# Using health impact assessment in community development to improve air quality and public health

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Air pollution contributes to asthma, allergies, lung function impairment, cardiovascular disease, and premature mortality. Transit-oriented development, roadway expansion, new residential and commercial development, and pollution mitigation projects impact local and regional air quality. This article discusses the use of Health Impact Assessment (HIA) by community advocates, public health and city planning departments, and regulatory agencies to ensure health impacts are considered in decision-making processes that affect air quality. HIAs encourage collaboration among diverse stakeholders, including communities facing health inequities. HIAs also use data and analysis to predict health outcomes of proposed planning and policy decisions. This article describes the collaborations, empirical assessment tools, communication and advocacy strategies, findings, recommendations, and outcomes of the following HIAs: a transit-oriented station area plan in Pittsburg, CA, grade separations funded through a policy to levy a fee on all port containers passing through major ports in California, and a freeway expansion in Los Angeles, CA.

Keywords: environment and sustainability; health, transportation; land use; citizen participation

### Introduction

Public health research provides extensive evidence that land use patterns, transportation systems and community design impact air quality and environmental health (Ewing, Frank, & Kreutzer, 2006). For example, automobile and truck emissions contribute to ambient air pollution (Frumkin, Frank, & Jackson, 2004), which is associated with increased rates of respiratory disease, heart disease and some forms of cancer (CARB, 2006a). Children living next to busy roadways experience greater exposure to air pollutants, increased respiratory disease symptoms, asthma hospitalizations and doctor visits, and poorer lung function than children who live further away (Delfino et al., 2009; Gauderman et al., 2007; Gunier, Hertz, Behren, & Reynolds, 2003; Zhou & Levy, 2007). These impacts are disproportionately concentrated in urban communities, and contribute to health disparities (Flournoy & Yen, 2004).

While substantial research demonstrates that the built environment impacts health, health data are not always taken into consideration when land use, transportation and

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ISSN 1557-5330 print/ISSN 1944-7485 online © 2011 Community Development Society DOI: 10.1080/15575330.2011.553289

http://www.informaworld.com

design decisions are made (Arquiaga, Canter, & Nelson, 1994; Steinemann, 2000). Health Impact Assessment (HIA) is a systematic process that can be used to help ensure adequate consideration of health effects in planning and policy decisions. HIA makes evidence-based predictions of health outcomes resulting from proposed decisions, and provides recommendations about how to enhance the positive and mitigate negative health impacts of proposed decisions. HIA uses diverse methodologies and offers an opportunity to engage stakeholders including community members and advocates, public health departments, regulatory agencies, and academics (WHO, 2009).

The definition of health in HIA is holistic. It includes traditional physical and mental health outcomes and how these are influenced by built, social, economic, and political factors, such as infrastructure, public services, and environmental conditions. When analyzing health impacts, HIA considers how these "determinants of health" will change based on a project or policy.

HIA can be used in conjunction with Environmental Impact Assessment (EIA), which is required for many plans and projects by the federal National Environmental Policy Act (NEPA) and various state environmental quality laws. EIA assesses how a proposed project will impact the environment and human health; however, the health assessment in EIA is often limited and seldom considers disproportionate and cumulative burdens on vulnerable populations. Incorporating a comprehensive analysis of health effects in an EIA can increase transparency, efficiency, and the responsiveness of decision-makers to community quality of life concerns.

This article describes three case studies where HIA was used to influence decisions with the potential to impact air quality in California:

- (1) A transit-oriented station area plan in Pittsburg, CA.
- (2) Grade separations funded through a policy to levy a fee on all port containers passing through major ports in California.
- (3) A freeway expansion in Los Angeles, CA.

We describe the collaborations established, assessment tools used, communication and advocacy strategies employed, and findings, recommendations, and outcomes achieved in the process of conducting these HIAs.

#### Health impacts of air quality related to traffic

Traffic-related emissions have been identified as one of the main sources of air pollution leading to poor health outcomes. Many counties in California are at higher risk of cancer due to vehicular emissions (EPA, 2001).

