SFDPH Program on Health, Equity, and Sustainability
Urban Health and Place Team
Health Impact Assessment Tools – June 2009

The Urban Health and Place Team develops, applies and disseminates tools, research and expertise to assess environmental conditions and respond to urban health inequities and environmental policy gaps. Specific tools include:

- Healthy Development Measurement Tool
- Air Quality Measurement and Modeling
- The San Francisco Noise Model
- Pedestrian Environmental Quality Index
- Vehicle-Pedestrian Injury Collision Model
- Bicycle Environmental Quality Index
- Retail Food Availability Survey
- Neighborhood Completeness Indicator
- Pedestrian Flow Model

We use these tools and our general public health expertise to work with community stakeholders and government agencies to inform project development and policy-making and to improve the consideration of health and health inequities in decision-making. Please note that several of the tools/models listed below have preliminary products and are *still being refined*.

Name	Tool Description	SFDPH Staff Contact
Healthy Development Measurement Tool (HDMT)	The Healthy Development Measurement Tool (HDMT) is a comprehensive evaluation metric that supports the inclusion and consideration of health needs in urban land use plans and projects. The HDMT is comprised of three core components: 1) a "community health indicator system" to evaluate community health objectives and baseline neighborhood conditions, 2) a "healthy development checklist" that is used to evaluate land use plans and projects, and 3) a "menu of policy and design strategies" that can be used to make recommendations on how to improve baseline conditions and/or meet checklist targets. The HDMT explicitly connects public health to urban development planning in efforts to achieve a higher quality social and physical environment that advances health. Available at: www.theHDMT.org	Lili Farhang (415) 252-3988 lili.farhang@sfdph.org
Air Quality Measurement and Modeling	Motor vehicle air pollution is greater for those living close to busy roadways. Research shows that living close to high levels of traffic is associated with reduced lung function, increased asthma hospitalizations, asthma symptoms, bronchitis symptoms, and medical visits. SFDPH is attempting to assess the problem of traffic-related air pollution in a partnership with UC Berkeley School of Public Health. Using both modeling and monitoring to determine exposure to air pollutants at a local level, SFDPH is using the data to help planners and community groups understand potential exposures and craft solutions. SFDPH is interested in defining the distribution of diesel trucks and busses and their contribution to neighborhood diesel particulate exposures.	Tom Rivard (415) 554-8930 tom.rivard@sfdph.org
The San Francisco Noise Model	The San Francisco Noise Model is a set of tools including field measurements, evaluations and modeling which define current noise levels in SF communities with special emphasis on understanding the effects of traffic volumes on the acoustical environment. This information is used to assist in the implementation of State Building Code requirements associated with acoustical insulation of new residential construction. In addition, local community groups can use this information to advocate for sound walls, quieter busses, fewer trucks, and less mechanical equipment on commercial rooftops.	Tom Rivard (415) 554-8930 tom.rivard@sfdph.org

