California's

High Injury Network and Planning for Zero

SAFETY DATA CASE STUDY

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U.S. Department of Transportation
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CITY OF Fremont

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16. Abstract The Strategic Highway Safety Plan (SHSP) is a critical part of the Federal Highway Safety Improvement Program. As part of the SHSP process, States are encouraged to take a broad view of safety needs and identify over-arching emphasis areas or "Challenge Areas" (e.g., roadway departure, bicyclists, or pedestrians) for improvement over a multi-year period. At a community level, Vision Zero and Safe System approaches to safety complement this strategic planning process. These approaches recognize that people make mistakes and that everyone has a right to move safely through the transportation system. California's use of High Injury Networks (HINs) is an example of these goals in practice. The State's SHSP implementation plan recommends HINs as an effective tool for community-level safety planning. As part of the SHSP implementation process, a Challenge Area Team convened a diverse group of stakeholders to develop recommendations for statewide guidance on HINs. Within the resulting report, the group included guidance for local agencies pursuing Vision Zero and safety planning. This report documented best practices from across California, and it provided recommendations for agencies to consider. Several examples from around the State, such as the communities of Fremont, Berkeley, and San Francisco, show how HINs can be an effective tool for safety planning at agencies of all sizes and capabilities.			
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Acronyms

Acronym	Description
BeST	Berkeley Strategic Transportation
Caltrans	California Department of Transportation
DOT	department of transportation
E&TS	Engineering and Traffic Survey
FHWA	Federal Highway Administration
HIN	High Injury Network
HSIP	Highway Safety Improvement Program
MPO	metropolitan planning organization
OEHHA	Office of Environmental Health Hazard Assessment
SCAG	Southern California Association of Governments
SFDPH	San Francisco Department of Public Health
SFMTA	San Francisco Municipal Transportation Agency
SHSP	Strategic Highway Safety Plan
SWITRS	Statewide Integrated Traffic Records Systems
TIMS	Transportation Injury Mapping System
TISS	Transportation-related Injury Surveillance System

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Executive Summary

The Strategic Highway Safety Plan (SHSP) is a critical part of the Federal Highway Safety Improvement Program. As part of the SHSP process, States are encouraged to take a broad view of safety needs and identify over-arching emphasis areas or "Challenge Areas" (e.g., roadway departure, bicyclists, or pedestrians) for improvement over a multi-year period. At a community level, Vision Zero and Safe System approaches to safety complement this strategic planning process. These approaches recognize that people make mistakes and that everyone has a right to move safely through the transportation system. California's use of High Injury Networks (HINs) is an example of these goals in practice. The State's SHSP implementation plan recommends HINs as an effective tool for community-level safety planning. As part of the SHSP implementation process, a Challenge Area Team convened a diverse group of stakeholders to develop recommendations for statewide guidance on HINs. Within the resulting report, the group included guidance for local agencies pursuing Vision Zero and safety planning. This report documented best practices from across California, and it provided recommendations for agencies to consider. Several examples from around the State, such as the communities of Fremont, Berkeley, and San Francisco, show how HINs can be an effective tool for safety planning at agencies of all sizes and capabilities.

Introduction

The Strategic Highway Safety Plan (SHSP) is a critical part of the Federal Highway Safety Improvement Program (HSIP) (FHWA, 2021a). As part of the SHSP process, States are encouraged to take a broad view of safety needs and identify over-arching emphasis areas or "Challenge Areas" (e.g., roadway departure, bicyclists, or pedestrians) for improvement over a multi-year period. These plans inform the priorities for State departments of transportation (DOTs) and local agencies for HSIP funding, and they also provide an avenue for multi-disciplinary and multi-jurisdictional collaboration. An SHSP can help align safety-related strategies with a focus on equity and effectiveness, as well as provide a means for State transportation agencies to communicate with their regional and local stakeholders.

At a community level, Vision Zero is an approach to safety that complements this strategic planning process. Vision Zero is a strategy aimed at eliminating all traffic fatalities and severe injuries, while increasing safe, healthy, equitable mobility for all (Vision Zero Network, 2022). The Vision Zero strategy recognizes that people make mistakes and that everyone has a right to move safely through the transportation system. It also emphasizes a multi-disciplinary approach among planners, engineers, policymakers, and public health officials to reduce fatalities and serious injuries. This is accomplished through local and regional leadership, data-driven decision making, community engagement, and established timelines and goals. Through this combination of strategic planning and data, Vision Zero and the SHSP can align the aspirational components of a community's safety program with tangible and equitable project outcomes.