The main pollutants produced by road traffic are carbon monoxide (CO), nitrogen oxides (NO<sub>X</sub>), fine particulate matter (PM), and hydrocarbons (EPA, 2007). Other vehicle emissions that are sources of concern for health include volatile organic compounds (VOCs), ozone, diesel exhaust, and sulfur oxide (SO) (Bhatia & Rivard, 2008). The Environmental Protection Agency finds the most carcinogenic air pollutant is benzene (EPA, 2006). In California, 84% of benzene emissions come from motor vehicles (Alexis & Cox, 2005). Diesel particulate matter (PM) is identified by the California Air Resource Board (CARB) as a toxic air contaminant and represents 70% of the known potential cancer risk from air toxics in California (CARB, 2005).

The health impacts of living near high traffic roadways have been well studied. Children living in close proximity to busy roadways have been found to suffer from increased respiratory disease symptoms and asthma, and reduced lung function (Brugge, Durant, & Rioux, 2007; Gauderman et al., 2007; Kim et al., 2004). Studies also show higher rates of cardiovascular and respiratory disease among adults living near freeways, particularly for those living within 650 feet of heavy traffic and heavy truck volumes (Brugge et al., 2007; Jerrett et al., 2005; Künzli et al., 2009). Long-term exposure to traffic-related air pollution is associated with an increased risk of lung cancer (Beelen et al., 2008; O'Neill et al., 2007; Zanobetti & Schwartz, 2002). Additionally, living in areas with high levels of air pollution is a disincentive to exercise, and exercise reduces the risk of heart disease, diabetes, osteoporosis, and stress-related anxiety and depression (CDC, 1996; Wen, Balluz, Shire, Mokdad, & Kohl, 2009). CARB recommends not locating sensitive land uses, such as residences, schools, and senior citizen homes, within 500 feet (150 meters) of a highway that has traffic in excess of 100,000 vehicles per day (CARB, 2005).

#### The HIA process

HIA benefits from the involvement of diverse stakeholders. Having representatives from affected communities work with public health, planning and transportation agencies, advocacy organizations, regulatory agencies, academics, elected officials, and others can increase the availability and relevance of data and analysis used in HIA, and increase the effectiveness of findings and recommendations in informing decisions. Collaboration in HIA also increases awareness of broader community concerns, and helps secure responsive action from decision-makers (CHIA, 2010; Harris et al., 2009; Mathias & Harris-Roxas, 2009).

The North American HIA Practice Standards Working Group defines the following steps of HIA (NAHIAPSWG, 2009):

- (1) **Screening** decide whether a HIA is feasible, timely, and would add value to the decision making process.
- (2) **Scoping** create a plan and timeline for conducting a HIA that defines priority issues, research questions and methods, and participant roles.
- (3) Assessment provide a profile of existing conditions, an evaluation of potential health impacts, and evidence based recommendations to mitigate negative and maximize positive health impacts.
- (4) **Reporting** develop the HIA report and communicating findings and recommendations.
- (5) **Monitoring** track the impacts of the HIA on the decision-making process and the decision, the implementation of the decision, and the impacts of the decision on health determinants.

These five steps will be described for the case studies presented below. While these case studies focus primarily on air quality, the full HIAs analyzed a wide range of health impacts.

# Case study 1. A station area plan in Pittsburg, CA

#### Description of plan

The Pittsburg Railroad Avenue Station Area Specific Plan is an example of transit oriented design (TOD), a planning approach used to reduce the

environmental impacts of urban sprawl and automobile dependence, such as regional air pollution. TOD can also be a strategy to address transportation-related public health concerns.

Pittsburg is a suburb in the San Francisco Bay Area with a population of 57,000 (Census, 2000). It is historically a working class factory town and the population is 32% Latino, 31% White, 19% Black, and 13% Asian (Census, 2000). In contrast to rest of the county, Pittsburg is projected to grow more quickly (Pittsburg, 2009).

Nearly 81% of residents leave Pittsburg for work, with an average one-way commute of 37 minutes (Census, 2000). The closest Bay Area Rapid Transit (BART) rail station connecting Pittsburg to the rest of the Bay area is over 3 miles away, and the parking lot is often at capacity by early morning.

In 1999, BART proposed a six-stop extension, including a stop at Railroad Avenue in Pittsburg. In 2006, the City started working on the Railroad Avenue Station Area Specific Plan. In addition to the BART station, the Plan also included 1590 new residential units, of which 15% were to be affordable; 446,000 square feet of retail and commercial space; about five acres of public-serving space; and pedestrian and bicycle infrastructure improvements.

