DRISI

Data Collection of Bicycle Collisions Occurring on Nonpublic Roadways

Requested by
Paul Moore, Bicycle Facilities Unit

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The Caltrans Division of Research, Innovation and System Information (DRISI) receives and evaluates numerous research problem statements for funding every year. DRISI conducts Preliminary Investigations on these problem statements to better scope and prioritize the proposed research in light of existing credible work on the topics nationally and internationally. Online and print sources for Preliminary Investigations include the National Cooperative Highway Research Program (NCHRP) and other Transportation Research Board (TRB) programs, the American Association of State Highway and Transportation Officials (AASHTO), the research and practices of other transportation agencies, and related academic and industry research. The views and conclusions in cited works, while generally peer reviewed or published by authoritative sources, may not be accepted without qualification by all experts in the field. The contents of this document reflect the views of the authors, who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the California Department of Transportation, the State of California, or the Federal Highway Administration. This document does not constitute a standard, specification, or regulation. No part of this publication should be construed as an endorsement for a commercial product, manufacturer, contractor, or consultant. Any trade names or photos of commercial products appearing in this publication are for clarity only.

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Background

Gathering data about the collisions and crashes that occur on bikeways, walkways, shared-use paths and other nonpublic roadways can be challenging. Many of these facilities are not in a roadway right of way and fall outside the jurisdiction of local and state law enforcement officials. As a result, collisions occurring on these facilities are underreported. Caltrans is seeking information about the bicycle collision and crash data collection and reporting practices of agencies managing nonpublic roadways where bicycling occurs.

To gather information for this gap in bicycle collision data, CTC & Associates distributed online and email surveys to selected California cities, counties and regional planning organizations. The surveys sought information about agency practices in reporting on the bicycle collisions that occur on a range of nonpublic roadways. Contacts made to selected state and national organizations sought to supplement survey results.

Summary of Findings

Limited responses to surveys were supplemented by contacts to representatives of state and national organizations expected to have experience with bicycle collision data and with the results of a limited literature search. Below is a summary of findings in five topic areas:

- Collision-related databases and tools.

- Ongoing research and analysis.

- Local and state practices.

- National practices.

- Related resources.

Collision-Related Databases and Tools

Three databases and tools play a prominent role in recording, managing, querying and mapping collision data in California:

- *Fatality Analysis Reporting System (FARS)*.This national database contains data regarding fatal injuries suffered in motor vehicle traffic crashes. FARS includes data related to bicycle collisions only if the collision involved a motor vehicle and resulted in a fatality. FARS does contain bicycle-related data for fatal crashes that occur on some nonpublic roadways.

- *Statewide Integrated Traffic Records System (SWITRS)*. This California database, maintained by California Highway Patrol (CHP), captures data from CHP's Traffic Collision Report. Data from crashes (including bicycle crashes) on nonpublic roadways is not typically entered in SWITRS.

- *Transportation Injury Mapping System (TIMS)*. This online system was developed by Safe Transportation Research and Education Center (SafeTREC) to conduct a geographic analysis of the collision data in SWITRS. Various tools present the geocoded data and allow the user to visualize collisions by specific factors.

Currently, none of these systems serves as a comprehensive source for data on bicycle collisions occurring on nonpublic roadways.

A fourth tool—Street Story, a crowdsourcing platform developed by SafeTREC—moved from the pilot stage to statewide release in October 2018.

Ongoing Research and Analysis

Three California agencies are examining bicycle and other crash data:

- *California Department of Public Health*. The Crash Medical Outcomes Data (CMOD) program uses probabilistic linkage software to link crash data from SWITRS with medical data (hospitalizations and emergency department visits). The lack of data associated with bicycle collisions on nonpublic roadways in SWITRS precludes linkage of comprehensive bicycle crash data with nontraffic-related hospitalization data.

- *SafeTREC*. SafeTREC's mission is "the reduction of transportation-related injuries and fatalities through research, education, outreach and community service." A co-director of SafeTREC reported on future research expected to access emergency medical services (EMS) or hospital data to assess the underreporting of bicycle collisions. He noted, however, that location data in these records lacks precision.

- *Santa Cruz County*. Santa Cruz County Community Traffic Safety Coalition (CTSC) collects anecdotal data from media reports, personal accounts and other reported sources for all fatal and injury crashes in connection with the agency's Vision Zero initiative. CTSC has also mapped fatal and serious injury crashes using SWITRS data from 2010 to 2014.

Local and State Practices

Two surveys were distributed to gather information from California public agencies expected to have knowledge of or experience with bicycle collision data:

- The first online survey sought information from bicycle/pedestrian coordinators and parks and public works department contacts in 17 cities and six counties across California.

- A second, shorter survey was distributed by email to 30 additional potential respondents using contact information provided by Caltrans district bicycle/pedestrian coordinators.

The limited feedback from these surveys includes responses from three agencies, which is supplemented by the results of a discussion with a representative from California Department of Parks and Recreation:

- *City of Palo Alto*. The city collects data on bicycle collisions and reports it to SWITRS. The respondent provided additional information about reporting practices for specific nonpublic facilities; see page 16 for details.

- *Shasta County*. The county does not collect and report any bicycle collision data on nonpublic roadways and has no plans to do so.

- *City of Solvang*. The city does not collect and report any bicycle collision data on nonpublic roadways and has no plans to do so.

- *California Department of Parks and Recreation*. The agency's lead law enforcement officer believes that bicycle crashes in state parks are grossly underestimated. People

involved in these crashes typically require medical aid. Solo crashes tend to be most common. Park staff members are most likely to take reports of bicycle collisions and crashes that occur on bike paths and sidewalks where urban and wild lands interface. The lack of a records management system means the agency cannot conduct data analysis specific to bicycle-related crashes.

National Practices

This section of the report summarizes email exchanges and telephone interviews with representatives from four national agencies expected to have knowledge of or experience with bicycle collision data:

- *Federal Railroad Administration and Amtrak*. A Federal Railroad Administration (FRA) Region 7 grade crossing inspector provided a significant level of detail about FRA's collision reporting practices. Any impact, regardless of severity, between railroad on-track equipment and a highway user (in this case, a bicyclist) at a highway-rail grade crossing site is to be reported on Form FRA F 6180.57, Highway-Rail Grade Crossing Accident/Incident Report. The railroad involved in the collision is responsible for filing the report. See page 19 of this report for further details. (A representative from Amtrak Police Department reiterated some of the information provided by the FRA contact.)

- *National Park Service*. A federal lands transportation program coordinator reported that the Visitor and Resource Protection Division is responsible for reporting on collisions occurring on public and nonpublic roadways within national parks (multiple jurisdictions could be responsible for public roadways). Most bicycle crashes occur on park roadways. On park trails, bicycle crashes are reported as personal injuries rather than in a crash report. This means that a bicycle crash would not be reported if it did not result in a serious injury. All reports are submitted to a centralized database. Currently, there is not a systematic approach for addressing bicycle collisions on public and nonpublic roadways within park lands.

- *Rails-to-Trails Conservancy*. The director of trail development noted that local law enforcement is responsible for collecting and reporting data on the bicycle collisions that occur on rails-to-trails facilities. A Trails and Greenways listserv could be used to query local trail managers to gather additional information.

Related Resources

Publications and other resources are provided in three categories:

- *State and local agency bicycle crash reporting and assessment*. Research and data associated with bicycle crashes is provided for a range of locations, including North Carolina (including a crash data tool), Oregon and the cities of Boston, Denver and Minneapolis. A summary of the Police Data Initiative offers information about efforts in New York City; Tucson, Arizona; St. Paul, Minnesota; and Chapel Hill and Durham, North Carolina, to report on pedestrian and bicycle crashes.

- *Crowdsourcing bicycle collision data*. Publications in this section include an August 2017 journal article by SafeTREC staff and multiple publications produced by the Canadian developers of BikeMaps.org, a global crowdsourcing tool used for collision and near miss mapping. Also included are an April 2016 Georgia Department of Transportation study that examines the use of crowdsourcing to prioritize bicycle network improvements, and a January 2015 Federal Highway Administration white paper that considers how crowdsourcing applications and data are being applied.

- *International research.* Researchers in Sweden examine bicycle collisions in the context of insurance claims in a February 2017 journal article and address the underreporting of single-bicycle crashes in a 2014 conference paper. Attempts to validate self-reported bicycle crash data in New Zealand are the subject of a May 2013 journal article.

Gaps in Findings

While there is research activity and stakeholder interest associated with collecting data on bicycle collisions occurring on both public and nonpublic roadways, we uncovered no current comprehensive source or practice for gathering, reporting and analyzing this data. Publications cited in this report and several of the experts we contacted noted that bicycle collisions tend to be underreported on both public and nonpublic roadways. Additionally, the surveys conducted for this project received an extremely limited response.

Next Steps

Moving forward, Caltrans could consider:

- Contacting CHP to conduct an in-depth assessment of current practices associated with SWITRS and the agency's treatment of bicycle collisions on nonpublic roadways.

- Continuing to examine the linkage of medical and crash data to identify opportunities to track bicycle collisions on nonpublic roadways.
    - Consulting with SafeTREC to learn more about plans to use EMS or hospital data to assess underreporting of bicycle crashes.
    - Continuing engagement with California Department of Public Health to identify any plans to address bicycle collisions occurring on nonpublic roadways.

