the Robert Wood Johnson Foundation,^{4, 16-21} The

California Endowment,¹³ the CDC,^{30,31} anonymous donors,^{24,25} university fellowships,²⁶⁻²⁹ and local governments.^{22,23} Six HIAs in California and Alaska^{8,10,26-29} were conducted in conjunction with environmental impact assessment processes.³²

Most investigators followed the commonly accepted steps for conducting HIAs, including screening (determining if health impacts are involved); scoping (determining which health impacts will be examined, how, and for whom); assessment of the direction and magnitude of the health impacts; communication of results and recommendations to decision-makers; and evaluation of the HIA's impact on the decision-making process.³³ The San Francisco ENCHIA (Eastern Neighborhoods Community Health Impact Assessment) project⁹ used a collaborative planning process that included visioning, assessing baseline conditions, identifying priority needs and opportunities, and forwarding proposals for action. Most investigators used literature reviews, expert opinion, and/or stakeholder input in the scoping and assessment steps.

Community involvement was a component of most HIAs, such as those for the San Francisco redevelopment projects and area plans,^{8,9} residential development in Oakland, the Massachusetts housing rental voucher and home energy assistance policies, and the Florida power plant plan. Community stakeholders assisted in identifying and assessing health impacts for the Alaska oil and gas leasing programs, Jack London senior housing plan, and those on San Francisco's land-use plans and public housing carpet policy as these HIAs involved a facilitated structured dialogue among stakeholders and experts. In other HIAs, no substantial community involvement occurred due to time, resources, or human subjects research constraints.

Health disparities among various racial and socioeconomic groups are a prominent component of many of the HIAs, especially ones related to housing, urban redevelopment, home energy subsidies, and wage policy. For example, investigators noted increased burdens of asthma and lead poisoning among children living in substandard housing,²⁴ delayed cognitive development in households experiencing food insecurity,²⁵ and that increased employment from the Florida power plant could lead to health benefits for African Americans living nearby.²³

The methods used to make predictive judgments on health outcomes varied. In some cases quantitative measures of health status and environmental conditions were used to describe existing conditions, providing general evidence of priorities and needs. Most HIA reports included an assessor's judgment of the direction, but not necessarily the magnitude, of an effect on a health indicator, such as asthma morbidity, academic performance, personal safety, mental health, and social capital. Some HIAs used validated dose-response func-

tions to quantitatively predict changes in physical activity, obesity, life expectancy, respiratory morbidity, sleep disturbance, teen pregnancy, school outcomes, and pedestrian injuries. Other HIAs used direct measurement or modeling to quantify environmental measures of noise, air and water quality, and access to parks. Some HIAs also used qualitative research methods, including focus groups, interviews, and structured dialogues, to support predictive judgments.

Most of the HIAs included recommendations to mitigate predicted adverse health impacts of the proposed policy or project, and/or to increase predicted health-promoting components of the proposal. Some HIA findings encouraged or discouraged a project or policy from moving forward. For example, the Atlanta BeltLine HIA encouraged the project to proceed because of its substantial health promotion value, and the California after-school program HIA indicated the proposed policy was unlikely to reach the adolescents most likely to engage in risky behaviors.

Communication of the results of various HIAs included reports released to the media and posted on websites, formal public testimony presented to decision-makers,^{3,8,9,14,22,24} comments integrated into environmental assessments,^{8,10,26–29} and publication in peer-reviewed journals.^{3,4,8,28} Information on the outcome and impact of these HIAs is incomplete. In some cases, policy or plan decisions have been challenged and changed, in part due to issues raised in an HIA. For example, in San Francisco, the Trinity Plaza and Rincon Hill HIAs led to displacement protections, additional affordable housing, and funds for parks and community facilities; the living-wage ordinance HIA³ contributed to its passage by the city board of supervisors; and the public housing flooring policy HIA⁷ resulted in the adoption of new standards for public housing. In addition, the local development authority accepted the Florida power plant HIA recommendations to recruit minorities for the jobs created by the project.

In one case, the HIA created an evaluation methodology through a participatory process. The Healthy Development Measurement Tool,³⁴ developed through the ENCHIA process in San Francisco, includes a structured approach that evaluates land-use development plans and projects on over 100 community-level indicators of health, using objective development criteria as surrogates for improvements in health. ENCHIA's primary recommendation was the institutionalization of this tool into local land-use planning. This tool has been subsequently applied for five land-use plans locally.

Discussion

After many years of HIA use in Europe and elsewhere, HIAs are emerging in the U.S.; this report reviews that

experience. The issues examined in these HIAs are diverse, suggesting that HIA methods may be useful for a wide range of projects and policies. These studies highlight the multidisciplinary nature of HIAs and the need for effective collaboration between public health practitioners and nontraditional partners such as land-use and transportation planners.

Health impact assessments are valuable as a public health tool in decision-making processes to highlight the importance of health disparities among racial and socioeconomic groups.^{2,9,35} For example, the HIAs of redevelopment projects and plans in San Francisco⁸ led to substantial proposal improvements by identifying the potential for adverse health impacts.