#### Screening

TransForm, a transportation and land use advocacy organization, obtained funding to advocate for the inclusion of health in the Specific Plan through HIA. They invited Human Impact Partners (HIP) and CCISCO, an interfaith community organizing group, to work with them. At the time that the HIA was proposed, a draft Specific Plan had not yet been released, so there was ample time to conduct the HIA and present the findings and recommendations within the EIA process. The Plan details had not been decided upon and the City was open to evidence-based recommendations to maximize the Plan's potential. The Pittsburg Planning Department was not heavily involved at the HIA's inception, but realized HIA could support their interest in sustainable development and address community needs.

#### Scoping

The scoping of this HIA was a three-step process. First, the team developed a scope of the potential health issues that could be impacted by the Specific Plan. Second, community focus groups were held to educate community leaders about connections between the built environment and health, and to engage the community in the process. Third, the team refined the research questions that would become the subject of the assessment, based on community input.

The topic areas prioritized in the scope were transportation and air quality as well as housing, jobs and livelihood, noise, and access to retail and public services.

#### Assessment

Assessment methods included: empirical and noise literature review; retail and demographic characteristics mapping; air quality modeling; asthma and chronic respiratory disease forecasting; field visits and site observations; interviews and focus

groups with residents, city officials, and involved stakeholders; primary data collection and analysis of pedestrian quality; and trip generation forecasting.

a. Findings. The following are the air quality related HIA findings:

- Auto trips: The Plan would generate 4100 additional daily auto trips, a fraction compared to other non-TOD projects of similar size (Cheng, 2007). New auto trips impact health through air quality, physical activity and pedestrian injury.
- Air quality: Trip generation forecasts and air quality modeling results indicated the BART station would help reduce growth in regional vehicle trips, thus decreasing air emission exposures on a regional level. However, residents living in close proximity to the proposed BART station potentially faced increased exposure to air pollution from additional traffic and construction. Anticipated exposure to traffic-related pollutants was associated with a modest increase in risk of premature death, 0.5% increase in asthma hospitalizations, and a 3.8% increase in lower respiratory symptoms for those living near the new BART station.
- Use of public transit: In the Bay Area, public transit is used for commuting by 27% of those living within half a mile, 23% living from half one mile, and 11% living over one mile away from a transit stop (MTC, 2006). In Pittsburg, 8% of the population used public transit when the Plan was proposed (Census, 2000). The HIA estimated that if the Plan were implemented, the proportion of people using public transit would double to 16%.<sup>1</sup>

*b. Recommendations.* The following strategies were recommended to decrease harmful air emissions and air pollution exposure:

- *To reduce residential traffic sources of air pollution*, increase the frequency of bus service from communities that would use BART; use parking restrictions, pricing strategies, and other Transportation Demand Management measures to promote use of alternative modes of transportation; and create a comprehensive pedestrian/bicycling plan;
- To decrease risk of respiratory disease from air emissions, locate residences and other sensitive land uses in the Plan area at a safe distance from roadways with heavy traffic. However, since the positive impact on use of public transportation diminishes with distance from BART, an alternative recommendation was made to install central Heating, Ventilating and Air Conditioning (HVAC) systems with high efficiency filters in buildings near the BART station; maintain all condominium and apartments under positive pressure at all times; locate air intake systems for HVAC as far away from roadway air pollution sources as possible; and develop an ongoing HVAC maintenance plan. If HVAC systems are not properly maintained, there are unintended health risks such as exposure to internally generated pollutants (EPA, 1991).

# Reporting

Once finalized in April 2008, the full HIA report provided documentation of the research findings including background literature, existing conditions, research

methods, and recommendations for each of the six topics listed above. An executive summary condensed the HIA findings, fact sheets were developed, and two presentations were made, one to community members and the other by community members to elected officials.

The most effective communication of findings was TransForm's sharing of the draft HIA with the Planning Department via regular meetings. As a result, recommendations were incorporated into the Specific Plan through the EIR and the City Council voting process.