Pedestrian Environmental Quality Index (PEQI)	The Pedestrian Environmental Quality Index (PEQI) is an observational survey which quantifies street and intersection environmental factors empirically known to affect people's travel behaviors. PEQI includes five main pedestrian categories which embody important physical environmental factors: traffic, sidewalks, land use, intersections, and safety. SFDPH has applied the PEQI in various parts of SF including sections of the Eastern Neighborhoods, Treasure Island, the Excelsior, and Executive Park. PEQI findings inform neighborhood planning, prioritization of improvements through the land use and transportation planning, and environmental assessments.	Cyndy Comerford Scully (415) 252-3989 cyndy.comerford@sfdph.org
Vehicle-Pedestrian Injury Collision Model	The Vehicle-Pedestrian Injury Collision Model is a practical forecasting tool to predict changes in vehicle-pedestrian injury collisions associated with changes in traffic volume, land use, and additional environmental and demographic factors impacted by development. This multivariate, census tract-level model utilizes publicly available data, and variables for which data is routinely collected, analyzed and reported in local planning processes. SFDPH first piloted a simple bivariate model in Oakland, and then developed and refined a multivariate model for use in San Francisco. This tool can be used in conjunction with safety countermeasures to plan to prevent future pedestrian deaths and injuries. Model methods and findings were published in the peer-reviewed, scientific journal Accident Analysis & Prevention in January 2009.	Megan Wier (415) 252-3972 megan.wier@sfdph.org
Bicycle Environmental Quality Index (BEQI)	The Bicycle Environmental Quality Index (BEQI) is a quantitative observational survey to assess the bicycle environment on roadways and evaluate what streetscape improvements could be made to promote bicycling in San Francisco. The survey has 22 empirically-based indicators, each of which has been shown to promote or discourage bicycle riding and connectivity to other modes of transport. The BEQI is under development has been piloted in San Francisco neighborhoods including Lakeshore and Treasure Island as part of a community transportation plan.	Jennifer McLaughlin (415) 252-3879 jennifer.mclaughlin@sfdph.org
Retail Food Availability Survey	The Retail Food Availability Survey is a survey which assesses the availability of healthy and affordable foods within stores, and therefore within neighborhoods, to determine community food security. This survey aims to examine the availability of certain foods, all of which are components of the US Department of Agriculture's Thrifty Food Plan Market Basket, and other factors influencing food purchases within stores in low-income neighborhoods in San Francisco, California. The survey has been piloted in 55 stores within the designated boundaries of San Francisco's South of Market District.	Cyndy Comerford Scully (415) 252-3989 cyndy.comerford@sfdph.org
Neighborhood Completeness Indicator	Created as part of the HDMT, the Neighborhood Completeness Indicator (NCI) is a quantitative spatial assessment tool measuring the proximity of San Francisco residents to daily goods and services in their neighborhoods. Included in the NCI are 11 key public and 12 key retail services, necessary to meet the daily needs of neighborhood residents and to promote increased social interaction and increased walking and biking, thereby reducing daily vehicle trips and miles traveled. The NCI will be piloted this summer at Hope SF project sites to help identify service gaps in each neighborhood.	Jennifer McLaughlin (415) 252-3879 jennifer.mclaughlin@sfdph.org
Pedestrian Flow Model	The Pedestrian Flow Model is a practical forecasting tool which relates pedestrian activity at a street-level to modifiable environmental characteristics within developing and established mixed-use neighborhoods in San Francisco. The model is currently under development and will be used to estimate pedestrian counts on streets segments based on a set of built environment variables. SFDPH will apply the model to planning scenarios and infrastructure proposals emerging out of ongoing planning efforts in order to identify and prioritize enhancements to the pedestrian environment.	Cyndy Comerford Scully (415) 252-3989 cyndy.comerford@sfdph.org
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SFDPH Program on Health, Equity, and Sustainability
Urban Health and Place Team
Pedestrian Environmental Quality Index – June 2009

Pedestrian Environmental Quality Index (PEQI)

Description

The Pedestrian Environmental Quality Index (PEQI) has been developed to assess the quality of the physical pedestrian environment and inform pedestrian planning needs. The PEQI draws on published research and work from numerous cities to assess how the physical environment impacts on whether people walk in a neighborhood. The PEQI is an observational survey which quantifies street and intersection factors empirically known to affect people's travel behaviors, and is organized into five categories: traffic, street design, land use, intersections, and safety. Within these categories are 30 indicators that reflect the quality of the built environment for pedestrians and comprise the survey used for data collection. SFDPH aggregates these indicators to create a weighted summary index, which can be reported as an overall index or deconstructed by pedestrian environmental category (Table 1) or even by each indicator.