The 27 HIAs that were reviewed were conducted by a small number of investigators, most of whom had no formal training in conducting HIAs. The many HIAs done in California suggest successful leadership from HIA advocates working in these communities. Broader geographic distribution of HIA use may be expected as a result of HIA courses and training materials now being developed and disseminated by organizations including the San Francisco Department of Public Health,³⁴ University of California Los Angeles,³⁶ University of California Berkeley,³⁷ University of Minnesota,³⁸ National Association of County and City Health Officials,³⁹ Human Impact Partners,⁴⁰ and CDC.⁴¹ This review of completed HIAs may assist these efforts.

The investigators who conducted the 27 HIAs did so on a voluntary basis with or without specific funding, out of concern that public health issues were receiving inadequate attention in the decision-making process. Funding for HIAs is difficult, and more funding sources are needed if the use of HIAs is to grow in the U.S. California and Maryland have considered legislation to support HIAs of built environment projects, and Washington recently linked the conduct of an HIA to funding for a major highway bridge replacement.⁴²

While environmental impact assessments (EIAs) occasionally include health risk assessments and the Environmental Protection Agency (EPA) conducts formal health-effects forecasting as part of legally mandated cost-benefit analyses,³² HIAs are not routinely required in any settings in the U.S. Although HIAs are not formally part of the EIA scope and analysis, procedural rules require EIAs to take into account evidence relating a decision's environmental effects to potential adverse health effects. Collaboration through HIA and EIA processes may result in better outcomes. An EIA may acknowledge the findings of an HIA and consider mitigations, may critique HIA findings, or may provide an alternative analysis. In each case, the EIA response to HIA findings furthers the public consideration of the underlying health issues. Some HIAs in California and Alaska contributed analyses that were integrated within concurrent EIAs. For example, in the Trinity Plaza project,⁸ officials changed the scope of the EIA to

Table 1. Key features of 27 health impact assessments conducted in the United States, 1999–2007

HIA name, group conducting HIA, location, and year	Policy, plan, program, or project	Methods	Scoping: Health determinants affected by the decision	Assessment: Population affected; health disparities identified; quantitative and nonquantitative ^a estimates of health impacts	Recommendations to decisionmakers and stakeholders	Impact of HIA on subsequent decisions and/or affected population
1. Living Wage Ordinance, SFDPH, San Francisco, 1999 ³	Policy to increase minimum wage for city contractors and leaseholders	Developed forecasting model relating worker income to human health status outcomes using data from published national observational studies	Income	10,000 contractors and leaseholders working for city; health disparities related to measures of low SES. Quantitative: Reduced sick days, medical care utilization, and mortality risk; increased educational attainment of workers' children; increase in alcohol consumption Nonquantitative: Increased self-rated health	A modest gain in income resulting from a living wage would be associated with substantial health benefits	HIA contributed to passage of living wage ordinance and to passage of subsequent citywide minimum wage increase
2. Flooring Policy for Public Housing, SFDPH, San Francisco, 2002 ⁷	Policy of local housing authority on flooring options in public housing developments	Structured multi-day dialogue among experts, residents, asthma-prevention advocates, and responsible agency representatives; review of evidence on asthma triggers	Airborne allergens and asthma triggers in carpeted apartments	Occupants of 6114 public housing units, specifically asthma sufferers; health disparities related to area of residence and substandard housing with deferred maintenance. Quantitative: None Nonquantitative: Carpeting is associated with reduced ambient noise but increased asthma attacks	Recommended proportion of new units built without carpeting and for the housing authority to increase awareness of policy for requesting removal of existing carpeting	City Board of Supervisors endorsed recommendations and requested annual progress report from city housing authority
3. Trinity Plaza housing redevelopment, SFDPH, San Francisco, 2003 ⁸	Project proposed by private developer to replace existing rent-controlled housing units with condominiums	Rapid desktop HIA; scope based on intersection of health determinants, community priorities, public hearings, and plan outcomes; focus groups; report used logic pathways and empiric evidence	Housing adequacy and affordability; social cohesion; residential displacement and segregation	360 low-income households in area of high housing costs; health disparities related to area of residence, ethnicity, and measures of SES. Quantitative: None Nonquantitative: Tenant focus groups suggested displacement would lead to increased psychological stress, fear, crowding, substandard living conditions due to limited affordable replacement housing, food insecurity due to increased rent burden, and reduced social capital	Recommended to planning department that displacement analysis be done and prevention strategy developed	Decisionmakers required developer to analyze impacts in EIR or mitigate; developer proposed replacement housing for existing residents under rent control