Purpose and Need

This case study presents an institutional approach to safety planning that begins at the strategic planning stage (i.e., the SHSP) and ultimately helps inform planning and policy at the local level. California's promotion and use of High Injury Networks (HINs) demonstrates how strategic planning can be used to support local governments as they implement safety planning policy and targeted projects to improve the built environment.

Target Audience

The target audience for the case study includes:

- Executive leadership.
- Stakeholders involved in the SHSP process (e.g., public health, education, and emergency response staff).
- Transportation professionals in planning, engineering, and safety.
- Local technical assistance program managers and staff.

Background

The California Department of Transportation (Caltrans) updated the State's SHSP in 2020 (Caltrans, 2021a). This update incorporated four guiding principles to improve upon the previous plan:

1. **Integrate equity:** Address institutional and systemic biases to not overlook traditionally underserved and vulnerable populations.
2. **Double down on what works:** Implement proven safety countermeasures that are highly effective at reducing fatalities and serious injuries (FHWA, 2021b).
3. **Accelerate advanced technology:** Encourage the use of advanced technology in the roadway through partnerships between multi-disciplinary stakeholders.
4. **Implement a Safe System approach:** Take a holistic view of the roadway, one that considers the individual and human vulnerabilities, to improve the built environment (FHWA, n.d.).

The update also recognized several high-priority Challenge Areas based on a review of fatal and serious injury crash data:

- Lane Departures.
- Speed Management/Aggressive Driving.
- Impaired Driving.
- Active Transportation (Bicyclists and Pedestrians).
- Intersections.

These high-priority Challenge Areas represent the best opportunity to reduce severe crashes in California. Caltrans organized Challenge Area Teams as part of the State's SHSP Implementation Plan to address each Challenge Area and support the SHSP's implementation (Caltrans, 2021b). The Challenge Area Team tasked with active transportation (both bicyclists and pedestrians) documented best practices for developing local HINs from across the State. This Challenge Area Team published recommended statewide guidance for developing and applying HINs for local safety planning.

HINs in California

HINs are a method for network screening. They are continuous street corridors and intersections with a history of severe crashes of similar type. San Francisco developed California's first HIN in 2013. The City analyzed 5 years of pedestrian crash data and determined that 60 percent of pedestrian fatalities and serious injuries occurred on only 6 percent of the City's road mileage. When San Francisco adopted Vision Zero in 2014, the City

expanded its HIN to include bicyclist and motorist fatalities and serious injuries. This became the Vision Zero HIN in 2015, noting that 70 percent of fatalities and serious injuries across all modes occurred on 12 percent of the City's network.

In spring 2020, the Southern California Association of Governments (SCAG), the metropolitan planning organization (MPO) representing the Los Angeles region, requested developing statewide guidance on HINs as part of the State's SHSP implementation. In fall 2020, a subset of the Bicycle and Pedestrian Challenge Area Team members began work on the proposed recommended guidance.

This multidisciplinary team included several public agencies:

- California Department of Public Health.
- Federal Highway Administration (FHWA).
- SCAG and the San Diego Association of Governments MPOs.
- University of California at Berkeley.
- The cities of Long Beach, Los Angeles, Oakland, Palmdale, San Francisco (including San Francisco County), and San Jose.

The team reviewed over 20 existing HINs in California, Oregon, and Washington State, and in 2021, they published the *Recommendations for California Statewide Guidance on High Injury Networks* (Custodio et al., 2021). This document provides three critical components: 1) methodology for developing HINs, 2) applicational guidance, and 3) connections to Vision Zero and Safe System approaches.

Methodology Components

Although some jurisdictions in California had adopted HINs prior to this publication, the SHSP implementation guidance aimed to standardize recommendations for all agencies in California. This consisted of eight core components:

1. **Years of crash data:** The HIN should typically use between 3 and 5 years of data with up to 10 for smaller jurisdictions.
2. **Share of road network:** The HIN should represent a subset of the road network (typically 5 to 20 percent of road mileage and no more than 50 percent).
3. **Level of analysis:** Corridors should be continuous, and individual corridors should have comparable crash patterns, design, and land use context.
4. **Collision density:** Corridors should capture a significant number of fatal and serious injury crashes (typically 40 percent or more).
5. **Roadway facility types:** The HIN should focus on roads which the agency has the ability to set speed limits or conduct enforcement.