Table 1. PEQI Indicators by Pedestrian Environmental Category

Intersection Safety	Traffic	Street Design	Perceived Safety	Land Use
▪ Crosswalks ▪ Ladder crosswalk ▪ Countdown signal ▪ Signal at intersection ▪ Crossing speed ▪ Crosswalk scramble ▪ No turn on red ▪ Traffic calming features ▪ Additional signs for pedestrians	▪ Number of vehicle lanes ▪ Two-way traffic ▪ Vehicle speed ▪ Traffic volume ▪ Traffic calming features	▪ Width of sidewalk ▪ Sidewalk impediments ▪ Large sidewalk obstructions ▪ Presence of curb ▪ Driveway cuts ▪ Trees ▪ Planters/gardens ▪ Public seating ▪ Presence of a buffer	▪ Illegal graffiti ▪ Litter ▪ Lighting ▪ Construction sites ▪ Abandoned buildings	▪ Public art/historic sites ▪ Restaurant and retail use

Background and Development

SFDPH began developing the PEQI in order to meet the need for a practical method to evaluate existing barriers to walking and prioritize future investments for increasing pedestrian activity and safety in land use and urban planning processes. The PEQI includes street and intersection physical environmental indicators for which there was previous research demonstrating their importance for pedestrian safety or in promoting pedestrian activity. SFDPH is currently finalizing a report detailing the methodology used to develop the index, as well as examples of applications as refinements to the PEQI are continually made.

Collaborations/Constituencies Involved

SFDPH consulted national experts including city planners, independent planning consultants, and pedestrian advocates to develop the indicator weights and scores for each indicator category, based on survey responses regarding their importance for pedestrian environmental quality. Applications of the PEQI include assessments of physical pedestrian environmental conditions on Treasure Island in collaboration with the San Francisco Bicycle Coalition as a part of a community-based planning effort funded by CalTrans to create a walkable, bikeable Treasure Island. SFDPH has also used the PEQI in collaboration with PODER, UC Berkeley researchers, and environmental justice students to assess pedestrian conditions in the Excelsior neighborhood of SF. SFDPH has also and is currently applying the PEQI in health impact assessment work in select areas of San Francisco's Eastern Neighborhoods and Mid Market Area. As the PEQI is further refined, SFDPH hopes to engage planners, City agencies and community organizations to use the PEQI for transportation planning and as an evaluation tool.

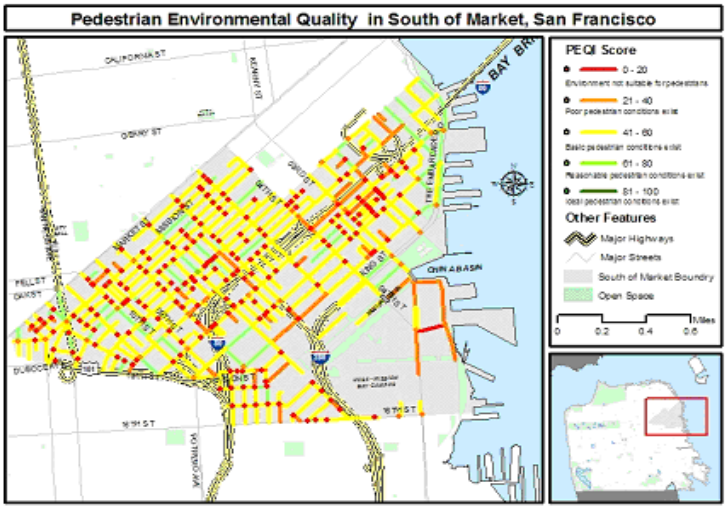
SFDPH Program on Health, Equity, and Sustainability
Urban Health and Place Team
Pedestrian Environmental Quality Index – June 2009

Relevance to Health and Health Equity

Environments that support walking, both as an alternative to driving and as a leisure activity, have multiple, potential positive health impacts. Environments that encourage walking while discouraging driving reduce traffic-related noise and air pollution – associated with cardiovascular and respiratory diseases, premature death, and lung function changes especially in children and people with lung diseases such as asthma. Quality, safe pedestrian environments also support a decreased risk of motor vehicle collisions and an increase in physical activity and social cohesion with benefits including the prevention of obesity, diabetes, and heart disease as well as stress reduction and mental health improvements that promote individual and community health. Given these implications, San Francisco residents should have equal access to quality, safe pedestrian environments throughout the city.