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4. Rincon Hill Area Plan, SFDPH, San Francisco, 2004 ⁸	Area plan for new downtown residential neighborhood	Rapid desktop HIA; scope based on intersection of health determinants, community priorities, public hearings, and plan outcomes; report used logic pathways and empiric evidence	Housing adequacy and affordability; residential segregation; access to parks, open space, and schools; air quality; commute time	14,000 existing and 12,000 future neighborhood residents in area with housing supply and demand mismatch; health disparities related to area of residence, ethnicity, and measures of SES. Quantitative: None Nonquantitative: Increased mortality and violence associated with economic segregation; increased traffic hazards and air pollution associated with jobs–housing imbalance and lack of neighborhood schools	Health department recommended that a jobs–housing balance analysis disaggregated by income be conducted as part of a revised environmental impact report	Increased plan’s affordable housing requirement and improved its location; created community impact fund for community services and infrastructure
5. Eastern Neighborhoods Community Health Impact Assessment, SFDPH, San Francisco, 2006 ⁹	Area plans and rezoning proposal for three contiguous neighborhoods	Process included community visioning; indicators selection; policy and design strategy prioritization; development and application of Healthy Development Measurement Tool	Stakeholder vision of 27 community health objectives; existing conditions and development plans evaluated against indicators and development criteria in measurement tool	134,000 existing and 44,000 future neighborhood residents in area with inadequate neighborhood infrastructure; local health disparities related to area of residence, ethnicity, and measures of SES; baseline assessment of 100 community health indicators. Quantitative: None Nonquantitative: Focus groups on neighborhood health priorities and effects of development	Identified 20 city-level policies for healthy city development; advocated for 3 of 20 policies for immediate adoption; recommended institutionalization of measurement tool to local planning; multiple recommendations for area plans resulting from tool application	1 of 3 recommended local ordinances adopted; planning commission endorsed use of measurement tool on plans; area plans incorporated multiple policies and implementing actions recommended through HDMT evaluation
6. Eastern Neighborhoods Rezoning and Area Plans Environmental Impact Report, SFDPH, San Francisco, 2007 ¹⁰	Area plans and rezoning proposals for four contiguous neighborhoods	Analysis of health effects associated with change in environment outcomes documented in an EIR; developed and used predictive model of vehicle–pedestrian collisions	Roadway air pollutant emissions; noise-related land use conflicts; pedestrian safety	134,000 existing and 44,000 future neighborhood residents in area with land use conflicts among residential, industrial, and transportation uses; local health disparities related to area of residence, ethnicity, and measures of SES. Quantitative: Predict 20 additional pedestrian collisions per year Nonquantitative: Mortality and respiratory morbidity for new residents near busy roadways; noise-related sleep disturbance	Exposure modeling and mechanical ventilation to mitigate land use–air quality conflicts; noise mitigation measures; traffic calming; intersection countermeasures; circulation changes and traffic demand reduction	Draft EIR adopted mitigation measures for air quality and noise impacts; recommendations for pedestrian safety under review

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Table 1. Key features of 27 health impact assessments conducted in the United States, 1999–2007 (*continued*)

HIA name, group conducting HIA, location, and year	Policy, plan, program, or project	Methods	Scoping: Health determinants affected by the decision	Assessment: Population affected; health disparities identified; quantitative and nonquantitative ^a estimates of health impacts	Recommendations to decisionmakers and stakeholders	Impact of HIA on subsequent decisions and/or affected population
7. Executive Park Sub Area Plan, SFDPH, San Francisco, 2007 ¹¹	Project proposed by private developer to build 2800-unit mixed-use neighborhood on waterfront commercial site	Application of HDMT to area plan for 71 acre mixed-use residential development; assessed 84 community-level indicators for area	Structured evaluation of existing conditions and development outcomes using HDMT	2800 units of new residential housing in area with inadequate neighborhood infrastructure; local health disparities related to area of residence, ethnicity, and measures of SES. Quantitative: None Nonquantitative: Stakeholder interviews; evaluated land-use plan content against 87 HDMT development criteria	Increase specificity of plan's implementing actions; reduce area's isolation by improving transportation systems and access to goods and services; coordinate with other local development; 135 specific recommendations for area plan and planning process	Plan and recommendations under review
8. Jack London Gateway senior housing project, Human Impact Partners, Oakland CA, 2006 ¹²	Project to develop 54 units of low-income senior housing and new retail services	Facilitated structured participant dialogue among area residents, neighborhood organizations, and environmental health experts; literature review; secondary data analysis	Outdoor and indoor air quality; access to retail services; environmental noise; pedestrian safety; community violence	Low-income and minority elderly; health disparities related to elderly minority populations. Quantitative: Increase housing affordability Nonquantitative: Adverse impacts on respiratory illness, sleep disturbance, injury, physical activity, and fear of crime; potential benefits from retail services	Incorporate design features to improve indoor air quality; use noise-insulating features; increase private security; add walkability amenities and traffic-calming measures; allow pets; provide transport to services	Developer has engaged with HIA team and stakeholder group in discussion on project design; final decisions pending
9. East Bay Greenway, Human Impact Partners, Alameda County CA, 2007 ¹³	Project to build 12 miles of walking and biking paths under elevated rail transit tracks	Dialogue among area residents, neighborhood organizations, and environmental health experts; literature review; expert review of scope; secondary data analysis	Physical activity; social cohesion; greening the landscape; motor vehicle use and air pollutants; safety concerns	Affected population mostly low SES and minority with high rates of obesity and chronic diseases. Quantitative: None Nonquantitative: Reduced obesity, diabetes, heart disease, pedestrian and bicycle injuries, and osteoporosis; improved mental health and life expectancy	Optimize design to reduce pedestrian and bicyclist injury risks; incorporate public safety measures to reduce risk of crime	Pending