6. **Equity:** The HIN should be conscious of disadvantaged communities. For instance, HINs may be concentrated in "Disadvantaged Communities" identified by California Senate Bill 535 as high scoring Census tracts in the California Office of Environmental Health Hazard Assessment's (OEHHA's) health screening tool, CalEnviroScreen 4.0 (OEHHA, 2018).
7. **Consideration of modes:** The HIN should consider all transportation modes.
8. **Maintenance:** The HIN should be revisited as conditions change, particularly speed limits, land use characteristics, or additional data.

For agencies or jurisdictions with a relatively small or sporadic number of crashes, the guidance also notes:

> "In cases where a jurisdiction experiences few collisions due to its size, systemic methodologies, which rely on prioritization based on high-risk roadway characteristics or other contextual factors…may be appropriate to include in the development of an HIN." (Custodio et al., 2021; p. 20)

Jurisdictional Guidance

In addition to the analysis methodology, the document provides a checklist of considerations for agencies applying HINs. This includes:

- **Technical readiness –** Who will use the HIN and do the resources exist within an agency to develop and maintain the HIN?
- **Data preparation –** Which datasets can and should be used?
- **Data cleaning and creating the HIN –** What data checks should be performed prior to HIN development and application of the recommended methodology.
- **Public engagement and community outreach –** How can local knowledge be incorporated to obtain qualitative data, and how can the HIN best be communicated to local stakeholders?
- **Maintenance –** What new information could be considered in the future and is there a plan for future updates?

In addition to a brief overview of existing statewide and publicly accessible crash databases, such as the Statewide Integrated Traffic Records System (SWITRS) and Transportation Injury Mapping System (TIMS) provided through the University of California at Berkeley, the guidance also touches on alternative data sources. These include incident reports available through police, fire, and public health departments. The guidance also notes limitations with these data, such as self-reporting biases and resource requirements.

Connections to Vision Zero and a Safe System

The guidance notes the strong similarities between Vision Zero and a Safe System approach. Both strategies share an emphasis on reducing speed and the kinetic energy associated with a collision, and they acknowledge that the transportation system should accommodate all users and consider that mistakes are inevitable. HINs are valuable in the planning process as a record of existing conditions and potential needs. They help practitioners understand when and where issues are present, who is affected by safety concerns, and why crashes might be happening.

A key connection of HINs with Vision Zero and the Safe System approach involves traffic speed setting. California traditionally relies on 85th-percentile speeds for setting speed limits. Historically, there has been very little range in the discretion that local planners and engineers could use when setting posted speed limits. However, efforts by the State's Zero Traffic Fatalities Task Force have led to recent State legislation enabling more local discretion in setting speed limits, particularly on roads included on HINs (AB-43 Traffic safety, 2021).

Applications Across California

Several agencies across California have used HINs to support Vision Zero and safety planning in the State. This section provides a summary of a few noteworthy examples, although more examples can be found in the *Recommendations for California Statewide Guidance on High Injury Networks* document.

City of Fremont

The City of Fremont has actively pursued a Vision Zero program since 2015. Simple before and after studies have helped demonstrate that the approach has been effective, and the City has seen a marked decrease in the number of fatal and serious injuries since adopting Vision Zero (figure 1). Even as a moderate-sized city with a population of around 240,000, Fremont illustrates the potential for making data-driven decisions to support Vision Zero and a Safe System approach.