Applications and Policy Targets

The PEQI survey is designed to be simple to use in the field, requiring a trained observer to visually assess street segment and intersection features (Table 1) and check the corresponding box on the survey form. Once collected, data is entered into a user-friendly Microsoft Access database that automatically scores the data (see attachment). A PEQI score, reflecting the quality of the physical pedestrian environment, is created for each street segment and intersection in a defined area. An example of the mapped PEQI street segment scores is included below. SFDPH is developing a field manual with instructions on how to conduct the survey, use the PEQI Microsoft Access database, and geocode and display PEQI results (see map below).



For More Information

Please visit our website at http://www.sfphes.org/HIA_Tools_PEQI.htm.

A completed a public draft of *The Pedestrian Environmental Quality Index (PEQI): An assessment of the physical condition of streets and intersections DRAFT Methods Report – Fall 2008* can be found at:
http://www.sfphes.org/HIA_Tools/PEQI_Methods_2008.pdf

A copy of the training manual, database, survey form and shapefiles can be found at:
http://www.sfphes.org/HIA_Tools_PEQI.htm#

For Questions, contact:

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SFDPH Program on Health, Equity, and Sustainability
Urban Health and Place Team
Bicycle Environmental Quality Index – June 2009

Bicycle Environmental Quality Index (BEQI)

Description

The Bicycle Environmental Quality Index (BEQI) is a quantitative observational survey to assess the bicycle environment on roadways and evaluate what streetscape improvements could be made to promote bicycling in San Francisco. The survey has 22 empirically-based indicators, each of which has been shown to promote or discourage bicycle riding and connectivity to other modes of transport. Several of the indicators have been used in other bicycle indices from different regions in the country, while others are new concepts that have been found significant through other studies regarding healthy bicycle environments. SFDPH identified five main categories which embody important physical environmental factors for bicyclists: Intersection Safety, Vehicle Traffic, Street Design, Safety, and Land Use. Table 1 details each BEQI indicator under its broader environmental category. These indicators can be aggregated to create the final index (the BEQI), which can be reported as an overall index score, and/or deconstructed by the bicycle environmental categories shown in Table 1.

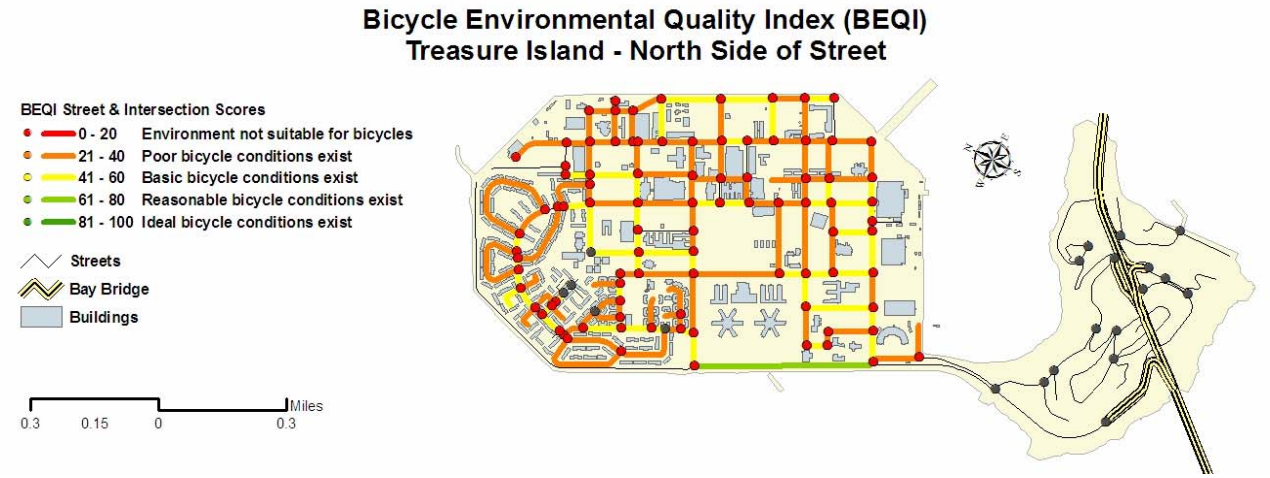
Table 1. BEQI Indicators by Bicycle Environmental Category