- Contacting Santa Cruz County to learn more about efforts to gather anecdotal collision data using alternative sources (media reports and personal accounts).

- Reviewing crowdsourcing as a method to gather collision data.
    - Consulting with SafeTREC to learn more about its Street Story platform.
    - Reviewing BikeMaps.org to identify elements of interest to Caltrans.
    - Examining in detail the crowdsourcing-related research included in this report.

Detailed Findings

Background

Gathering data on the collisions and crashes that occur on bikeways, walkways and shared-use paths and other nonpublic roadways can be challenging. Many of these facilities are not in a roadway right of way and fall outside the jurisdiction of local and state law enforcement officials. As a result, collisions occurring on these facilities are underreported.

Caltrans is seeking information about the bicycle collision and crash data collection and reporting practices of agencies managing nonpublic roadways where bicycling occurs. The facilities of interest include:

- Class I bikeways (located on exclusive rights of way for bicyclists and pedestrians).

- Other bikeways, walkways and shared-use paths.

- Park sidewalks.

- Private or park parking lots.

- Utility rights of way.

- Access, service or maintenance roads.

- Other nonpublic roadways where bicycle collisions and crashes occur.

Online and email surveys were distributed to selected California cities, counties and regional planning organizations to gather information about agency practices in reporting on the bicycle collisions that occur on nonpublic roadways. (The survey questions are provided in Appendix A.) Contacts made to selected experts supplemented survey results.

This Preliminary Investigation presents information in five categories:

- Collision-related databases and tools.

- Ongoing research and analysis.

- Local and state practices.

- National practices.

- Related resources.

Collision-Related Databases and Tools

The three databases and tools described below play a prominent role in recording, managing, querying and mapping collision data in California:

- Fatality Analysis Reporting System (FARS).

- Statewide Integrated Traffic Records System (SWITRS).

- Transportation Injury Mapping System (TIMS).

Currently, none of these systems serves as a comprehensive source for data on bicycle collisions occurring on nonpublic roadways.

A fourth tool—Street Story, a crowdsourcing platform—moved from the pilot stage to statewide release in October 2018.

Fatality Analysis Reporting System

Background

The Fatality Analysis Reporting System (FARS) is described as "a nationwide census providing NHTSA [National Highway Traffic Safety Administration], Congress and the American public yearly data regarding fatal injuries suffered in motor vehicle traffic crashes." A 2014 brochure describes the types of crashes tracked in FARS (see https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/811992):

> The Fatality Analysis Reporting System (FARS) contains data derived from a census of fatal traffic crashes within the 50 States, the District of Columbia, and Puerto Rico. To be included in FARS, a crash must involve a motor vehicle traveling on a trafficway customarily open to the public and must result in the death of at least one person (occupant of a vehicle or a non-motorist) within 30 days of the crash.

The brochure also describes the data included in the FARS database:

> The FARS database contains descriptions, in a standardized format, of each fatal crash reported. Each crash has 143 different coded data elements (as of 2013) that characterize the crash, the vehicles, and the people involved. The specific data elements may be modified slightly each year to conform to changing user needs, vehicle characteristics, and highway safety emphasis areas. Data comes primarily from the police accident report (PAR) in that State, but also from death certificates, State coroners and medical examiners, State driver and vehicle registration records, and emergency medical services records.

In 2000, FARS began recording geographic information systems location information for each fatal crash collected in the database.

Bicycle Collision Data in FARS

Rick Jefferson, a California Highway Patrol (CHP) FARS analyst, responded to an email inquiry about bicycle-related data in FARS.

Jefferson indicated that FARS includes data related to bicycle collisions only if the collision involved a motor vehicle and resulted in a fatality. To be considered a FARS crash, the crash in

question must take place on a trafficway open to the public. FARS does contain bicycle-related data for fatal crashes that occur on some nonpublic roadways (a "non-trafficway location"); for example, FARS will include data when a vehicle is entering a trafficway or when a vehicle is in a driveway access, and for crashes that take place in specific parts of parking lots.

Contacts

Rick Jefferson, Staff Services Analyst, Fatality Analysis Reporting System, California Highway Patrol, 916-843-4215, rjefferson@chp.ca.gov.

(Jefferson recommends contacting Marietta Bowen, State Data Reporting Systems Division, National Highway Traffic Safety Administration, 202-366-4257, marietta.bowen@dot.gov, if further information is desired.)

Related Resources

Fatality Analysis Reporting System (FARS), National Highway Traffic Safety Administration, U.S. Department of Transportation, undated.
https://www.nhtsa.gov/research-data/fatality-analysis-reporting-system-fars
This web site serves as a starting point to obtain a wide range of information about FARS.

2016 FARS/CRSS Coding and Validation Manual, National Highway Traffic Safety Administration, U.S. Department of Transportation, October 2017.
https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812449
This manual, which uses data from FARS and the Crash Report Sampling System (CRSS), describes the coding used in FARS. PC5, Trafficway Description (see page 496), includes Code 0, Non-Trafficway or Driveway Access, which is described below:

0 (Non-Trafficway or Driveway Access) is used when this vehicle is entering a trafficway but was not on a trafficway prior to its critical precrash event or when the vehicle was in a driveway access prior to its critical precrash event.

ANSI D16-2017: Manual on Classification of Motor Vehicle Traffic Crashes, 8th Edition, Association of Transportation Safety Information Professionals, December 2017.
https://www.transportation.gov/sites/dot.gov/files/docs/resources/government/traffic-records/304331/ansid16-2017.pdf
The main purpose of the American National Standards Institute (ANSI) Manual on Classification of Motor Vehicle Traffic Crashes is "to promote uniformity and comparability of motor vehicle traffic crash statistics now being developed in Federal, state and local jurisdictions."

Statewide Integrated Traffic Records System

Background

Below is a brief description of SWITRS, the online database used to track California crash data (see the SWITRS Users' Guide in **Related Resources** below for more information):

- Approximately 550 city police departments, sheriff offices, state department of parks and recreation police departments, and state university police departments and over 100 CHP areas investigate and report collisions. Data from crashes (including bicycle crashes) on nonpublic roadways is not typically entered in SWITRS.

- SWITRS captures data from CHP's Traffic Collision Report. These reports are entered into the SWITRS database and the data is checked for errors. The collision data is examined in connection with specific factors and summarized by year. Information is provided in Excel and PDF formats.

- The rules for gathering and managing SWITRS data are found in Highway Patrol Manual (HPM) 110.5, Collision Investigation Manual. The Internet SWITRS application can be used to obtain reports by jurisdiction, city or county location, or annual or quarterly reports. See **Related Resources** below for more information.

Contacts

Note: The CHP contacts listed below are expected to be able to address SWITRS-related questions but did not respond to requests for information for this report.

Sgt. Anthony Horner, California Highway Patrol, Collision Investigation Unit, ahorner@chp.ca.gov.

Dalila Fontana, Information Services Unit, California Highway Patrol, dfontana@chp.ca.gov.

Related Resources

SWITRS—Internet Statewide Integrated Traffic Records System, California Highway Patrol, 2018.
https://www.chp.ca.gov/programs-services/services-information/switrs-internet-statewide-integrated-traffic-records-system
From the web site: The Statewide Integrated Traffic Records System (SWITRS) is a database that serves as a means to collect and process data gathered from a collision scene. The Internet SWITRS application is a tool by which California Highway Patrol (CHP) staff and members of its Allied Agencies throughout California can request various types of statistical reports in an electronic format. Custom reports can be created by the user to capture data relevant to specified criteria such as Jurisdiction, Location, or Annual or Quarterly reports by date.

SWITRS Codebook, SWITRS Collision Raw Data Export Layout, SafeTREC, University of California, Berkeley, July 2018.
https://tims.berkeley.edu/help/files/SWITRS_codebook_20180719.doc
This document "provides a complete description of all the fields including the variable name and all possible values for the field."

Highway Patrol Manual (HPM) 110.5, Collision Investigation Manual, Chapter 1, Responsibilities and Policies, California Highway Patrol, revised June 2017.
See Attachment A.
This recently revised document describes the responsibilities for CHP and local agencies, when collision investigations are to be conducted, and when collisions are to be documented in a collision report. See page 1-8 for a list of the conditions that apply to documenting a collision in a Traffic Collision Report.

Highway Patrol Guide (HPG) 40.60, SWITRS Users' Guide, Chapter 1, undated.
See Attachment B.
This brief document provides an overview of SWITRS, its legal background and an input-output matrix.

Transportation Injury Mapping System

Background

TIMS was developed by the Safe Transportation Research and Education Center (SafeTREC) to conduct a geographic analysis of the collision data in SWITRS. Various tools present the geocoded data and allow the user to visualize collisions by specific factors.

Contact

TIMS team, tims_info@berkeley.edu.

Related Resources

Transportation Injury Mapping System, SafeTREC, University of California, Berkeley, 2018.
https://tims.berkeley.edu/
The web site provides a history of TIMS:

> SafeTREC began assessing the usage of the California Statewide Integrated Traffic Records System (SWITRS) by state and local agencies in 2003 on a project funded by the California Office of Traffic Safety (OTS). Specifically, the project looked at the needs of agencies to geocode and map the collisions in an efficient and simple manner. … Further grants from OTS allowed SafeTREC to develop a geocoding methodology and apply it to SWITRS data statewide. In order to distribute the geocoded SWITRS data, a web-based data query and download application was developed with the ability to display pin maps in Google Maps. A second application was designed to provide a more map-centric experience with other types of data layers and spatial analysis capabilities typically seen in a Geographic Information System (GIS).