#### Monitoring

In October 2009, the Specific Plan was adopted by the Pittsburg City Council. The final Specific Plan reflected various HIA recommendations, including requirements for the use of HVAC systems and maintaining levels of threatened affordable housing.

# Case study 2. Grade separations funded through a California port container fee

#### Description of policy

In 2009, legislation was introduced in California to levy a fee on all shipping containers coming through the ports of Los Angeles, Long Beach, and Oakland (SB 632). Revenue would fund air quality mitigation projects and particularly help people located in close proximity to goods movement corridors, the majority of whom are lower income people of color (Palaniappan, Prakash, & Bailey, 2006). This HIA analyzed health impacts from projects that could be funded by a port container fee (PCF). It is estimated that the PCF would raise \$340 million annually (Miller, 2008).

More than one-third of the United States' exports and imports come through the ports of Los Angeles, Long Beach, and Oakland (BST, 2007), and the volume of goods moving through these ports is expected to triple by 2020 (CARB, 2006b). Goods movement is now the dominant contributor to transportation emissions in the state (CARB, 2006b). According to the California Air Resources Board, freight transportation generates 30% of the nitrogen oxide and 75% of all diesel particulate matter emissions statewide, and each year, air pollution from freight transportation causes 3700 Californians to die prematurely, 2830 to be admitted to the hospital, 360,000 to miss work, and 1.1 million California children to miss school (CARB, 2006b).

#### Screening

HIP selected the PCF bill after screening several statewide transportation policies where a HIA would highlight indirect health costs imposed on society and potential health benefits of transportation projects. Pollution from goods movement is an example of a health cost that is not included in the price of goods, or accounted for in public policies. HIP further screened policies proposed in the PCF bill through document review and discussions with decision-makers, public agencies, and advocacy groups. Findings indicated that the bill had the potential to fund air quality and traffic congestion mitigation projects, which have public health benefits. Because many disadvantaged communities live near ports and goods movement corridors, the policy could affect health inequities. Apart from air quality, other health impacts of the bill had not been analyzed; thus, a HIA would add value to the debate. Last, since air quality and transportation congestion mitigation projects would be proposed in the future regardless of funding source, a HIA analyzing health impacts was judged to be useful in future decision-making.

#### Scoping

Through a series of phone meetings, the HIA team decided on which PCF-funded project the HIA would focus and on research questions. Research questions were assigned to partners willing to participate in data collection and analysis.

Partners included California State Senate staff, the Natural Resource Defense Council (NRDC), Coalition for Clean Air (CCA), Los Angeles County Public Health Department, Alameda County Public Health Department, West Oakland Environmental Indicators Project, and the Environmental Defense Fund (EDF). Other contributors were from the South Coast Air Quality Management District and CalTrans. Through the scoping process, it was determined that the health impacts of the following projects would be included in the analysis:

- (1) Grade separation projects.
- (2) Freeway expansion projects (although not funded by SB 632, these were analyzed as a way to compare the SB 632 funded projects to other transportation alternatives).
- (3) Replacement/retrofit of heavy duty diesel trucks.
- (4) Locomotive engine retrofit/replacement and use of alternative energypowered locomotives.

Because this HIA was unfunded, the scope for detailed analysis was restricted to projects with the most partner interest—grade separation projects and freeway expansion. Health impacts related to air quality effects of grade separation are described here and freeway expansion will be discussed in case study 3.

#### Assessment

The HIA examined how grade separation projects would impact traffic delay, emergency response time, noise, train/motor vehicle collisions, stress, and air quality. Impacts related to air quality through traffic delay, idling, induced travel, and construction are presented here. Much evidence regarding grade separation impacts came from research in Riverside County, CA, a region highly impacted by railroad crossing delays due to freight trains originating at Southern California ports.

#### a. Findings

Rail lines in the city of Riverside carry over 75% of the freight handled by the ports of Long Beach and Los Angeles through the county (Riverside County, 2009). There are 61 at-grade crossings conflicting with roadways in the county (Stokley, 2008).