Intersection Safety	Vehicle Traffic	Street Design	Safety	Land Use
▪ Left turn bicycle lane ▪ Dashed intersection bicycle lane ▪ No turn on red sign(s)	▪ Number of vehicle lanes ▪ Vehicle speed ▪ Traffic calming features ▪ Parallel parking adjacent to bicycle lane/route ▪ Traffic volume ▪ Percentage of heavy vehicles	▪ Presence of a marked area for bicycle traffic ▪ Width of bike lane ▪ Bicycle lane markings ▪ Trees ▪ Connectivity of bike lanes ▪ Pavement type/condition ▪ Driveway cuts ▪ Street slope	▪ Bicycle/pedestrian scale lighting ▪ Presence of bicycle lane sign(s)	▪Line of site ▪Bicycle parking ▪Retail use

Background and Development

In June 2007, the SFDPH developed a physical survey to assess the quality of the bicycle network on Treasure Island called the Bicycle Environmental Quality Index (BEQI). The values of the indicators listed in Table 1 were obtained by sending a survey to bicycle experts and members of the bicycle community in July 2007. The survey was promoted through the San Francisco Bicycle Coalition newsletter where 88 respondents completed the survey. The survey responses were used to devise numerical scores and weights for the BEQI. The total score for each street segment and intersection will reflect the bicycle quality for the area the BEQI is applied to. Data collection for the BEQI is based on a visual assessment of street segments and intersections by a trained observer. Two SF neighborhoods, Lakeshore and Treasure Island, were chosen as the two pilot study areas for the BEQI. Both locations were chosen because of the need for bicycle facility improvements The San Francisco Bicycle Coalition (SFBC) has a specific interest in the Lakeshore area and recommended this location, which was surveyed first. A group of SFBC members volunteered to survey both areas and participated in a BEQI training. A detailed field and technical manual with instructions on how to conduct the survey is in development.

SFDPH Program on Health, Equity, and Sustainability
Urban Health and Place Team
Bicycle Environmental Quality Index – June 2009



Collaborations/Constituencies Involved

As the BEQI is being developed, SFDPH continues to work closely with SFBC to finalize the indicators which determine a safe and adequate bicycle environment. SFDPH will be requesting a BEQI review from other City agencies.

Relevance to Health and Health Equity

Cycling to work, school shopping, or leisure activities can be both a sustainable and time-efficient exercise regimen for maintaining acceptable levels of fitness. Studies have shown that bicycle commuters work more efficiently, arrive to work eager and alert, and due to a cyclists' improved health, they have fewer job-related injuries. The use of non-motorized transportation provides exercise, reduces fatal accidents, increases social contacts and reduces air and noise pollution. Increased exercise protects against heart disease and exercise and is also recognized to have mental health benefits. Furthermore, traffic reduction on streets increases safety and opportunities for social interaction between residents and workers.