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10. Oak to Ninth Avenue project, UCBHIG, Oakland CA, 2006 ¹⁴	Project proposed by private developer to build mixed-use neighborhood on underutilized waterfront industrial site	Review of development proposal, EIA data, and literature; public input and interviews with key stakeholders; GIS mapping; quantitative forecasting; planning process provided minimal public involvement	Pedestrian safety, air quality, open space, environmental noise, housing affordability, public school capacity, social cohesion	411,000 existing and 7500 future neighborhood residents, 19% area poverty rate; high housing costs; health disparities related to area of residence and SES. Quantitative: Loss of 15 acres of open space; pedestrian injuries; sleep disturbed by ambient noise; unmet housing and school needs; health effects of particulate matter Nonquantitative: Open space adequacy and accessibility; social cohesion	Incorporate new public routes to waterfront park; add traffic-calming, lower speed limits, and other pedestrian safety measures; notify potential buyers of air quality risks	Project approved without consideration or mitigation of health impacts; stakeholder groups have used health arguments as basis of referendum effort on project
11. MacArthur BART Transit Village, UCBHIG, Oakland CA, 2007 ¹⁵	Project to build mixed-use development on transit station parking lot	Review of literature and planning documents; field visits; interviews with key stakeholders, content experts, area residents, and business people; secondary data analysis; quantitative health-effects forecasting tools	Affordable housing, employment opportunities, transportation access, physical activity, access to parks and greenspace, pedestrian safety, noise, air quality, social cohesion	600 households who rent or buy housing units; Oakland residents including many of low SES Quantitative: 17% of residents near rail line will have disturbed sleep; increased cancer risk from freeway emissions; one extra pedestrian injury or death per 3.25 years; increased rental-housing supply for low-income families Nonquantitative: Increased social interaction, facilitates routine physical activity for residents	Unbundle parking from housing unit sales; add bicycle parking; connect project to local bike network; recruit full-service grocery store; add pedestrian safety improvements; use building materials and ventilation systems to reduce allergens and toxic exposures	Plans under review
12. Living Wage Ordinance, UCLA, Los Angeles, 2003 ⁴	Policy to increase minimum wage for city contractors	Local and national data used to model impact on mortality of various income and health insurance scenarios; consulted with advocacy group during screening and scoping	Income; health insurance status	Approximately 10,000 employees and contractors with the city; health disparities related to low-income and uninsured populations. Quantitative: Increased income would prevent 1.4 deaths per year; health insurance for uninsured workers would prevent 6.4 deaths per year in study population Nonquantitative: Increased income would not increase spending on health-related goods and services	Wage and health insurance provisions benefit the health of covered workers; health insurance for uninsured workers would cost one-tenth the amount needed as wage increases to produce equivalent reduction in mortality	Unknown

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Table 1. Key features of 27 health impact assessments conducted in the United States, 1999–2007 (continued)

HIA name, group conducting HIA, location, and year	Policy, plan, program, or project	Methods	Scoping: Health determinants affected by the decision	Assessment: Population affected; health disparities identified; quantitative and nonquantitative ^a estimates of health impacts	Recommendations to decisionmakers and stakeholders	Impact of HIA on subsequent decisions and/or affected population
13. After-School Programs Ballot Proposition, UCLA, California, 2003 ¹⁶	Policy for increased funding of before- and after-school programs	Estimated health impacts by extrapolating from the outcomes of published evaluations of after-school programs	Educational achievement, substance abuse, crime, physical activity, high-risk behaviors such as alcohol, drugs, and sex	6.3 million elementary and junior high school students, up to 600,000 in after-school programs. Quantitative: None Nonquantitative: Programs unlikely to attract high-risk or eligible low-income youth; academic gains likely to be insignificant to subsequent earning potential and health status; risk of funds being diverted from other health programs	Youth development programs that address the social and psychological precursors to risky behavior are most likely to yield health benefit; benefits will be realized only to the extent that high-risk youth are recruited	Unknown, but possible influence on subsequent rule changes to give priority to low-income schools
14. 2002 Federal Farm Bill, UCLA, 2004 ¹⁷	Federal policy for farm subsidies, rural development, and land conservation	Retrospective HIA; developed logic frameworks and pathways focused on dietary consumption affected by farm subsidy policy, and on air pollution related to ethanol production; used existing data	Dietary consumption patterns, air pollution	U.S. population including food stamp and WIC recipients. Quantitative: None Nonquantitative: Unclear relationship between farm subsidies and food consumption, or between ethanol production and air pollution; diet may be affected by food prices; ethanol production inefficiencies may increase air pollution	No clear recommendations but some changes in farm bill could have an impact on health	Results reviewed as part of discussions about subsequent federal farm bill
15. Walk-to-School Program, UCLA and CDC, Sacramento CA, 2004 ¹⁸	Policy of encouraging children to walk to school and project of street improvements	Developed logic model to forecast outcomes; used data from National Household Transportation Survey, California Healthy Kids Survey, and literature; reviewed existing programs; consulted project coordinator	Physical activity, obesity, air pollution, pedestrian safety, neighborhood safety and crime	1186 elementary school students and their guardians; low-income population with high ethnic diversity. Quantitative: Students achieving 30 minutes/day of physical activity would increase from 13% to 21%; overweight students would reduce BMI 0.09 kg/m ² /year Nonquantitative: Reduced air pollution exposure; small decrease in pedestrian injuries; enhanced social capital; reduced neighborhood crime	Encourage walk-to-school programs as one opportunity for children to be active; also encourage physical education classes and other active after-school programs and activities	Pending