*Traffic delay/idling*. Grade separations eliminate wait times at at-grade crossings. In Riverside County, traffic was delayed for a total of 1262 hours per day, and at one

crossing, through which an average of 16,300 vehicles and 100 trains pass, the safety gate is down for 4.8 hours per day (RCTC, 2006). By eliminating idling due to traffic delays, HIP estimated that a grade separation at one crossing in Riverside would eliminate 438 pounds of volatile organic compounds, 6233 pounds of carbon monoxide, and 128 pounds of nitrogen oxides. These numbers were extrapolated for the 145 grade separation projects proposed in the PCF bill (Lowenthal, 2008) and found that if the PCF were to fund these projects, as much as 2008 tons of hazardous pollutants and 3946 tons of greenhouse gases could be eliminated. This reduction in air pollutants would lead to decreases in asthma, chronic obstructive pulmonary disease, heart attacks, and cancer throughout the state. While more drivers may choose to use the grade separated routes due to the absence of delay, it is likely that these drivers are switching from alternate routes used to avoid delays from at grade crossings. Thus, emissions increases due to more vehicle miles traveled (VMT) is likely to be negligible.

*Construction emissions.* Living in close proximity to a grade separation construction site can increase the level of exposure to fine particulate matter (RCTC, 2006). Nearby residents may experience impaired lung function, exacerbation of acute and chronic respiratory conditions, lung cancer, and heart attacks (Bhatia & Rivard, 2008). Construction workers face greater impacts, including a 40% increase in the relative risk of lung cancer (CARB, 1998), and an increased risk of asthma (UCS, 2007).

# b. Recommendations

Based on these findings, the following recommendations were made:

- Grade separation projects were recommended for funding with revenue from the PCF.
- To mitigate short-term pollution from construction use clean, low-emissions vehicles; use pollution controls in heavy-duty diesel construction equipment; properly tune equipment; turn off diesel equipment while not in use, and establish a staging zone away from the public for trucks waiting to load or unload (WSUEEP, 2004).
- Incorporate pedestrian and bicycle improvements into grade separation designs to encouraging walking and bicycling to increase physical activity and reduce driving.
- Prioritize at grade crossings with the highest vehicle volumes.

*Reporting.* The PCF HIA is under review by HIA stakeholders and will be publicly released in mid-2010. Because the legislation did not move forward in 2009, the HIA is not currently necessary for advocacy purposes in relation to the bill. However, this portion of the PCF HIA will likely be used to highlight the health impacts of grade separations in counties where many of those projects are proposed.

*Monitoring and outcomes.* The California legislature did not vote on the bill for political reasons, so the HIA was not used to impact the decision. This HIA may be used to affect other decision-making processes around air quality and traffic

congestion mitigation projects. It could also be used if the PCF is proposed in the future. This HIA involved a wide variety of stakeholders, including local and state public health and transportation agencies, environmental and health advocacy organizations, state legislators, air quality experts, and academics. It was a successful learning tool for conducting a HIA on a specific legislative policy and working collaboratively across disciplines. It will also likely be a starting point for other related HIAs.

#### Case study 3. A freeway expansion in Los Angeles, CA

#### Description of plan

Interstate 710 (I-710) is a vital transportation artery linking the Ports of Long Beach and Los Angeles to the rest of Southern California and beyond. As an essential component of the regional, statewide and national transportation system, I-710 serves both passenger and goods movement vehicles. Due to population growth, increases in cargo container transport, increasing traffic volumes, and aging infrastructure, I-710 experiences serious congestion and safety issues. In March 2005, the Los Angeles County Metropolitan Transportation Authority proposed plans for freeway expansion and improvement along an 18-mile span of I-710 to decrease congestion and improve safety.

The proposed expansion site passes through 15 cities and unincorporated areas in Los Angeles County, and is located close to residences and other sensitive sites, including schools, day care and senior centers, and hospitals. The majority low-income and communities of color that live along the I-710 corridor already experience higher levels of pollution than other areas in the county and state (EPA, 2008; Künzli et al., 2003; LACDPH, 2009). There are concerns about the existing and future health impacts for communities living along the I-710 corridor. A coalition of community groups, public agencies, and universities have been working together to bring health into the decision-making process for the I-710 project. HIP facilitated a HIA training for the coalition, using the I-710 freeway expansion as a case study.