Applications, Policy Targets, and Next Steps

Results from the BEQI reveal the relative quality of the biking environment at a street-level scale in select San Francisco neighborhoods. Use of the BEQI can translate environmental variables into a set of provisions for a healthy bicycle environment and a BEQI assessment can inform neighborhood planning and prioritize improvements through the land use plans and environmental assessments. An application of the BEQI asks the following questions:

1) Does a place have adequate and safe bicycle facilities throughout the neighborhood?
   - BEQI indicators are used to assess baseline conditions
2) Does a plan or project advance bicycle facilities in the area?
   - Plans/projects are assess to evaluate the extent to which BEQI indicators are present
3) What recommendations for planning policies, implementing actions, or project design would advance the bicycle environment?
   - Concrete, specific recommendations are provided to the plan/project based on the evaluation

To better understand how the BEQI could be used in future transportation planning it would be valuable to identify and meet with other agencies to provide feedback on the BEQI. In addition it would be beneficial to hold focus groups to determine if all indicators are present and to re-analyze the value of each indicator. From focus groups, the BEQI indicator scores could be potentially re-weighted to determine a more accurate score for bicycle conditions.

For more information, please visit:
www.sfphes.org

SFDPH Program on Health, Equity, and Sustainability

Urban Health and Place Team

Vehicle-Pedestrian Injury Collision Model – June 2009

Vehicle-Pedestrian Injury Collision Model

Description

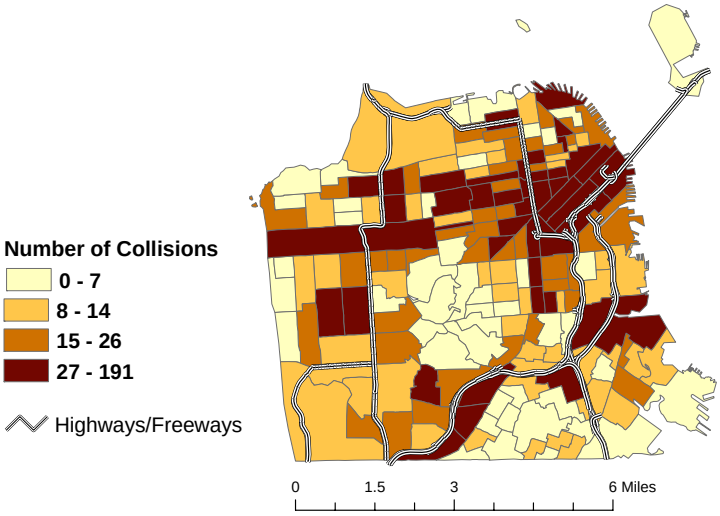
The Vehicle-Pedestrian Injury Collision Model predicts change in the number of collisions resulting in pedestrian injury or death associated with area-level changes in street, land use and population characteristics due to new development or transportation system changes. SFDPH uses this model to inform the need for pedestrian safety mitigations and improvements in the course of land use and transportation planning, to prevent people from being injured or killed by motor vehicles while walking on San Francisco streets. Significant predictors (census-tract level variables) in the current model are:

- Traffic volume
- Arterial streets (%, without MUNI transit)
- Neighborhood commercial areas (%, land area)
- Land area (square miles)
- Employee population
- Resident population
- Below poverty level (%, population)
- Age 65 and older (%, population)

Background and Development

Primary preventable predictors of vehicle-pedestrian injury collisions are environmental, including: traffic volume, higher vehicle speeds, pedestrian volume, and intersection and street design factors. To achieve safe, walkable communities, planning professionals need practical tools to assess and mitigate the impact of land use and development plans and projects on pedestrian safety, including vehicle-pedestrian collisions. Currently, the tools available to evaluate the impacts of land use planning on pedestrian safety conditions are limited to existing conditions assessments of collisions or qualitative analyses of the pedestrian environment.