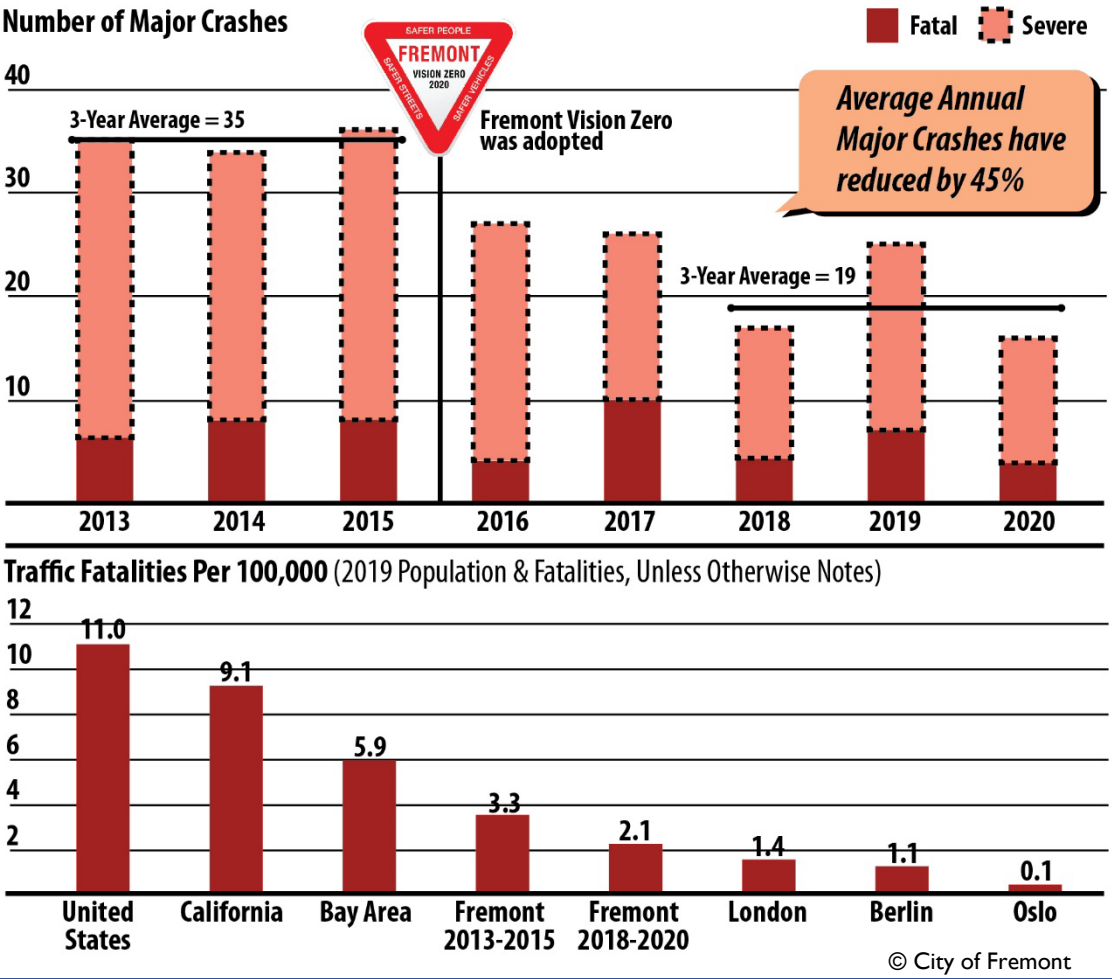

Figure 1. Graphic. Reduction in major crashes in Fremont since implementing Vision Zero.

Data analysis has been a key component of Fremont's approach, both for understanding crash characteristics as well as developing the City's HIN. The latter is especially important for determining where best to implement low-cost "quick-build" projects and other proven safety countermeasures. These quick-build projects are intended to be installed faster than larger capital improvements. They involve countermeasures aimed to reduce speeds and separate more vulnerable users (i.e., bicyclists and pedestrians) from motor vehicle traffic (figure 2).

Figure 2. Graphic. Example of quick build crosswalk improvements.[1]

Subsequent traffic surveys observed that implemented projects often had the desired effect of reducing speeds. As part of a mid-cycle Engineering and Traffic Survey (E&TS) in 2019, the City reviewed 86 segments with implemented projects to determine if changes to the posted speed limit were warranted. Through the E&TS, the City reduced the posted speed limit on 40 segments as a result of project-related changes to the roadway configuration and characteristics. With the passage of recent State legislation, local governments in California will have even more discretion for setting lower posted speed limits on HIN segments.

Community outreach and equity are key components of Fremont's approach as well. The future of Fremont's safety planning will continue to involve community outreach, as well as an emphasis on key vulnerable groups. These include bicyclists, pedestrians, persons over 65, and the unhoused. More information on Fremont's approach, recognized by the Institute of Transportation Engineers with the 2021 Transportation Achievement Award for Safety, can be found in the City's *Status Report and 2025 Action Plan* (City of Freemont, 2021).

City of Berkeley

The City of Berkeley adopted Vision Zero in 2018, hired a Vision Zero program manager in 2019, and adopted the Berkeley Vision Zero Action Plan in 2020. Like Fremont, the City of Berkeley's approach is a multi-disciplinary effort including coordination, public awareness, enforcement, and with an engineering emphasis on targeted improvements. This includes a mix of low cost quick-build projects and more capital-intensive proven safety countermeasures and designs (e.g., traffic calming, protected left turn signal phases, protected bikeways, and intersections, etc.). A key feature of the City's approach involves the prioritization of existing

[1] The California Manual on Uniform Traffic Control Devices stipulates that, "crosswalk markings near schools shall be yellow" (State of California, 2021; p. 682).

projects, including those in the five-year repaving plan and the Berkeley Strategic Transportation (BeST) Plan, according to the City's network of "High Injury Streets" (the City's equivalent of an HIN). This includes equity-driven prioritization according to community needs (figure 3).