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16. Greyfield Redevelopment, Buford Highway, UCLA and CDC, Atlanta, 2004 ¹⁹	Project of highway redevelopment and policy of changed priority uses of road corridor	Methods include expert opinion, literature review and modeling	Built environment; pedestrian safety; physical activity	14,000 people in highway corridor area; project designed to reduce injuries and other health disparities in low-income immigrant population. Quantitative: Estimated 6.1 fewer injuries and 1.6 fewer fatalities to pedestrians, 73.8 fewer motor vehicle injuries per year; 73 minutes per week more physical activity; no change in air pollution. Nonquantitative: increased safety and social capital	Use incremental approach for redeveloping the area, increase housing density, assure mixed-income housing includes affordable housing	Facilitated CDC's dialogue with state and federal departments of transportation, county commissioners and county board of health
17. Farmers Market, UCLA and Project for Public Spaces, Trenton NJ, 2006 ²⁰	Plan for revitalization for area farmers market	Developed logic framework; assessed market redevelopment plans; reviewed literature; consulted technical experts and farmers market stakeholders	Nutrition; physical activity; economics; social capital; public health services	5000 customers per week, residents within 2 miles of market and others within same city and county; health disparities associated with low SES are not reduced under current redevelopment proposal. Quantitative: None Nonquantitative: Current plan has no significant impact on vegetable and fruit consumption, physical activity, or preventive health services	Create master plan; improve diversity of farm products sold; install public seating in eating area, bicycle racks, and cash machines; improve signage and pedestrian connections to market	Decisionmakers showed minimal interest in study findings and recommendations
18. Beltline transit, trails, and parks project, CQGRD and CDC, Atlanta, 2007 ²¹	Project of new trails, parks, transit, and redevelopment of brownfields and greyfields	Expert and stakeholder opinions; community survey; literature review; HIA was conducted in parallel with multiple city-initiated planning processes	Built environment and land-use patterns; transit access; physical activity; pedestrian safety; social capital; quality of life; air and water quality; noise	200,000 current and 50,000 future area residents and 230,000 area workers; project may improve health disparities associated with low SES. Quantitative: Increase in physical activity and in access to greenspace and transit; little impact on air quality Nonquantitative: Increase social equity and quality of life, decrease injury and crime	Encourage faster progress than current 25-year schedule to obtain earlier health benefits; add health professional to advisory board; add more parks to underserved area; assure adequate affordable housing is built	Pending

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Table 1. Key features of 27 health impact assessments conducted in the United States, 1999–2007 (continued)

HIA name, group conducting HIA, location, and year	Policy, plan, program, or project	Methods	Scoping: Health determinants affected by the decision	Assessment: Population affected; health disparities identified; quantitative and nonquantitative ^a estimates of health impacts	Recommendations to decisionmakers and stakeholders	Impact of HIA on subsequent decisions and/or affected population
19. City of Decatur Community Transportation Plan, CGQRD, Decatur GA, 2007 ²²	Plan for a city-wide multimodal transportation system	Rapid HIA; input from community leaders and local health and planning experts; literature review	Physical activity; access to health-promoting goods and services; safety; social capital	20,000 residents and numerous people who work in or visit Decatur; increased health risks associated with age, income and disabilities. Quantitative: None Nonquantitative: Improved bicyclist and pedestrian safety; improved access; increased opportunities for physical activity and building social capital	Prioritize safety issues and connectivity to promote active travel for commuting and recreation; improve intersections for users of all abilities; assign staff person to coordinate the City's Active Living initiatives	City is making infrastructure improvements; created an Active Living Division to work across departments
20. Taylor Energy Center, Healthy Development, Inc., Taylor County FL, 2007 ²³	Project of new coal-fired power plant	Stakeholder and key informant interviews and survey during scoping; literature review; quantitative assessment of impacts of air pollutants and employee income on life expectancy; expert opinion	Employment opportunity; income; air and water contaminants such as sulfur dioxide, nitrogen oxides, particulate matter (PM), and mercury emissions	County population 19,256; health disparities associated with low income and education. Quantitative: Risks include increase in overall, lung cancer and cardiopulmonary mortality; increased mercury emissions and fish consumption warnings near plant; benefits include increased employment and life expectancy of black employees and their families. Nonquantitative: Adverse impact from carbon dioxide emissions	Purchase low-polluting coal; collect ambient particulate matter data in county; explore technology to reduce emissions; hire diverse workforce; provide health benefits to all employees	Development authority accepted recommendations and evaluation indicators; project subsequently suspended due to CO ₂ emissions
21. Massachusetts Rental Voucher Program, Boston University Child HIA Working Group, 2005 ²⁴	Policy of eligibility for housing vouchers for low-income families	Secondary data analysis; literature review; interviews with experts and key stakeholders; survey of local housing authorities; policy appraisal with input from experts, housing authority and advocacy groups	Housing conditions, housing stability, affordability of housing, mobility, neighborhood environment	4715 households in 2005; health disparities associated with housing insecurity in low-income families. Quantitative: Program restrictions could cause 50% increase in food insecurity among affected households and associated health risks Nonquantitative: Program restrictions could lead to increased housing instability and health risks for children such as increased asthma, depression, anxiety, and hunger	Increase funding and reduce procedural requirements for program; support tracking of enrollees so program impact could be better monitored	Pending