Vehicle-pedestrian injury collisions: San Francisco, California census tracts (2001-2005)



Source: California Highway Patrol, Statewide Integrated Traffic Records System

SFDPH began developing this multivariate model to understand how changes in traffic and other environmental factors impacted by development decisions in SF predict vehicle-pedestrian injury collisions. The model was developed in collaboration with the UC Berkeley School of Public Health and sought input from health, planning, and transportation professionals, and community advocates for pedestrian safety – both individually and through presentations at City staff and task force meetings, professional conferences, and academic settings – throughout the process.

SFDPH Program on Health, Equity, and Sustainability
Urban Health and Place Team
Vehicle-Pedestrian Injury Collision Model – June 2009

SFDPH published the model findings in January 2009 in the professional scientific journal *Accident Analysis & Prevention,* and is now writing a second manuscript detailing the practical application of the model to the Eastern Neighborhoods Area Plans in San Francisco.

Collaborations/Constituencies Involved

SFDPH researchers developed the Vehicle-Pedestrian Injury Collision Model in collaboration with Edmund Seto, a UC Berkeley School of Public Health researcher and lecturer – drawing on traffic data generated from an on-going collaboration regarding the health impacts of traffic and transportation planning decisions.

As detailed above, constituencies for this work include public health, transportation, and planning professionals that could apply the model to anticipate the need for improvements, as well as pedestrian safety and community organizations that could advocate for its application to predict health impacts of planning decisions. SFDPH continues to engage with these constituencies regarding both our findings and potential practical applications to predict vehicle-pedestrian injury collisions based on area-level changes impacted by City planning decisions, including Congestion Pricing policy.

Relevance to Health and Health Equity

Walking, both as an alternative to driving and as a leisure activity, can be beneficial for human health by reducing the risk of motor vehicle collisions, reducing motor vehicle-related noise and air pollution, and increasing physical activity and social cohesion.

In San Francisco, neighborhoods with some of the lowest proportions of households owning cars are disproportionately burdened by streets with high traffic volumes, posing serious hazards to pedestrians. Those neighborhoods also have some of the highest concentrations of poverty and people dependent on walking or public transportation as their primary mode of travel.

Walking and public transit, as opposed to driving, are sustainable travel modes – and can be supported by safe environments that promote those behaviors. Land use and transportation planning processes provide an opportunity to assess pedestrian safety conditions for current and future San Francisco residents and workers, and to intervene to improve the pedestrian environment and support safe, sustainable transportation modes – provided there are tools to conduct these assessments.

Applications and Policy Targets

The main aim of the application of the San Francisco Vehicle-Pedestrian Injury Collision Model is to inform the need for pedestrian safety mitigations and improvements in the course of land use and transportation planning. Potential area-level interventions that improve pedestrian safety include planning and design decisions that reduce traffic volumes, speeds, and the need to drive, while promoting more walkable, safe environments including: transportation-land use planning coordination, transportation demand management measures, traffic calming, and street and intersection engineering countermeasures and amenities.[1]

SFDPH is currently using the model to assess potential impacts of Congestion Pricing policy being studied by the SF County Transportation Authority. SFDPH also used the model to analyze the impact of the Eastern Neighborhoods Area Plans using estimated changes in resident population and traffic volume from the SF Planning Department.[2] The plans are expected to produce both a modest increase in local area traffic volume and a more substantial increase in the resident population. The model predicted that the plans' implementation will result in increases in five-year pedestrian injury collision totals - by approximately 17% overall, or over 30 additional pedestrian injury collisions on those streets each year. SFDPH's analyses were included in the Pedestrian Safety Assessment of the Eastern Neighborhoods Environmental Impact Assessment.

[1] See the online TDM encyclopedia from the Victoria Transport Policy Institute for detailed information: http://www.vtpi.org/tdm.

[2] Bhatia R, Wier M, Weintraub J. 2007. *Impacts of Urban Land Use Development on Pedestrian-Motor Vehicle Collisions: An Application of the San Francisco Pedestrian Injury Model to Five Neighborhood Plans.* San Francisco, CA: San Francisco Department of Public Health. Available at: www.sfphes.org.

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