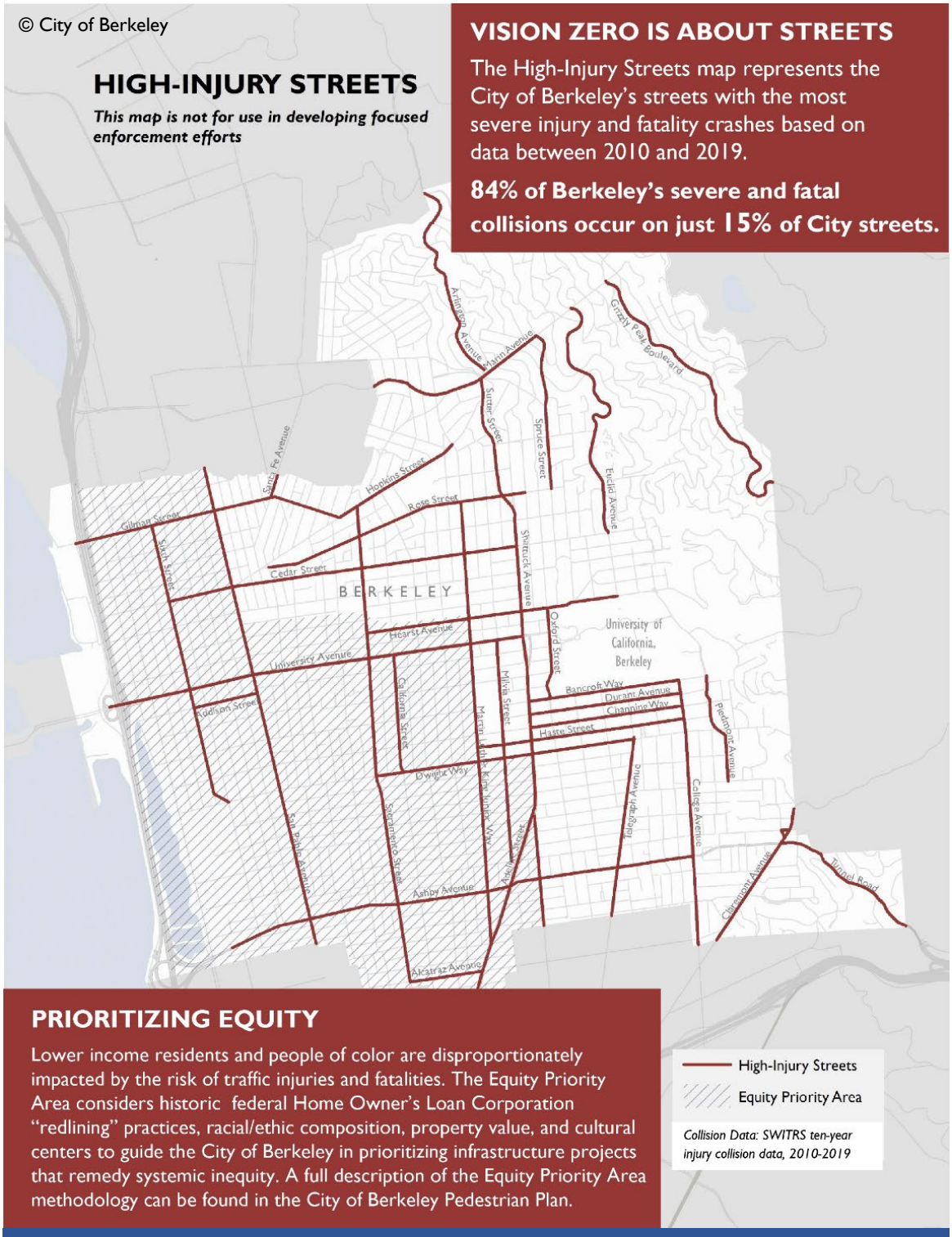

Figure 3. Graphic. Overlap of High Injury Streets and equity priority areas in Berkeley.