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Table 1. (continued)

<p>22. Massachusetts Low Income Home Energy Assistance Program, Boston University Child HIA Working Group, 2006³⁵</p>	<p>Policy of home energy assistance for low-income families</p>	<p>Literature review; analysis of energy burden on low-income families; stakeholder inter-views with energy assistance pro-grams, affordable energy experts, and community organizations</p>	<p>Heating assistance affects child food security which is a determinant for developmental growth; injury prevention</p>	<p>140,000 families with children receiving heating assistance; health disparities related to poverty and access to stable home energy. Quantitative: None Nonquantitative: Decreased child hospital admissions, nutritional risk for growth problems, injuries from alternative heating sources, and asthma rates; increased overall child well-being</p>	<p>Increase federal and state funding of energy assistance program; extend program outreach; address gaps in data that undermine ability to release emergency energy assistance funds</p>	<p>Pending</p>
<p>23. Arctic Outer Continental Shelf Oil and Gas Leasing Program, Alaska Inter-Tribal Council, Alaska, 2007²⁶</p>	<p>Program to lease areas of the U.S. Outer Continental Shelf for oil and natural gas exploration and development</p>	<p>Literature review; public testimony from EIA process; expert opinion; review of other impacts in the EIA such as impacts to economy, subsistence hunting, and social structure</p>	<p>Impacts on air and water quality; sociocultural disturbances; disturbance of subsistence resources; access to alcohol and drugs</p>	<p>Communities in multiple areas of Alaska, many of which have large Alaskan Native populations who experience major health disparities. Quantitative: None Nonquantitative: Metabolic health effects if subsistence resources harmed; increased food insecurity, sociocultural tensions, alcohol and substance abuse, injury, and domestic abuse; predicted increase in overall employment is small</p>	<p>Nine alternative plans to the proposed action identified, assessed, and included in EIA report</p>	<p>U.S. Minerals Management Service that oversees offshore oil and gas development has committed to work to develop new health-related mitigation measures at the lease sale stage</p>
<p>24. Chukchi Sea Oil and Gas Lease Sale and Seismic Surveying Activities, Alaska Inter-Tribal Council, Alaska, 2007²⁷</p>	<p>Plan for oil and gas leasing within 34 million acres of Chukchi Sea Planning Area</p>	<p>Literature review; public testimony from EIA process; expert opinion; review of other impacts in the EIA such as impacts to economy, subsistence hunting, and social structure</p>	<p>Impacts on air and water quality; sociocultural disturbances; disturbance of subsistence resources; access to alcohol and drugs</p>	<p>Eight Inupiat villages in North Slope Borough with 250 to 4000 residents each who experience major health disparities including high rates of cancer, social pathology, and chronic illness. Quantitative: None Nonquantitative: Increased risks of injury, diabetes, cancer, endocrine disruption, food insecurity, alcohol and drug abuse; potential increased exposure to HIV and syphilis</p>	<p>Develop a monitoring strategy to identify and track regional health indicators; continue study of how oil and gas development impacts determinants of health; institute health-focused mitigation measures at lease sale stage</p>	<p>Anticipated health mitigation measures at the project permitting stage</p>

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Table 1. Key features of 27 health impact assessments conducted in the United States, 1999–2007 (*continued*)