TIMS includes several SWITRS-related tools:

SWITRS Query and Map Application, SafeTREC, University of California, Berkeley, 2018.
https://tims.berkeley.edu/help/Query_and_Map.php
From the web site: The SWITRS Query & Map application is a tool for accessing and mapping collision data from the California Statewide Integrated Traffic Records System (SWITRS).

SWITRS GIS Map, SafeTREC, University of California, Berkeley, 2018.
https://tims.berkeley.edu/help/GIS_Map_New.php
From the web site: The SWITRS GIS Map offers an interactive map-centric approach to viewing and querying SWITRS collision data.

Collision Diagram Tool, SafeTREC, University of California, Berkeley, 2018.
https://tims.berkeley.edu/help/Col_Diagram.php
From the web site: The Collision Diagram tool allows users to generate an interactive collision diagram. To access the tool, select a set of collisions in SWITRS GIS Map (for help

in spatially selecting collisions, see [here](#)). Next, click on the link to **Create Collision Diagram** that should now be included in the Results box.

Street Story

Background

SafeTREC has developed a new crowdsourcing tool—Street Story—that allows communities to self-report collisions, near misses or perceptions of safety for use in community education and engagement. Bakersfield and Kern County participated in a pilot of Street Story; SafeTREC expanded access to the tool to the entire state of California in October 2018.

Contacts

Jill Cooper, Co-Director, SafeTREC, University of California, Berkeley, 510-643-4259, cooperj@berkeley.edu.

Kate Beck, Research Associate, SafeTREC, University of California, Berkeley, katembeck@berkeley.edu.

Related Resource

Street Story: A Platform for Community Engagement, SafeTREC, University of California, Berkeley, 2018.
https://safetrec.berkeley.edu/programs/street-story-platform-community-engagement
From the web site:

Street Story is a community engagement tool that allows residents, community groups and agencies to collect information about transportation collisions, near-misses, general hazards and safe locations to travel. The platform and the information collected is free to use and publicly accessible. The tool was created by a team of city planners, public health professionals, engineers, social welfare experts and computer scientists at UC Berkeley's Safe Transportation Research and Education Center (SafeTREC).

Street Story includes a survey about roadway experiences and a publicly available dataset of community input with maps and tables that can be downloaded. The platform allows the public to share information about crashes or near-misses they have been in, and places they feel safe or unsafe traveling through.

Once a report has been made, the information is publicly accessible, and community groups and agencies can use this information as a part of community needs assessments or transportation safety planning efforts.

In October 2018, the tool became available at https://streetstory.berkeley.edu/ to any California city or county.

Ongoing Research and Analysis

The ongoing efforts of three agencies to examine bicycle and other crash data are highlighted below:

- California Department of Public Health.
- SafeTREC.
- Santa Cruz County.

California Department of Public Health

Background

The California Department of Public Health's Active Transportation Center provided the following description of its Crash Medical Outcomes Data program:

> The California Department of Public Health's Crash Medical Outcomes Data (CMOD) Program links crash data (California Highway Patrol—Statewide Integrated Traffic Records System) and medical data (Office of Statewide Health Planning and Development—Hospitalizations and Emergency Department visits). This approach provides additional detail on injury outcomes for crash victims treated in a hospital or emergency department. Through collaboration with partners such as the Emergency Medical Services Authority (EMSA) and Department of Motor Vehicles (DMV), the CMOD Program plans to expand the linkage between crash data and medical data by integrating additional data such as EMS response, trauma registry and driver history. Integrating additional multiple data sources strengthens the ability to identify risk and protective factors and their relationship to medical outcomes. CMOD is informed by the Division of Traffic Operations in alignment with the Traffic Records Coordinating Committee with support from the Office of Traffic Safety.

Using the LinkSolv probabilistic linkage software, CMOD links data from police traffic crash records to medical data from emergency departments and hospitals (a future update will link data from death files). As the Department of Public Health's web site indicates, "[p]robabilistic record linkage is useful when the data of interest come from two or more sources that do not have a common identifier for the same individual. Using information common to both the crash and medical files (like age, sex, date of injury) the linkage software mathematically decides whether two records are likely to refer to the same person."

Note: Survey and other findings described in this report indicate that bicycle collisions occurring on nonpublic roadways are less likely to be formally reported than bicycle collisions occurring on public roadways. The lack of this data in SWITRS precludes linkage of comprehensive bicycle crash data with nontraffic-related hospitalization data.

Contact

Victoria Custodio, Active Transportation Resource Center, California Department of Public Health, 916-552-9833, victoria.custodio@cdph.ca.gov.

Related Resources

Crash Medical Outcomes Data Project, Safe and Active Communities Branch, California Department of Public Health, March 2018.
https://www.cdph.ca.gov/Programs/CCDPHP/DCDIC/SACB/Pages/CrashMedicalOutcomesData(CMOD)Project.aspx
From the web site: The California Department of Public Health, Safe and Active Communities (SAC) Branch has implemented a project to integrate medical and crash data on traffic injuries. California's traffic safety and injury prevention communities need analyses of both crash and medical data focusing on person-level risk factors and outcomes to better understand how to prevent Californians from being injured and killed in traffic crashes.

This project responds to the current gap in knowledge by electronically linking police crash reports with medical sources like emergency department and hospital records and with death data. Other states have used this data linkage approach to show, for example, how seat belts and motorcycle helmets protect people from injuries. This project also responds to the need for instant on-line analysis of traffic injury data for policy evaluation and planning by making person-level crash data accessible via the web.

Crash Medical Outcomes Data, EpiCenter: California Injury Data Online, California Department of Public Health, 2010.
http://epicenter.cdph.ca.gov/ReportMenus/CrashMedicalOutcomesTable.aspx
From the web site: CMOD links data from law enforcement traffic crash records (i.e., scene investigations) to medical data (from emergency departments, hospitals). The level of linkage varies by year with 2014 having 58% of injury crash records linking to a medical record. To learn more about CMOD data linkage, go to Help.

There are valid reasons why some records do not link. Some crash victims are never treated in a hospital or emergency department, and thus there are no medical outcomes data to report. In other cases, records do not have enough information for a positive match. These linked data do not include a full count of all crashes or all crash injuries. For describing all traffic-related injuries, use EpiCenter's other queries. For describing all crashes on California roadways, use the California Highway Patrol (CHP) SWITRS Reports CHP-SWITRS.

"Crash Medical Outcomes Data Project: Bicyclist and Pedestrian Injuries," Carolyn Zambrano, *Active Transportation and Livable Communities Meeting*, February 15, 2018. See Attachment C.
Slides 12 and 13 of this meeting presentation show the high numbers of nontraffic-related bicyclist hospitalizations versus bicyclist traffic-related hospitalizations. Nontraffic-related hospitalizations are not linked to SWITRS reports.

SafeTREC

As its web site indicates, "SafeTREC's mission is the reduction of transportation-related injuries and fatalities through research, education, outreach and community service." David Ragland, SafeTREC co-director, responded to an email inquiry about SafeTREC's activities with regard to the collection and management of bicycle-related collision data. Below is a summary of Ragland's feedback.

Bicycle Collision Data Sources

Ragland noted that crashes (including bicycle crashes) on nonpublic roadways will not appear in SWITRS. He suggested that information for such crashes, if they involve injury, could be found in emergency medical services (EMS) or hospital data. SafeTREC is planning to access such data to assess its underreporting and may be able to review this data for bicycle crashes on nonpublic roads. Ragland noted that "[o]ne issue with EMS and hospital data is that the location data is often not precise."

Ragland further noted that "a number of studies suggest that bicycle injuries are underreported even when they occur on public roadways. This may be true especially if the event does not involve a vehicle. SafeTREC is also planning to look at this issue in an upcoming project using EMS or hospital data."

Contacts

Jill Cooper, Co-Director, SafeTREC, University of California, Berkeley, 510-643-4259, cooperj@berkeley.edu.

David Ragland, Co-Director, SafeTREC, University of California, Berkeley, 510-642-0655, davidr@berkeley.edu.

Related Resource

SafeTREC, SafeTREC, University of California, Berkeley, 2018.
https://safetrec.berkeley.edu/home
One of SafeTREC's emphasis areas is the crash-related data analysis and data tools of interest to Caltrans:

Data Analysis and Data Tools is a necessity for understanding safety/mobility in transportation/land use planning in California. SafeTREC will build on current large scale data efforts (geocoding 15 years of traffic crashes in California, adding pedestrian and bicycle infrastructure elements to the State Highway data base, building a statewide Tribal Road Safety Data Base) to construct state-of-the-art data analysis and mapping tools for use by government agencies, researchers and the general public.

Santa Cruz County

Santa Cruz County staff members responded to a brief email survey about county activities to track bicycle collision data (see Appendix A for the survey questions). Below is a summary of their responses.

Bicycle Collision Data Sources

Operated by the Santa Cruz County Health Services Agency and funded by the Santa Cruz County Regional Transportation Commission, the Community Traffic Safety Coalition (CTSC) collects anecdotal data from media reports, personal accounts and other reported sources for all fatal and injury crashes in connection with the agency's Vision Zero initiative (see **Related Resources** for more information about Vision Zero). Gathering this data was prompted by the county's interest in a "more current picture of crash data than what SWITRS can provide." While the anecdotal data has not been mapped, CTSC has mapped fatal and severe injury crashes using SWITRS data from 2010 to 2014 (see **Related Resources** for more information).