Screening. A HIA was undertaken to evaluate freeway expansion in the context of the PCF legislation and also in working with partners around the I-710 expansion project. Screening results for the I-710 expansion are reviewed here (see Case Study 2 for PCF bill screening). Screening indicated that a HIA on the I-710 expansion would be useful because public health and community stakeholders were committed to understanding the health impacts and health was not being considered. There are potential health equity implications; more than 90% of the residents identify as Latino, nearly half of residents live at or below 200% of the federal poverty level, and many of these residents display poor health outcomes, such as asthma and diabetes, potentially related to their proximity to the freeway (Census, 2000; LACDPH, 2009). There is an established decision-making process that a HIA could inform, as the I-710 would be going through the environmental review process that would require approval by Los Angeles Metro, the lead agency. The stated objectives of the project include developing transportation alternatives that would improve air quality; mobility, congestion and safety; and assessing alternative, green goods movement technologies. Based on this information, a HIA was believed to be of added value.

*Scoping.* At the training, participants began the process of developing the scope, which included identifying and prioritizing health determinants and defining research questions for each. Prioritized issue areas included air quality, congestion and mobility (including pedestrian safety), noise, jobs and economic development, and access to goods and public services.

Assessment. With urging from training participants, a HIA has been initiated to evaluate the potential impacts of the I-710 expansion. Because the PCF HIA used the detailed I-710 expansion plans in several of its analyses, those results were formative for the I-710 HIA and are presented as part of this case study even though some of the findings are not specific to the I-710 project. The PCF HIA examined how freeway expansion projects impact collisions, air quality, climate change, noise, and public transportation. Impacts related to air quality through changes in VMT and speed, induced travel, and increased proximity of residents to pollutants are presented here. Data was gathered from the following sources: peer-reviewed literature; government and industry-commissioned studies, standards; health department and transportation agency data; and advocacy reports. Analysis, which consisted of modeling and secondary data analysis, was conducted by HIP and the Los Angeles County Department of Public Health.

# a. Findings

Predictive analyses of the impacts of freeway expansion were based on the following two inputs: (1) The number of lane miles expected to be added (862) under California's Surface Transportation Improvement Program (STIP) between 2009 and 2014; (2) Proposed expansion plans for I-710 were used as an example for several analyses in the PCF HIA because the project is currently being planned and assessed for other environmental impacts.

VMT. Based on estimates of increases in VMT due to lane expansions from past studies, the HIA estimated there would be 3 billion (0.6%) more VMT in California over the next five years. According to the Federal Highway Authority (2007) increases in VMT lead to more emissions; therefore, this large an increase in VMT would negatively impact air quality.

*Speed.* Using empirical findings quantifying average increases in speed due to new lane miles, the HIA estimated a 100% increase in lane miles (as proposed for the I-710 expansion) would result in a 42% increase in speeds. A 2009 bottleneck analysis of I-710 indicates vehicles travel 39 mph on average (ATRI, 2009). A 42% increase in speeds means vehicles would be travelling at 55.4 mph after expansion. This increase in speed would improve air quality.

*Proximity to the freeway.* The HIA concluded there would be an increase in the number of people living and working within close proximity of I-710, as expanding the freeway without displacing any residents moves the edge of the freeway out by 72 feet; increasing the number of people exposed to vehicular emissions (Fine, 2009; LACDPH, 2009; LACMTA, 2009; Weiss, Personal Communication, September 4, 2009). This could lead to increases in respiratory ailments and cardiovascular disease for those residents, many of whom already suffer health disparities (Gunier et al., 2003).

Induced travel. The HIA found that freeway expansion might result in short-term regional air quality improvements based on short-term increases in certain speed ranges. However, such improvements could be eroded over the long-term by increases in VMT due first to route changes, and then to added trips, longer trips, and land use changes (Cervero, 2003; Cervero & Hansen, 2000; Dowling, Ireson, Skabardonis, Gillen, & Stopher, 2005; Hansen & Huang, 1997). Studies note that not accounting for induced travel in transportation modeling leads to an underestimation of air pollution averted by freeway expansion (Rodier, 2004). Additional VMT would contribute to increases in harmful air toxics and greenhouse gas emissions (FHWA, 2007). Using a US EPA metric to calculate greenhouse gas increases due to transportation and mobile sources of air emissions (EPA, 2005), the HIA estimated that freeway expansion in the entire state of California from 2009– 2015 could add 273,780 metric tons of carbon dioxide equivalent per year. It is unclear if the magnitude of the potential initial regional air quality improvements due to speed would be entirely offset by the changes due to increased VMT.