HIA name, group conducting HIA, location, and year	Policy, plan, program, or project	Methods	Scoping: Health determinants affected by the decision	Assessment: Population affected; health disparities identified; quantitative and nonquantitative ^a estimates of health impacts	Recommendations to decisionmakers and stakeholders	Impact of HIA on subsequent decisions and/or affected population
25. National Petroleum Reserve-Alaska Oil Development Plan, Alaska Inter-Tribal Council, 2007 ^{28,29}	Plan for oil and gas leasing in the 4.6-million-acre Northeast National Petroleum Reserve, Alaska	Stakeholder input; literature review; qualitative analysis to identify associations among development-related disturbances, health determinants, and health outcomes	Impacts on air and water quality; sociocultural disturbances; disturbance of subsistence resources; access to alcohol and drugs	Inupiat populations in Alaska's North Slope experience health disparities including high rates of cancer, social pathology, and chronic illness. Quantitative: None Nonquantitative: Impacts of plan may include increased substance abuse, domestic violence, suicide, injury, and exposure to organic pollutants; may increase fears about survival of Inupiat culture and tradition. Benefits of plan may include increased employment, improved health care, and more funding for existing and new infrastructure	Recommended that developers in the region be required to use health-based mitigation measures included creation of a health advisory board to monitor development activities, measures to support subsistence intake, additional public safety measures and staffing, and health monitoring of employees	BLM agreed to include mitigation measures where legally permissible with later acceptance or rejection in subsequent stages of EIA process; BLM also agreed to consider working with a Health Advisory Board
26. Lowry Corridor Project, Hennepin County Planning and Public Health staff, Minneapolis MN, 2007 ³⁰	Project of redevelopment of blighted urban corridor into mixed-use, pedestrian-friendly area	Rapid desktop HIA; literature review; secondary data analysis of planning documents, census data, and injury data	Social capital, employment opportunities, pedestrian safety, physical activity	18,000 residents in neighborhoods affected by project; health disparities associated with concentrated poverty and unemployment. Quantitative: None Nonquantitative: Increased social supports; decreased fear of crime; increased physical activity and access to transit; increased mobility for people with disabilities	Pedestrian-level lighting; driver-feedback speed limit signs in pedestrian and school areas; 'Share the Road' signs; increased public signage and maps for public transit routes	HIA helped project manager obtain funding for countdown timers at key intersections, bike racks at key public buildings, and markers to encourage pedestrian traffic

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Table 1. Key features of 27 health impact assessments conducted in the United States, 1999–2007 (*continued*)

27. Derby Redevelopment, Tri-County Health Department, Commerce City CO, 2007 ³¹	Master plan, zoning ordinance, design guidelines, and budget request for community redevelopment project	Literature review; input from community and local business association; walkability assessment; GIS mapping; Photovoice project; recommendations from walkability and transportation planning and public policy consultants	Physical activity, nutrition	27,000 residents of historic Commerce City; groups at high risk for physical inactivity include children and teens, elderly, low-income individuals and Hispanic and black residents. Quantitative: None Nonquantitative: Increased bicyclist and pedestrian physical activity and safety; possible decrease in crime and fear of crime; favorable environment for expanding healthy food options	Take action to spur redevelopment plan; fund traffic calming, parks and open space; prepare bicycle and pedestrian plan; add affordable housing and universal design features; create a "Clean and Safe" Program of property maintenance and code enforcement for junk, weeds, and trash; police and community surveillance	City Council approved Derby Sub-Area Master Plan, rezoning ordinance, and Design Guidelines; funding decisions under consideration
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^aNonquantitative estimates include health impact information both from focus groups and interviews and from expert judgment when quantitative information was not available (BLM, Bureau of Land Management; BMI, body mass index; CDC, Centers for Disease Control and Prevention; CQGRD, Center for Quality Growth and Regional Development, Georgia Institute of Technology; EIA, Environmental Impact Assessment; EIR, Environmental Impact Report; ENCHIA, Eastern Neighborhoods Community Health Impact Assessment; GIS, Geographic Information Systems; HDMT, Healthy Development Measurement Tool; HIA, Health Impact Assessment; SFDPH, San Francisco Department of Public Health; UC-BHIG, University of California, Berkeley Health Impact Group; UCLA, University of California, Los Angeles Health Impact Assessment Group; WIC, Women, Infants, and Children supplemental nutrition program.

include adverse health effects related to resident displacement. In the Oak to Ninth Avenue project,¹⁴ the developer commissioned his environmental consultants to critique the HIA findings.

The 27 HIAs generally followed four of the five traditional steps for conducting HIAs: (1) screening, (2) scoping, (3) assessment, and (4) reporting of results.³³ Most of these HIAs used an informal screening step, possibly because voluntary HIAs assume the process is worth doing. None of the HIAs included a formal evaluation (the fifth traditional step) of the HIA's impact on the decision-making process. For teaching purposes, it is suggested that the importance of formulating clear, actionable recommendations be highlighted by inserting recommendations as a formal step between the assessment and reporting steps.

Some of the 27 HIAs forecasted quantitative changes in health status outcomes using effect estimates from observational studies to develop dose-response functions. For example, the Florida power plant HIA estimated the number of days of reduced life expectancy associated with future particulate emissions, the Buford Highway HIA estimated the number of pedestrian injuries preventable by better road design, and the walk-to-school HIA predicted an average change in children's BMI expected from the program. Quantitative results from HIAs may be useful in cost-benefit analyses, although the latter involve methods different from those used in HIAs.