CTSC is also considering the use of a crowdsourcing platform (see page 11 of this report for information about Street Story, a SafeTREC crowdsourcing tool that recently became available statewide). Also of interest to CTSC is the connection of hospitalization-related data with collision data.

Contacts

Theresia Rogerson, Community Health Education, Santa Cruz County Health Services Agency, 831-454-4312, theresia.rogerson@santacruzcounty.us.

Anais Schenk, Transportation Planner, Santa Cruz County Regional Transportation Commission, 831-460-3209, aschenk@sccrtc.org.

Related Resources

Data and Reports, Community Traffic Safety Coalition of Santa Cruz County, Santa Cruz County Health Services Agency, 2018.
http://www.santacruzhealth.org/HSAHome/HSADivisions/PublicHealth/CommunityHealthEducation/CommunityTrafficSafetyCoalition/DataReports.aspx
From the web site: Each year, the CTSC gathers a variety of bike and pedestrian data to guide and inform our programs. Annual Bike Observation Surveys and Pedestrian Observation Surveys help us to identify behavior trends among cyclists, pedestrians and motorists alike. Focus groups give us an opportunity to hear directly from diverse demographic groups about their transportation experiences in Santa Cruz County.

CTSC staff also access county injury and fatality data collected by the California Office of Traffic Safety to create annual State of the County reports. Data includes the location of bike and pedestrian injury collisions, the ages of those involved, who was at fault and top collision factors.

Traffic Violence Data for Santa Cruz County, Community Traffic Safety Coalition of Santa Cruz County, Santa Cruz County Health Services Agency, undated.
http://sccgis.maps.arcgis.com/apps/MapSeries/index.html?appid=dee9693fa91b43fc8bda944a0695b80c
This mapping site provides information about high-injury corridors and severe injury and fatal collisions in Santa Cruz County from 2010 to 2014. The site also provides a one-page summary of 2017 data and a recording of the June 2017 Vision Zero Forum.

Vision Zero: CTSC Work Plan FY 2016-2018, Community Traffic Safety Coalition of Santa Cruz County, Santa Cruz County Health Services Agency, undated.
http://www.santacruzhealth.org/Portals/7/Pdfs/CTSC/CTSC%20Work%20Plan%20FY%2016-18.pdf
This work plan provides a brief history of the Vision Zero initiative and CTSC's plans for adopting a Vision Zero policy and implementing best practices to reduce traffic-related fatality rates.

Local and State Practices

Two surveys were distributed to gather information from California public agencies expected to have knowledge of or experience with bicycle collision data:

- The first online survey sought information from bicycle/pedestrian coordinators, and parks and public works department contacts in 17 cities and six counties across California.

- A second, shorter survey was distributed by email to 30 additional potential respondents using contact information provided by Caltrans district bicycle/pedestrian coordinators.

The survey questions are provided in Appendix A.

We also contacted representatives from two California state agencies to ask about their experience with bicycle collision data:

- California Department of Parks and Recreation.

- California Department of Water Resources (California Aqueduct Bikeway).

These contacts generated a limited response. Summarized below is feedback received from four agencies:

- City of Palo Alto.

- Shasta County.

- City of Solvang.

- California Department of Parks and Recreation.

(A summary of the survey responses received from Santa Cruz County begins on page 14 of this report.)

City of Palo Alto

Patty Lum, assistant police chief, City of Palo Alto, is the only one of 23 potential respondents to complete the entire first online survey. Lum noted that the city of Palo Alto collects data on bicycle collisions and reports it to SWITRS. (Note that other contacts providing information for this report have indicated that, for the most part, data associated with bicycle and other crashes occurring on nonpublic roadways is not represented in SWITRS.) Lum's other comments are summarized below.

Current Practice

Lum provided the following comments specific to the facilities addressed in the survey:

- *Class I bikeways and other bikeways, walkways and shared-use paths*. Citizens often do not report these collisions. Typically, the city completes a report only when an injury is involved, and completes reports for collisions occurring on city-owned property and parkways when requested by the bicyclist. Completed reports are submitted to SWITRS.

- *Park sidewalks*. When reported, the city completes a collision report and sends the information to SWITRS.

- *Private or park parking lots*. The city completes reports for injury or hit-and-run collisions in private parking lots; reports are completed for collisions that occur in public parking lots regardless of circumstances. The respondent noted that these types of collisions are not always reported to city staff. When they are reported, the city completes its report and submits it to SWITRS.

- *Utility rights of way*. Palo Alto owns its utilities and considers these facilities public property. The city gathers data on bicycle collisions or crashes when they are reported; the data is sent to SWITRS.

- *Access, service or maintenance roads*. The city also considers these locations to be public property and gathers data on bicycle collisions or crashes when they are reported; the data is sent to SWITRS.

- *Other nonpublic roadways*. When reported, the city completes a report for injury or hit-and-run collisions; the data is sent to SWITRS.

Recommendations for Other Agencies

Lum suggested that policies for pathways and nonpublic roadways mirror a city's private and public location collision policy. An agency might consider recording all collisions in its computer-aided dispatch system, even when not completing a report, to gather data that can be used for future statistical analysis.

Contact

Patty Lum, Assistant Police Chief, City of Palo Alto, 650-329-2685, patty.lum@cityofpaloalto.org.

Shasta County

Pat Minturn, public works director, Shasta County, completed only a portion of the first online survey. Minturn's survey responses are summarized below.

Current Practice

Shasta County does not collect and report bicycle collision data for the facility types listed below and has no plans to do so. Minturn offered the additional comments below:

- *Class I bikeways and other bikeways, walkways and shared-use paths*. The county has very few Class I or other bikeways; trails are more common in the county's rural areas. Any collision reports taken on these facilities are completed by CHP. The county is not notified of the event or the report.

- *Park sidewalks*. The county maintains three very small parks. The respondent is unaware of any collisions resulting in injury in these parks in the last 10 years.

Contact

Pat Minturn, Public Works Director, Shasta County, 530-225-5661, pminturn@co.shasta.ca.us.

City of Solvang

Matt van der Linden, public works director/city engineer, City of Solvang, addressed a series of questions in a brief email survey. His comments are summarized below.

Current Practice

The City of Solvang does not collect or report data in connection with bicycle collisions and crashes occurring on nonpublic roadways. Van der Linden is unaware of other agencies in his jurisdiction that collect and report this type of data. He referred us to the Santa Barbara County Sheriff's Department, which serves as the Solvang police force, to obtain more information about agency practices.

Contact

Matt van der Linden, Public Works Director/City Engineer, City of Solvang, 805-688-5575, mattv@cityofsolvang.com.

California Department of Parks and Recreation

Scott Elliott, the lead law enforcement officer with the Department of Parks and Recreation, addressed a series of questions in a brief telephone interview. The results of that discussion appear below.

Current Practice

Elliott believes that there is a "gross underestimation" of bicycle crashes occurring in state parks. People involved in the crashes that are reported typically require medical aid. Solo crashes tend to be most common.

The state park system has many back country trails, and park staff members are often unlikely to hear about incidents occurring on them. Park staff members are more likely to take reports of bicycle collisions and crashes that occur on bike paths and sidewalks where urban and wild lands interface. The time of day of the incident can play a role in how a collision report is routed; the agency taking the report may be the state park, local law enforcement or CHP. Elliott also noted that the reporting of incidents can be complicated by concurrent jurisdictions within state parks.

While the agency employs staff with law enforcement duties, it is not a formal law enforcement agency. The lack of a records management system means the agency cannot conduct data analysis specific to bicycle-related crashes. State park collision/crash reports, often associated with medical aid, are housed in agency files and not shared with local law enforcement agencies. The agency is working on development of a central records database to allow for the sharing of data among districts and potentially with other agencies.

Contact

Scott Elliott, Law Enforcement and Emergency Services, California Department of Parks and Recreation, 530-836-2380, scott.elliott@parks.ca.gov.

National Practices

Summarized below are the results of email exchanges and telephone interviews with representatives from national agencies expected to have knowledge of or experience with bicycle collision data:

- Federal Railroad Administration.

- Amtrak.

- National Park Service.

- Rails-to-Trails Conservancy.

(We did not receive a response to an email inquiry posed to a representative from the Pacific Regional Office of the Bureau of Indian Affairs.)

Federal Railroad Administration

Eric Walker, grade crossing inspector for Region 7 of the Federal Railroad Administration (FRA), responded to an email inquiry about FRA's policies and practices associated with bicycle collisions at grade crossings. Below is a summary of Walker's responses.

Current Practice

Any impact, regardless of severity, between railroad on-track equipment and a highway user (in this case, a bicyclist) at a highway-rail grade crossing site is to be reported on Form FRA F 6180.57, Highway-Rail Grade Crossing Accident/Incident Report. The railroad involved in the collision is responsible for filing the report. (Railroads with involvement limited to track maintenance responsibilities are not required to complete the form.) Once the incident occurs, the railroad has 30 days from the end of the month in which the incident occurs to file the report. For example, if the incident occurs on February 2, then the railroad has until March 31 to make its report.