# b. Recommendations

Freeway expansion projects were found to be detrimental for long-term health outcomes. The following recommendations were made:

- When freeway expansions are proposed, conduct full analyses of health impacts and implement air pollution mitigations for adjacent communities.
- Require that freeway expansion environmental impact assessments take into account induced travel studies, including secondary and tertiary effects of lane mile additions.
- Use other mechanisms to alleviate congestion, such as transportation demand management strategies like public transportation, parking allowances, and high occupancy vehicle (HOV) lanes.

*Reporting*. While a comprehensive HIA has not been conducted on the I-710 project, efforts to develop the scope of research, understand existing conditions, and predict health impacts of freeway expansion have mobilized community members, public health agencies, and advocacy organizations, enabling them to inform decision-makers through letters, presentations, and fact sheets.

*Monitoring and outcomes.* Although a formal HIA has not yet been conducted, HIA tools and methods have influenced the decision-making process. The LA County Department of Public Health is now a formal "participating agency" on the project's EIA. Ongoing advocacy by community groups and other stakeholders has resulted in the adoption of a recommendation for the project's lead agencies to conduct and fund a HIA. This project has the potential to set an important precedent for the way health is considered in transportation projects. The work on this project is an example of community and advocacy groups working with public health departments and other agencies to influence public decisions.

# Discussion

HIA has strengths as a tool for improving the public's health and also has limitations. HIA can be a valuable tool to encourage decision-makers to consider the

impacts of planning and policy decisions on health outcomes and determinants, including air quality. HIA can make decision-makers aware of important healthrelated issues that typically receive little consideration, thereby improving decisionmaking processes by increasing transparency and providing mitigation strategies.

These case studies demonstrate how HIA can fit into land use and transportation decision-making processes and policy-making, and the benefits of doing so. The projects described established new collaborations between public health agencies, community groups, and other government agencies. Public health agencies increased their role in decision-making regarding plans and policies that are commonly considered "non-health" issues but have health impacts. Affected community residents were an integral part of the process, helping initiate HIA projects, define the scope of analysis, contribute to research, and communicate findings. Through the HIA process, community residents engaged in the decision-making processes and were empowered with data and tools with which to advocate on their own behalf. These projects considered health inequities by analyzing existing and potential disparities in exposure to air pollution by race/ethnicity, income, age and place. Community residents and public health agencies will use these analyses to inform decision-makers now and in the future.

Although these case studies highlight air quality, HIAs typically consider other environmental health issues, such as water quality and noise, and a variety of social issues, including housing, jobs, access to goods and services, and social cohesion.

In all HIA practice, there are challenges as well. Lack of familiarity with HIA required project teams in all examples take the time to educate and make the process responsive to a wide range of stakeholders. In addition, research and technical tools to respond to data needs are rapidly evolving, and are not necessarily standardized across locations. HIA is not a required practice; so while the desire may exist to initiate projects, the time and funding needed to organize and carry out the process is often not available. Proponents are forced to be creative in HIA coalition building, scoping, and execution. This challenge is reflected in the varied depth of analyses of the case studies presented here. Finally, sustaining community involvement in an extended and often technical process is an ongoing challenge for HIA practitioners. Developing creative approaches for stakeholders to participate and ensuring that HIA recommendations are both practical and resonant is crucial to maintaining participation.

#### Conclusion

Health impact assessment has proven to be a valuable methodology to supplement community development processes by promoting efforts to protect and improve community and population health. HIA can increase transparency and responsiveness of public agencies and decision-makers to community health concerns by providing evidence-based recommendations to improve land use planning and policy decisions. Finally, HIA reflects a model for upstream interventions to influence social and environmental determinants of health.

#### Note

 This estimation is based on MTC survey results and estimates of existing and proposed housing units. By adding 1590 new units with an average of 3.1 people per household (Census, 2000), there will be 4929 new residents within half a mile of the BART station. If the population of Pittsburg were to remain static, this would nearly double the amount of people who use public transit from 8.4% to 16%.

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