Other HIAs used quantitative estimates of environmental measures such as noise, air quality, and access to parks. While these are not health outcomes per se, such environmental measures help investigators make evidence-based inferences about prospective health effects based on empiric research and changes in environmental conditions. For example, data on distance to parks can be joined with research relating park access and physical activity.⁴³ Qualitative research methods were also used. In the Trinity Plaza project, the health department conducted focus groups with tenants threatened by eviction to assess immediate health impacts and concerns resulting from the proposed development.

In most of the HIAs, judgments were based predominantly on expertise and empiric research, often due to unavailability of quantitative forecasting methods or data inputs. For example, no models now exist to predict how many more asthma attacks low-income children will suffer if housing subsidies are reduced or how many cases of depression will be prevented or relieved if greenspace is included in neighborhood design. While more research is needed to improve quantitative forecasting, decision-makers must recognize that not all health impacts can be precisely measured.⁴⁴ Monitoring the health outcomes of current decisions can help improve future decisions.¹⁴

The lack of quantitative rigor is a common criticism of HIA. While acknowledging this concern, it is important to recognize a distinction between standards of evidence for research and practice. Physicians routinely make clinical decisions for patients based on research, patient history, experience, and expert judgment. Similarly, HIA practitioners need to use best available quantitative and nonquantitative evidence along with their expert judgment to provide advice to decision-makers despite uncertainties.⁴⁵ Public health practitioners do not need to know how many people will walk on each sidewalk before advocating for the health and safety benefits of sidewalks. Similarly, residents at a public hearing who highlight the qualitative health benefits of a new playground for their children may carry more weight in a political decision than a precise estimate of how many children would use such a playground. Many of the recommendations from HIAs now based on nonquantitative information would be unchanged if quantitative data were available.

Several limitations should be considered in interpreting the findings of this review. First, despite multiple search strategies, some HIAs conducted in the U.S. may have been missed because many are available only in the gray literature. While most HIAs reviewed in this study are available on websites, only five of these 27 HIAs have been published in the peer-reviewed literature,^{3,4,8,28} although some others are expected to be published. The authors are aware of at least ten additional HIAs now in progress in communities across the U.S. that will broaden the range of topics covered by HIAs and provide more models for future HIAs.

Second, some health department activities do not reach the level of being a formal HIA but may convey health impact information to a decision-maker. For example, in 2000, an environmental health professional in the Tri-County Health Department in Colorado sent a nine-page letter to the county planning commission highlighting the potential adverse health impacts related to the noise, air and water quality, and wastewater management of a proposed motor speedway and sports facility near Denver (Carol MacLennan, personal communication, January 2004). Such a rapid desktop review of issues may accomplish the same purpose as an HIA, but may not follow the formal process. Rapid desktop review also may be a precursor to more formal and structured HIA practice, if such informal health assessments generate further interest and specific questions for health analyses on the part of stakeholders, decision-makers, and public health officials. In San Francisco, HIAs conducted by the health department have led the city planning department to request health analyses on discrete projects and proposals (e.g., potential health impact of locating a park adjacent to a freeway) on a more informal and routine basis.

Wismar recently categorized the results of HIAs as: (1) directly affecting the decision being made, (2) not affecting the decision but raising awareness of health issues, (3) having little impact because the decision was already favorable to health, and (4) being ignored or dismissed by the decision-makers.⁴⁶ Only limited information is available about the impact that these 27 HIAs have had on decision processes. In a few cases, changes in policies or projects were made directly as a result of the HIA. More commonly, the HIA raised awareness of health issues among decision-makers and others; subsequent changes that occurred may be due in part to that increased awareness. HIA practitioners who have ongoing working relationships with their local community leaders may be able to influence decisions more than those who lack such relationships. To accomplish change, such links may be more important than rigorous quantitative data in the HIA report. Further work is needed to document the impacts of HIAs on decision processes and health outcomes.⁴⁷⁻⁴⁹

Health impact assessment use is generating interest and momentum in some parts of the country. Recent HIA training courses have attracted participants from 15 states. HIA activities in the San Francisco Bay Area region now include local public health agencies, public agency and private foundation funding, nonprofit organizations incorporating HIA into land-use planning assessment and advocacy work (www.urbanecology.org), the creation of a new nonprofit organization to support and conduct HIAs (humanimpact.org), and a course on HIA within a school of public health.³⁷ In Los Angeles, investigators are developing a web-based database to provide HIA practitioners in the U.S. and elsewhere with easy access to completed HIAs,³⁶ modeled in part on the English HIA Gateway website.⁵⁰

Decisions about projects and policies that affect the health of communities are being made on a daily basis throughout the U.S. HIAs are designed to offer the best available data to decision-makers to inform them about the health impacts of their decisions.⁵¹ It is believed that HIA is a promising approach to identify the impacts of proposed policy and infrastructure changes, utilizing quantitative and nonquantitative analyses, in a way that allows health outcomes to be appropriately factored into complex decisions.

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