One notable example includes a quick build project along Martin Luther King Jr. Way in south Berkeley. This project falls on a High Injury Street connection within an equity priority area. The project aims to improve safety for pedestrians and provide convenient and safe access to transit.

Improvements include:

- Signal modifications to eliminate conflicts between left-turning vehicles and pedestrians crossing the street.
- Rectangular rapid-flashing beacon installations.
- Painted curbs to improve pedestrian visibility.
- Crosswalk lighting.
- Corner sidewalk "bulbouts."
- Median crossing islands.

Public outreach and construction for the project is anticipated to last less than two years with completion projected by the end of 2022.

City and County of San Francisco

Since producing California's first HIN in 2013, San Francisco has continued to innovate in recent years. The original HIN and each subsequent update have been a collaboration between the San Francisco Municipal Transportation Agency (SFMTA) and the San Francisco Department of Public Health (SFDPH). These updates also presented an opportunity for these key partners to reach out to other data stakeholders. In 2017 for instance, SFMTA and SFDPH worked with the only level-one trauma hospital in the city to create the Transportation-related Injury Surveillance System (TISS).

TISS is a comprehensive database of traffic-related injuries shared and maintained between key Vision Zero agencies. It includes data provided by the City's level-one trauma center, ambulance services and third-party operators, the City's medical examiner, and San Francisco Police and Fire Departments. Recent enhancements have allowed these agencies to incorporate emergency medical service response data into TISS. This has improved the City's ability to account for injuries that might otherwise go unreported in traditional crash databases. Furthermore, the HIN incorporates hospital-based injury data where possible to better reflect the true severity of a crash; this provides a clinical injury assessment to supplement the baseline visual assessment conducted by the reporting officer at the crash scene.

To support consistent data management, key stakeholders adopted the Vision Zero Traffic Fatality Protocol. This is a shared policy between Vision Zero partners to help standardize the definition of a traffic-related fatality across agencies (i.e., some agencies may deal with fatalities and injuries of all types, and this clarifies the definition of a traffic fatality). These partners update fatality records monthly and maps these locations along with the City's HIN and other

traditional crash databases (e.g., SWITRS). These data are available to the public via the City's Vision Zero dashboard and map.

Like other California cities, San Francisco's Vision Zero data and HIN helps the City deploy its quick build program. These projects typically include:

- Paint, traffic delineators, and street signs.
- Traffic calming and slow streets.
- Parking and loading adjustments.
- Traffic signal timing.
- Transit boarding islands.

Many of these projects are located in *Communities of Concern* (i.e., low-income communities, communities of color, seniors, persons with disabilities, and residents with limited English proficiency) as over half of all HIN mileage in the City is located in these neighborhoods. Evaluation is also a key component of San Francisco's Vision Zero data approach. The Vision Zero Safe Streets Evaluation Program assesses pre- and post-construction conditions associated with quick build project locations and reports the findings to executive leadership within two years of implementation. This approach evaluates the effectiveness of the individual project in question, as well as provides lessons learned and success stories to promote the broader quick build program.

Conclusions

The SHSP is developed through a cooperative process by assembling traffic safety stakeholders throughout a State. This extends beyond transportation planners and engineers and includes transportation-related fields such as public health. The SHSP is a data-driven decision-making process that uses emphasis areas to organize stakeholder activities and reduce fatalities and serious injuries. The Vision Zero and the Safe System approaches complement this strategic planning. These strategies contribute at a tactical level, encouraging local leadership and community outreach to reduce the kinetic energy of crashes and provide a more forgiving and safe transportation system.

California's use of HINs is an example of these goals in practice. The State's SHSP recommends HINs as an effective tool for community-level safety planning. As part of the implementation process, an SHSP Challenge Area Team convened a diverse group of stakeholders to develop recommended statewide guidance on HINs and guidance for local agencies pursuing Vision Zero and safety planning. This guidance documented best practices from across the State, and it provided recommendations for agencies to consider. This includes accessing data from statewide, readily accessible databases (e.g., SWITRS, TIMS, and CalEnviroScreen 4.0) that can contribute to HIN development.

The agency examples listed in that guidance, as well as in this case study, show how the HIN can be an effective tool for local safety planning. These high-priority locations can channel safety project funding where it is needed most, using both quick build improvements and larger capital-intensive projects that incorporate proven safety countermeasures. HINs can also be collated with other data sources to proactively address underserved or other disadvantaged communities in need. As more communities embrace Vision Zero and the Safe System approach to planning and engineering, HINs can serve as a practical tool for agencies of all sizes and capabilities.

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