Form FRA F 6180.57 collects details about the reporting railroad, location, the highway user involved in the accident or incident, and the rail equipment and crossing involved. Forms associated with 49 CFR Part 225, Railroad Accidents/Incidents: Reports Classification and Investigations, do not explicitly identify bicyclists involved in an accident or incident. If a bicyclist is involved, the railroad will identify the highway user type as "Other" and provide a narrative description.

Accessing Data

Once the form is submitted to FRA, it is processed and published to the external FRA Office of Safety Analysis web site (see **Related Resources** below). A three-month publication delay associated with form reporting and processing means that a February 2 incident report may not be posted to the web site until June 1 (if it was reported on March 31). Data can be accessed using standard reports for key statistics (see Section 5, Highway Rail Crossing Accidents) or by downloading the entire data set from http://safetydata.fra.dot.gov/OfficeofSafety/publicsite/on_the_fly_download.aspx (select Table Name = Highway Rail Accidents).

Using Data

The data is used for safety analyses by state departments of transportation (DOTs), researchers, other federal agencies and various other stakeholders. FRA uses this information to carry out its regulatory and enforcement responsibilities under the federal railroad safety statutes. FRA also uses this information for determining comparative trends of railroad safety and to develop hazard elimination and risk reduction programs that focus on preventing railroad injuries and accidents.

Circumstances Not Requiring a Report

Form FRA F 6180.57 will not be completed if the impact occurred at a grade crossing but did not involve railroad on-track equipment. However, since all casualties must be reported on Form FRA F 6180.55a, Railroad Injury and Illness Sheet, the bicyclist will be reported as a nontrespasser on this form, unless the bicyclist went around or through lowered gates. In the latter case, the bicyclist is reported as a trespasser.

Note: We also contacted the Amtrak Police Department to inquire about bicycle-related collisions (see **Contacts** below). Detective Jim Martino of the Amtrak Police Department reiterated some of the information provided by FRA and further noted that the majority of bicycle-related collisions with Amtrak trains occur at grade crossings.

Contacts

For FRA inquiries related to policy: Eric Walker, Grade Crossing Inspector, Region 7, Federal Railroad Administration, 916-297-3262, eric.s.walker@dot.gov.

For FRA inquiries related to accident, incident and operational data: Lindsay Peters-Dawson, Management Division, Federal Railroad Administration, 202-493-6413, lindsay.petersdawson@dot.gov.

Detective Jim Martino, Amtrak Police Department, 209-465-0613, martijj@amtrak.com.

Related Resources

49 CFR Part 225, Railroad Accidents/Incidents: Reports Classification and Investigations, Code of Federal Regulations, October 2016.
https://www.gpo.gov/fdsys/pkg/CFR-2016-title49-vol4/xml/CFR-2016-title49-vol4-part225.xml
This regulation provides guidance for the agency's treatment of railroad accident/incident reports.

Office of Safety Analysis, Federal Railroad Administration, September 2018.
http://safetydata.fra.dot.gov/OfficeofSafety/default.aspx
From the web site: The purpose of this site is to make railroad safety information including accidents and incidents, inventory and highway-rail crossing data readily available to the public. Site users can run dynamic queries, download a variety of safety database files, publications and forms, and view current statistical information on railroad safety.

FRA Guide for Preparing Accident/Incident Reports, Office of Railroad Safety, Federal Railroad Administration, May 2011.
https://safetydata.fra.dot.gov/officeofsafety/publicsite/Newregulation.aspx?doc=FRAGuideforPreparingAccIncReportspubMay2011.pdf
Guidance for completing Form FRA F 6180.57, Highway-Rail Grade Crossing Accident/Incident Report, begins on page 141 of the guide (page 148 of the PDF).

Highway-Rail Grade Crossing Accident/Incident; Accident Downloads on Demand: Data File Structure and Field Input Specifications, Office of Railroad Safety, Federal Railroad Administration, June 2011.
https://safetydata.fra.dot.gov/officeofsafety/publicsite/Newregulation.aspx?doc=gxirfile_EFFECTIVE_060111.pdf
This document provides the field names and definitions used in connection with Form FRA F 6180.57.

Grade Crossing Accidents in California: 201[5] – Present, Federal Railroad Administration, April 2018.
Provided separately to Caltrans.
This Excel workbook includes data on the bicyclist-involved grade crossing accidents in California from 2015 through January 2018. This document was provided by Eric Walker, grade crossing inspector for FRA's Region 7, who offered the following context:

> Please keep in mind that there are no specific designations for "bicyclists" in the grade crossing (GX) accident reports. Therefore, we have included all GX accidents from 2015 – Jan[uary] 2018 that include "bike," "bicycle" or "bicyclist" in the narrative. Please note our accident data has a three-month publication delay, so we only have data through the end of January 2018. In the attachment, the Summary tab totals the number of bicycle accidents by year compared to the total in [California], and the Raw Data tabs are the full data set. Columns CP through CT (narrative) will be most helpful.

National Park Service

Justin De Santis, federal lands transportation program coordinator for the National Park Service, addressed a series of questions in a brief telephone interview. The results of that discussion appear below.

Current Practice

The Visitor and Resource Protection Division is responsible for reporting on collisions occurring on public and nonpublic roadways within national parks. De Santis noted that there could be multiple jurisdictions responsible for public roadways; a local agency rather than park staff could be the responsible party filing a collision report.

Most bicycle crashes occur on roadways within the park. On park trails, bicycle crashes are not reported as vehicular crashes; rather, crashes are reported as personal injuries. Therefore, a bicycle crash would not be reported if it did not result in a serious injury. Typically there is no contact with a park ranger if a crash did not result in injuries. When bicycle crashes result in serious injury, a personal injury or vehicular crash report is completed, as appropriate. All reports are submitted to a centralized database, Incident Management Analysis and Reporting System (IMARS). Reports associated with a range of incidents, including vehicle crashes, criminal activity and personal injury, are submitted to IMARS.

De Santis reported that IMARS only began recording information from all data fields on paper reports in 2016. IMARS currently attaches personal information to the data fields maintained in the database, which limits the use of IMARS data outside of law enforcement. The presence of personal information in IMARS records means that anecdotal evidence rather than IMARS data is typically used by park staff trying to identify engineering solutions for bicycle collision hot spots. Currently, De Santis noted there is not a systematic approach for addressing bicycle collisions on public and nonpublic roadways within park lands.

Contact

Justin De Santis, Federal Lands Transportation Program Coordinator, National Park Service, Pacific West Region, 415-623-2278, justin_desantis@nps.gov.

(De Santis recommends contacting Matt Wallat, Visitor and Resource Protection Division, Golden Gate National Recreation Area, matt_wallat@nps.gov, for further information about reporting bicycle collisions.)

Related Resource

The Department of the Interior Incident Management Analysis and Reporting System (IMARS), Office of the Director of National Intelligence, June 2012.
https://www.dni.gov/index.php/who-we-are/organizations/ise/ise-archive/ise-mission-stories/2012-the-department-of-the-interior-incident-management-analysis-and-reporting-system-imars
This brief web posting describes IMARS.

Rails-to-Trails Conservancy

Kelly Pack, director of trail development for Rails-to-Trails Conservancy, responded to an email inquiry about the reporting of bicycle collisions on rails-to-trails bike trails.

Current Practice

Pack noted that local law enforcement is responsible for collecting and reporting data on the bicycle collisions that occur on rails-to-trails facilities, further noting that "[t]rails that are within federal or state lands may use different processes, but most trails are managed and maintained by local jurisdictions and do not have an associated regulatory federal agency that they may report this type of data to (I'm thinking about how the Federal Railroad Administration collects injury and fatality data on federally regulated railroad corridors). There are few truly 'privately owned/managed' rail-trails, so it really would be a matter of surveying individual trail managers, or perhaps contacting other state agencies (maybe bike/ped/trail coordinators and/or TAP/RTP [Transportation Alternatives Program/Recreational Trails Program] administrators) to see how the data is collected."

Engaging Local Trail Managers

Pack suggested posting follow-up questions to the Trails and Greenways listserv maintained by the conservancy (see **Related Resource** below).

Contact

Kelly Pack, Director, Trail Development, Rails-to-Trails Conservancy, 202-974-5148, kellyp@railstotrails.org.

Related Resource

Trails and Greenways, Yahoo Groups Listserv, Rails-to-Trails Conservancy, founded 1999. https://groups.yahoo.com/neo/groups/trailsandgreenways/info
From the web site: A service of Rails-to-Trails Conservancy, this list is for trail and greenway advocates, managers, professionals, developers and consultants seeking to get help with issues relating to their communities or projects; to share ideas and solutions; to share information about trail and greenway issues of common concern or interest; to post success stories about trail or greenway projects; and to post job, conference and publication announcements.

Related Resources

The publications and other resources below are organized into three categories:

- State and local agency bicycle crash reporting and assessment.

- Crowdsourcing bicycle collision data.

- International research.

State and Local Agency Bicycle Crash Reporting and Assessment

Embracing Pedestrian and Bicycle Crash Data, Police Data Initiative, 2018.
https://www.policedatainitiative.org/crash-data/
This web site provides information about efforts in New York City; Tucson, Arizona; St. Paul, Minnesota; and Chapel Hill and Durham, North Carolina, to publish detailed open data about pedestrian and bicycle crashes in these jurisdictions.

The About page describes the Police Data Initiative (PDI) as "a law enforcement community of practice that includes leading law enforcement agencies, technologists and researchers committed to engaging their communities in a partnership to improve public safety that is built on a foundation of trust, accountability and innovation. The PDI represents the great work and leadership of more than 130 law enforcement agencies who have released more than 200 datasets to date, and originated as a result of several recommendations in the Task Force on 21st Century Policing that focused on technology and transparency."

Research and Data, Division of Bicycle and Pedestrian Transportation, North Carolina Department of Transportation, undated.
https://www.ncdot.gov/divisions/bike-ped/Pages/research-data.aspx
From the web site:

> **Bicycle and Pedestrian Crash Data**
> The University of North Carolina Highway Safety Research Center has led the effort to collect more than 10 years of bicycle and pedestrian crash data and compile it into databases, reports and location information. The Bicycle and Pedestrian Division uses a crash data tool to provide details on that information in the form of maps, tables, geographic information system data and an interactive crash data map.

Related Resource:

> **North Carolina Pedestrian and Bicycle Crash Data Tool**, North Carolina Department of Transportation, undated.
> http://www.pedbikeinfo.org/pbcat_nc/
> *From the web site:* Use our online database to learn about these North Carolina police reported bicycle and pedestrian crashes. Information for almost 40,000 bicycle and pedestrian crashes with motor vehicles in North Carolina has been compiled to create an interactive database. You can look for standard data tables for certain years or geographic areas or create your own using our online query tool. Select bicycle data or pedestrian data below to begin.

Bicycle Crash Analysis: Understanding and Reducing Bicycle and Motor Vehicle Crashes, Transportation and Mobility Division, Denver Public Works, February 2016.
https://www.denvergov.org/content/dam/denvergov/Portals/705/documents/visionzero/denver-bicycle-motor-vehicle-crash-analysis_2016.pdf
This report describes Denver's crash reporting process and analyzes bicycle crash data, noting that the "total number of bicycle crashes is likely higher than the number of crashes captured by police reports. Bicycle crashes may go unreported if there were no major injuries or less than $1,000 of property damage occurred, if one or more parties were not aware of the need to report the crash, or if one or more parties were afraid to contact law enforcement." The report acknowledges the need for additional data but does not appear to offer solutions.

Cyclist Safety Report 2013, City of Boston, Massachusetts, May 2013.
https://www.cityofboston.gov/news/uploads/16776_49_15_27.pdf
From the introduction: The 2013 Cyclist Crash Report is comprised of multiple sections. The Findings section consolidates information from the BPD [Boston Police Department], EMS and Boston Bikes to provide a holistic picture of crashes in Boston. The report then makes recommendations based on the findings. Lastly, the document provides the original crash report prepared by the BPD and EMS. By offering the original information from each department, the reader can most accurately and fully understand the data.

Understanding Bicyclist-Motorist Crashes in Minneapolis, Minnesota, City of Minneapolis Public Works Department, January 2013.
http://www.minneapolismn.gov/www/groups/public/@publicworks/documents/webcontent/wcmsp-213248.pdf
See Chapter 3, Understanding the Data, which begins on page 10, for a brief discussion of unreported crashes and the use of hospital records to augment reported crash data and the limitations of this approach.

Bicycle and Pedestrian Travel Assessment Report, Dru van Hengel, Mike Tresidder and Mathew Berkow, Oregon Department of Transportation, July 2011.
Available at https://digital.osl.state.or.us/islandora/object/osl:39669
From the executive summary:

> The Bicycle and Pedestrian Travel Assessment Report was undertaken to compare ODOT bicycle and pedestrian data collection and utilization practices with agency goals and national trends. The Report provides an overview of national best practices, describes current Agency use of various types of pedestrian and bicycle data, and reports on Agency goals related to bicycle and pedestrian data. Finally, the report recommends immediate steps that can be undertaken by the Agency and the Transportation and Growth Management (TGM) Program to reach Agency-wide goals and objectives related to multi-modal transportation.

On page 18 of the report, the authors note that "[b]icycle and pedestrian collision data (gathered by outside agencies and coded by ODOT Crash Analysis and Reporting Unit) are generally under-reported. There may also be a need to further refine existing ODOT coding to aid in the analysis of collisions involving bicycles and pedestrians."

Crowdsourcing Bicycle Collision Data

"Investigating the Underreporting of Pedestrian and Bicycle Crashes In and Around University Campuses—A Crowdsourcing Approach," Aditya Medury, Offer Grembek, Anastasia Loukaitou-Sideris and Kevan Shafizadeh, *Accident Analysis and Prevention*, August 2017.
Citation at https://www.ncbi.nlm.nih.gov/pubmed/28847409
From the abstract: In this paper, the non-motorized traffic safety concerns in and around three university campuses are evaluated by comparing police-reported crash data with traffic safety information sourced from the campus communities themselves. The crowdsourced traffic safety data comprise of both self-reported crashes as well as perceived hazardous locations. The results of the crash data analysis reveal that police-reported crashes underrepresent non-motorized safety concerns in and around the campus regions. The spatial distribution of police-reported crashes shows that police-reported crashes are predominantly unavailable inside the main campus areas, and the off-campus crashes over-represent automobile involvement. In comparison, the self-reported crash results report a wide variety of off-campus collisions not involving automobiles, while also highlighting the issue of high crash concentrations along campus boundaries. An assessment of the perceived hazardous locations (PHLs) reveals that high concentrations of such observations at/near a given location have statistically significant association with both survey-reported crashes as well as future police-reported crashes. Moreover, the results indicate the presence of a saturation point in the relationship between crashes and PHLs wherein beyond a certain limit, an increasing number of traffic safety concerns may not necessarily correlate with a proportional increase in the number of crashes.

"Multiuse Trail Intersection Safety Analysis: A Crowdsourced Data Perspective," Ben Jestico, Trisalyn A. Nelson, Jason Potter and Meghan Winters, *Accident Analysis and Prevention*, Vol. 103, pages 65-71, June 2017.
Citation at https://www.sciencedirect.com/science/article/abs/pii/S0001457517301288
From the abstract:

Highlights:

- Characterized bike safety conditions at intersections between multiuse trails and roads.

- Used crowdsourced reports of bike collisions and near misses.

- Higher proportion of injuries was reported at trail-road intersections compared with road-road intersections.

- Bike volume and vehicle volume were both positively associated with incident frequency.

Abstract: Real and perceived concerns about cycling safety are a barrier to increased ridership in many cities. Many people prefer to bike on facilities separated from motor vehicles, such as multiuse trails. However, due to underreporting, cities lack data on bike collisions, especially along greenways and multiuse paths. We used a crowdsourced cycling incident dataset (2005–2016) from BikeMaps.org for the Capital Regional District (CRD), BC, Canada. Our goal was to identify design characteristics associated with unsafe intersections between multiuse trails and roads. 92.8% of mapped incidents occurred between 2014 and 2016. We extracted both collision and near miss incidents at intersections from BikeMaps.org. We conducted site observations at 32 intersections where a major multiuse trail intersected with roads. We compared attributes of reported incidents at multiuse trail-road intersections to those at road-road intersections. We then used negative

binomial regression to model the relationship between the number of incidents and the infrastructure characteristics at multiuse trail-road intersections. We found a higher proportion of collisions (38%, or 17/45 total reports) at multiuse trail-road intersections compared to road-road intersections (23%, or 62/268 total reports). A higher proportion of incidents resulted in an injury at multiuse trail-road intersections compared to road-road intersections (33% versus 15%). Cycling volumes, vehicle volumes and trail sight distance were all associated with incident frequency at multiuse trail–road intersections. Supplementing traditional crash records with crowdsourced cycling incident data provides valuable evidence on cycling safety at intersections between multiuse trails and roads, and more generally, when conflicts occur between diverse transportation modes.

"Comparing Crowdsourced Near-Miss and Collision Cycling Data and Official Bike Safety Reporting," Michael Branion-Calles, Trisalyn Nelson and Meghan Winters, *2662 Transportation Research Record*, pages 1-11, 2017.
Citation at https://trid.trb.org/view/1438393
From the abstract: Official sources of cyclist safety data suffer from underreporting and bias. Crowdsourced safety data have the potential to supplement official sources and to provide new data on near-miss incidents. BikeMaps.org is a global online mapping tool that allows cyclists to record the location and details of near misses and collisions they experience. However, little is known about how the characteristics of near-miss and collision events compare. Further, the question remains whether the characteristics of crowdsourced collision data are similar to those of collision data captured by official insurance reports. The objectives of this study were twofold: (a) to assess similarities and differences in near misses and collisions reported to BikeMaps.org and (b) to assess similarities and differences in collisions reported to BikeMaps.org and to an official insurance data set. Logistic regression was used first to model the odds of crowdsourced near-miss reports as opposed to collision reports and then to model the odds of crowdsourced as opposed to official insurance collision reports, as a function of incident circumstances. The results indicated higher odds of crowdsourced reports of near misses than of crowdsourced collision reports for commute trips, interactions with motor vehicles, and in locations without bicycle-specific facilities. In addition, relative to insurance reports, crowdsourced collision reports were associated with peak traffic hours, nonintersection locations, and locations where bicycle facilities were present. These analyses indicated that crowdsourced collision data have potential to fill in gaps in reports to official collision sources and that crowdsourced near-miss reporting may be influenced by perceptions of risk.

Using Crowdsourcing to Prioritize Bicycle Network Improvements, Kari E. Watkins, Chris LeDantec, Aditi Misra, Mariam Asad, Charlene Mingus, Cary Bearn, Alex Poznanski, Anhong Guo, Rohit Ammanamanchi, Vernon Gentry and Aaron Gooze, Georgia Department of Transportation, April 2016.
https://rosap.ntl.bts.gov/view/dot/31109/dot_31109_DS1.pdf?
From the abstract: Effort to improve the bicycle route network using crowdsourced data is a powerful means of incorporating citizens in infrastructure improvement decisions, which will improve livability by maximizing the benefit of the bicycle infrastructure funding and empowering citizens to be more active in transportation decisions. This research developed a free, GPS-enabled smartphone application to collect socio-demographic and route data of cyclists in Atlanta. The crowdsourced data were then used to model the factors influencing bicycle route choices of different types of cyclists as defined by their perceived safety and comfort with a facility. Finally, this research refined a quality-of-service measure for bicyclists based on the perceived level of traffic stress (LTS) that the users attach to the facility. The developed quality-of-service measure can be used by transportation professionals to compare alternative roadway

and bikeway designs using quantifiable variables such as speed limit, traffic volume and number of through lanes.

"BikeMaps.org: A Global Tool for Collision and Near Miss Mapping," Trisalyn A. Nelson, Taylor Denouden, Benjamin Jestico, Karen Laberee and Meghan Winters, *Frontiers in Public Health*, Vol. 3, 2015.
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4378118/
From the abstract: Due to limited forums for official reporting of cycling incidents, lack of comprehensive data is limiting our ability to study cycling safety and conduct surveillance. Our goal is to introduce BikeMaps.org, a new website developed by the authors for crowd-source mapping of cycling collisions and near misses. BikeMaps.org is a global mapping system that allows citizens to map locations of cycling incidents and report on the nature of the event. Attributes collected are designed for spatial modeling research on predictors of safety and risk, and to aid surveillance and planning. Released in October 2014, within 2 months the website had more than 14,000 visitors and mapping in 14 countries. Collisions represent 38% of reports (134/356) and near misses 62% (222/356). In our pilot city, Victoria, Canada, citizens mapped data equivalent to about 1 year of official cycling collision reports within 2 months via BikeMaps.org. Using report completeness as an indicator, early reports indicate that data are of high quality with 50% being fully attributed and another 10% having only one missing attribute. We are advancing this technology, with the development of a mobile App, improved data visualization, real-time altering of hazard reports, and automated open-source tools for data sharing. Researchers and citizens interested in utilizing the BikeMaps.org technology can get involved by encouraging citizen mapping in their region.

Related Resource:

> **BikeMaps.org**, undated.
> https://bikemaps.org/
> BikeMaps.org is a crowdsource tool for global mapping of cycling safety. Users add their own data on cycling crashes, near misses, hazards and thefts.

Crowdsourcing Pedestrian and Cyclist Activity Data, Amy Smith, Federal Highway Administration, January 2015.
http://www.pedbikeinfo.org/cms/downloads/PBIC_WhitePaper_Crowdsourcing.pdf
From the executive summary: This paper considers how crowdsourcing applications and crowdsourced data are currently being applied, as well as potential new uses for active transportation research and planning efforts of various types. The objectives of this white paper are to review existing crowdsourced bicycle and pedestrian data resources and crowdsourcing tools; discuss potential planning implementations of crowdsourced data for a sample of bicycle and pedestrian project types; and provide examples of how crowdsourcing is currently being used to inform decision-making. Potential issues related to crowdsourced data are also considered (e.g., quality, privacy concerns, participation rates, bias). The research presented here highlights a decreasing skepticism over the quality of volunteered, user-generated data provided by amateurs (as opposed to professionals) in light of a desire to open the lines of communication between the planning world and those affected by planning decisions, directly addressing (rather than being discouraged by) data limitations. The initiatives surrounding progressive data collection, management, and analysis are further reflected in the numerous conferences, meetups, and other events fostering collaboration between planners, developers, data scientists and others interested in applying critical thought and innovation in planning *(1).* While this paper reviews existing crowdsourcing techniques and their current applications in planning, the pace of technological change and rate of adoption in planning indicates that

planners will continue to develop and apply innovative approaches like crowdsourcing in response to continually changing community needs. This paper focuses on examples of current uses of crowdsourced data, crowdsourcing data suggestions, and data considerations.

International Research

"Detailed Description of Bicycle and Passenger Car Collisions Based on Insurance Claims," I. Isaksson-Hellman and J. Werneke, *Safety Science*, Vol. 92, pages 330-337, February 2017.
Citation at https://www.sciencedirect.com/science/article/pii/S092575351600045X
From the abstract: Today, cyclists constitute the highest percentage of severely injured road users in Sweden (Trafikverket, 2014). In particular, collisions between bicycles and motor vehicles often have the most serious outcomes. However, bicycle accidents are underreported in official databases (Elvik and Mysen, 1999) and information regarding accident details is very limited. The aims of this study were to investigate the frequency and severity of different accident scenarios and identify relevant factors and circumstances of these collisions. The detailed information about bicycle–car collisions at all levels of crash severity was obtained from insurance claims. A dataset of 882 collisions between bicycles and passenger cars in Sweden (2005–2012) was used for analysis (Isaksson-Hellman, 2012). Results showed that in over 78% of all bicycle–car collisions, the bicycle and car crossed each other's paths. In over 53% of these collisions, the cyclist crossed the roadway while following a bicycle path. In about half of these collisions the drivers reported that they did not see the cyclists beforehand. Collisions in which the bicycle and car were traveling in the same/opposite direction, the next most frequent type of collision, were less frequent (11%), but the injury severity was on average higher. These novel data, which cannot be found in other data sources, will enable new analyses, contributing to a better understanding of bicycle–car collisions in real road traffic situations.

"Integrating Road Safety Data for Single-Bicycle Crash Causation," Julia Werneke and Marco Dozza, *2014 International Research Council on the Biomechanics of Injury (IRCOBI) Conference*, 2014*.
http://www.ircobi.org/wordpress/downloads/irc14/pdf_files/52.pdf
From the introduction: In Sweden, more than 70% of all bicycle crashes are single-bicycle crashes, in which the bicyclist falls or collides with an obstacle, without any physical contact with another road user (e.g., vehicle, pedestrian, etc.). Despite this high share, very little research has addressed single-bicycle crashes thus far. Data used to investigate this type of crash to determine the circumstances, contributing factors and injuries are mainly from accident databases (e.g., STRADA) and surveys. However, it is also well-known that single-bicycle crashes are highly underreported in accident databases. As a result, only a limited understanding of the factors causing single-bicycle crashes can be achieved by continuing to query the accident databases. The aim of the BikeSING project presented here was to pilot a new approach of exploring single-bicycle crashes by combining multiple road safety data sets. In addition to the two accident data sources mentioned above, five additional road data sets were considered. By combining such data, BikeSING was able to show how we can get a more complete picture of single-bicycle crashes and a better understanding of the contributing factors. As a first step in this project, multiple road safety data sets were analyzed to identify research questions related to single-bicycle crashes which each data set alone could not answer. Next, research questions and an analysis plan were developed. As a final step, a preliminary analysis showing the feasibility and potential of combining road safety data was performed. An extensive analysis plan was developed as a basis for a further project called BikeSING2.

"Completeness and Accuracy of Crash Outcome Data in a Cohort of Cyclists: A Validation Study," Sandar Tin Tin, Alistair J. Woodward and Shanthi Ameratunga, *BMC Public Health*, Vol. 13, No. 1, May 2013.
https://bmcpublichealth.biomedcentral.com/articles/10.1186/1471-2458-13-420
From the abstract:

Background
Bicycling, despite its health and other benefits, raises safety concerns for many people. However, reliable information on bicycle crash injury is scarce as current statistics rely on a single official database of limited quality. This paper evaluated the completeness and accuracy of crash data collected from multiple sources in a prospective cohort study involving cyclists.

Results
Of the 2,590 cyclists who were resident in New Zealand at recruitment, 855 experienced 1336 crashes, of which 755 occurred on public roads and 120 involved a collision with a motor vehicle, during a median follow-up of 4.6 years. Log-linear models estimated that the linked data were 73.7% (95% CI [confidence interval]: 68.0%-78.7%) complete with negligible differences between on- and off-road crashes. The data were 83.3% (95% CI: 78.9%-87.6%) complete for collisions. Agreement with the self-reported data was moderate (kappa: 0.55) and varied by personal factors, cycling exposure and confidence in recalling crash events. If self-reports were considered as the gold standard, the linked data had 63.1% sensitivity and 93.5% specificity for all crashes and 40.0% sensitivity and 99.9% specificity for collisions.

Conclusions
Routinely collected databases substantially underestimate the frequency of bicycle crashes. Self-reported crash data are also incomplete and inconsistent. It is necessary to improve the quality of individual data sources as well as record linkage techniques so that all available data sources can be used reliably.

Contacts

CTC contacted or corresponded with the individuals below to gather information for this investigation.

National Organizations

Amtrak

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Federal Railroad Administration

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State Agencies and Organizations

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Appendix A: Survey Questions

Two surveys, presented below, were conducted for this project:

- An initial online survey sought information from 23 cities and counties in California expected to have experience with bicycle collision data.

- A second, shorter survey was distributed by email to 30 additional potential respondents using contact information provided by Caltrans district bicycle/pedestrian coordinators.

First Survey (Online)

Survey Introduction

This survey includes questions about your agency's practices for gathering data on bicycle collisions and crashes that occur on the nonpublic roadway facilities managed by your agency. If data is collected, it may be reported to the Statewide Integrated Traffic Records System (SWITRS), a database that serves as a means to collect and process data gathered from a collision scene in California. An agency's bicycle collision data may also be recorded and used in another manner.

You'll be asked about your agency's bicycle collision and crash data collection and reporting practices in connection with:

- Class I bikeways (located on exclusive rights of way for bicyclists and pedestrians).

- Other bikeways, walkways and shared-use paths.

- Park sidewalks.

- Private or park parking lots.

- Utility rights of way.

- Access, service or maintenance roads.

- Other nonpublic roadways where bicycle collisions and crashes occur.

For each facility type, you'll be asked to choose one of the following options and then provide details about your selection:

- We collect data and report it to SWITRS.

- We collect data but don't report it to SWITRS.

- We don't collect and report any data, and we have no plans to do so.

- We don't collect and report any data, but we have plans to do so.

- We don't collect and report any data. Reports are taken by another agency in our jurisdiction.

Class I Bikeways

Please describe your agency's bicycle collision and crash data collection and reporting practices in connection with Class I bikeways by selecting from the options below.

A. We collect data and report it to SWITRS.

B. We collect data but don't report it to SWITRS.

C. We don't collect and report any data, and we have no plans to do so.

D. We don't collect and report any data, but we have plans to do so.

E. We don't collect and report any data. Reports are taken by another agency in our jurisdiction.

If you selected Option A: Please describe how this data is collected and who is responsible for reporting it to SWITRS.

If you selected Option B: How is the bicycle collision and crash data your agency collects on Class I bikeways recorded, used or distributed?

If you selected Option C: Why does your agency not collect and report data on bicycle collisions and crashes that occur on Class I bikeways?

If you selected Option D: Please describe your agency's plans to collect and report data on bicycle collisions and crashes that occur on Class I bikeways.

If you selected Option E: Please identify the agency responsible for reporting on the bicycle collisions and crashes that occur on Class I bikeways in your jurisdiction.

Other Bikeways, Walkways and Shared-Use Paths

Please describe your agency's bicycle collision and crash data collection and reporting practices in connection with other bikeways, walkways and shared-use paths by selecting from the options below.

A. We collect data and report it to SWITRS.

B. We collect data but don't report it to SWITRS.

C. We don't collect and report any data, and we have no plans to do so.

D. We don't collect and report any data, but we have plans to do so.

E. We don't collect and report any data. Reports are taken by another agency in our jurisdiction.

If you selected Option A: Please describe how this data is collected and who is responsible for reporting it to SWITRS.

If you selected Option B: How is the bicycle collision and crash data your agency collects on other bikeways, walkways and shared-use paths recorded, used or distributed?

If you selected Option C: Why does your agency not collect and report data on bicycle collisions and crashes that occur on other bikeways, walkways and shared-use paths?

If you selected Option D: Please describe your agency's plans to collect and report data on bicycle collisions and crashes that occur on other bikeways, walkways and shared-use paths.

If you selected Option E: Please identify the agency responsible for reporting on the bicycle collisions and crashes that occur on other bikeways, walkways and shared-use paths in your jurisdiction.

Park Sidewalks

Please describe your agency's bicycle collision and crash data collection and reporting practices in connection with park sidewalks by selecting from the options below.

    A. We collect data and report it to SWITRS.

    B. We collect data but don't report it to SWITRS.

    C. We don't collect and report any data, and we have no plans to do so.

    D. We don't collect and report any data, but we have plans to do so.

    E. We don't collect and report any data. Reports are taken by another agency in our jurisdiction.

If you selected Option A: Please describe how this data is collected and who is responsible for reporting it to SWITRS.

If you selected Option B: How is the bicycle collision and crash data your agency collects on park sidewalks recorded, used or distributed?

If you selected Option C: Why does your agency not collect and report data on bicycle collisions and crashes that occur on park sidewalks?

If you selected Option D: Please describe your agency's plans to collect and report data on bicycle collisions and crashes that occur on park sidewalks.

If you selected Option E: Please identify the agency responsible for reporting on the bicycle collisions and crashes that occur on park sidewalks in your jurisdiction.

Private or Park Parking Lots

Please describe your agency's bicycle collision and crash data collection and reporting practices in connection with private or park parking lots by selecting from the options below.

    A. We collect data and report it to SWITRS.

    B. We collect data but don't report it to SWITRS.

    C. We don't collect and report any data, and we have no plans to do so.

    D. We don't collect and report any data, but we have plans to do so.

    E. We don't collect and report any data. Reports are taken by another agency in our jurisdiction.

If you selected Option A: Please describe how this data is collected and who is responsible for reporting it to SWITRS.

If you selected Option B: How is the bicycle collision and crash data your agency collects on private or park parking lots recorded, used or distributed?

If you selected Option C: Why does your agency not collect and report data on bicycle collisions and crashes that occur on private or park parking lots?

If you selected Option D: Please describe your agency's plans to collect and report data on bicycle collisions and crashes that occur on private or park parking lots.

If you selected Option E: Please identify the agency responsible for reporting on the bicycle collisions and crashes that occur on private or park parking lots in your jurisdiction.

Utility Rights of Way

Please describe your agency's bicycle collision and crash data collection and reporting practices in connection with utility rights of way by selecting from the options below.

   A. We collect data and report it to SWITRS.

   B. We collect data but don't report it to SWITRS.

   C. We don't collect and report any data, and we have no plans to do so.

   D. We don't collect and report any data, but we have plans to do so.

   E. We don't collect and report any data. Reports are taken by another agency in our jurisdiction.

If you selected Option A: Please describe how this data is collected and who is responsible for reporting it to SWITRS.

If you selected Option B: How is the bicycle collision and crash data your agency collects on utility rights of way recorded, used or distributed?

If you selected Option C: Why does your agency not collect and report data on bicycle collisions and crashes that occur on utility rights of way?

If you selected Option D: Please describe your agency's plans to collect and report data on bicycle collisions and crashes that occur on utility rights of way.

If you selected Option E: Please identify the agency responsible for reporting on the bicycle collisions and crashes that occur on utility rights of way in your jurisdiction.

Access, Service or Maintenance Roads

Please describe your agency's bicycle collision and crash data collection and reporting practices in connection with access, service or maintenance roads by selecting from the options below.

   A. We collect data and report it to SWITRS.

   B. We collect data but don't report it to SWITRS.

   C. We don't collect and report any data, and we have no plans to do so.

   D. We don't collect and report any data, but we have plans to do so.

   E. We don't collect and report any data. Reports are taken by another agency in our jurisdiction.

If you selected Option A: Please describe how this data is collected and who is responsible for reporting it to SWITRS.

If you selected Option B: How is the bicycle collision and crash data your agency collects on access, service or maintenance roads recorded, used or distributed?

If you selected Option C: Why does your agency not collect and report data on bicycle collisions and crashes that occur on access, service or maintenance roads?

If you selected Option D: Please describe your agency's plans to collect and report data on bicycle collisions and crashes that occur on access, service or maintenance roads.

If you selected Option E: Please identify the agency responsible for reporting on the bicycle collisions and crashes that occur on access, service or maintenance roads in your jurisdiction.

Other Nonpublic Roadways Where Bicycle Collisions and Crashes Occur

Please describe the other nonpublic roadways in your jurisdiction where bicycle collisions and crashes occur.

Please describe your agency's bicycle collision and crash data collection and reporting practices in connection with these locations by selecting from the options below.

    A. We collect data and report it to SWITRS.

    B. We collect data but don't report it to SWITRS.

    C. We don't collect and report any data, and we have no plans to do so.

    D. We don't collect and report any data, but we have plans to do so.

    E. We don't collect and report any data. Reports are taken by another agency in our jurisdiction.

If you selected Option A: Please describe how this data is collected and who is responsible for reporting it to SWITRS.

If you selected Option B: How is the bicycle collision and crash data your agency collects at these locations recorded, used or distributed?

If you selected Option C: Why does your agency not collect and report data on bicycle collisions and crashes that occur at these locations?

If you selected Option D: Please describe your agency's plans to collect and report data on bicycle collisions and crashes that occur at these locations.

If you selected Option E: Please identify the agency responsible for reporting on the bicycle collisions and crashes that occur at these locations in your jurisdiction.

Wrap-Up

1. What recommendations do you have for other agencies with regard to collecting and reporting data on bicycle collisions and crashes on nonpublic roadways?

2. If available, please provide links to documentation related to your agency's collection and reporting of bicycle collision and crash data. Send any files not available online to chris.kline@ctcandassociates.com.

3. Please use this space to provide any comments or additional information about your previous responses.

Second Survey (Email)

1. Does your agency collect and/or report data in connection with bicycle collisions and crashes occurring on nonpublic roadways?

2. If you responded "No" to the question above, are you aware of another agency in your jurisdiction that does collect and/or report this type of data? If yes, please provide the name of this agency.

3. Please provide contact information for the person we can contact to obtain more information about your agency's practices to collect and/or report data on bicycle collisions and crashes.