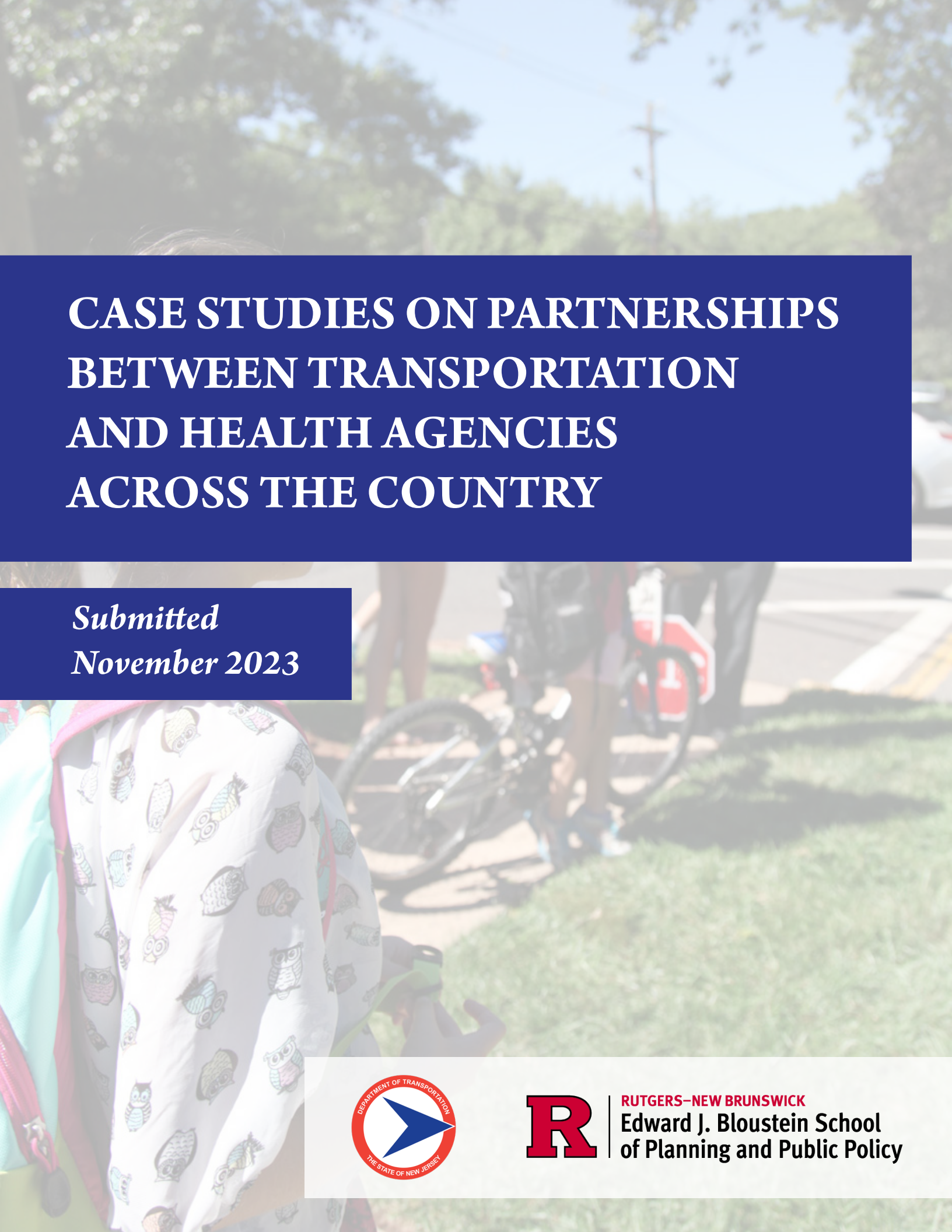

CASE STUDIES ON PARTNERSHIPS BETWEEN TRANSPORTATION AND HEALTH AGENCIES ACROSS THE COUNTRY

Submitted
November 2023

RUTGERS–NEW BRUNSWICK
Edward J. Bloustein School
of Planning and Public Policy

ACKNOWLEDGMENTS

The New Jersey Department of Transportation (NJDOT) Bicycle and Pedestrian Resource Center (BPRC) assists public officials, transportation and health professionals, and the public in creating a safer and more accessible walking and bicycling environment through primary research, education and dissemination of information about best practices in policy and design. The Center is funded and managed by the New Jersey Department of Transportation through funds provided by the Federal Highway Administration and is currently housed at the Alan M. Voorhees Transportation Center.

Susan G. Blickstein, LLC is a planning, policy, and public engagement firm that specializes in sustainable land use and transportation planning in the State of New York and New Jersey. It provides urban planning and strategic planning services to municipal entities, MPOs, state agencies and the private sector. Susan G. Blickstein, LLC is a certified DBE (Disadvantaged Business Enterprise) in New York and New Jersey.

The Alan M. Voorhees Transportation Center (VTC) is a national leader in the research and development of innovative transportation policy. Located within the Edward J. Bloustein School of Planning and Public Policy at Rutgers University, VTC has the full array of resources from a major research university on transportation issues of regional and national significance.

Report Authors
Siennah Yang, Susan G. Blickstein, LLC
Julian Wexer, Susan G. Blickstein, LLC
Susan G. Blickstein, AICP/PP, PhD, Susan G. Blickstein, LLC
Samuel Rosenthal, AICP, Alan M. Voorhees Transportation Center, Rutgers University

Report Contributors
Leigh Ann Von Hagen, AICP/PP, Alan M. Voorhees Transportation Center, Rutgers University
Md Shahadat Hossain, Alan M. Voorhees Transportation Center, Rutgers University

Alan M. Voorhees Transportation Center
Edward J. Bloustein School of Planning and Public Policy
Rutgers, The State University of New Jersey
33 Livingston Avenue, Fourth Floor
New Brunswick, NJ 08901

TABLE OF CONTENTS

OVERVIEW **1**
Health in All Policies (HiAP) 2
Health Impact Assessments (HIAs) 2
Social Determinants of Health (SDOH) 2
CURRENT EFFORTS IN NEW JERSEY AND BEYOND **4**
New Jersey Safety and Health Outcomes (NJ-SHO) Data 4
Healthy Community Planning New Jersey (HCP-NJ) 5
NJ Public Health Adapt 5
USDOT/CDC Transportation and Health Tool 6
Additional Health Mapping Resources in New Jersey and Across the United States 6
METHODOLOGY **6**
KEY FINDINGS AND RECOMMENDATIONS **7**
Key Findings 7
Recommendations for Increasing Health and Transportation Partnerships in New Jersey 8
CASE STUDIES **10**
Case Studies Summary Table 10
Massachusetts: Healthy Transportation Compact/Project Prioritization and Scoring Process 13
Minnesota: Equity and Health Assessment for the Highway 252/I-94 Corridor 17
Maryland Crash Outcome Data Evaluation System (CODES) 22
North Carolina Crash Injury Surveillance System (NC-CISS) 26
REFERENCES **30**
APPENDIX A: HEALTH MAPPING RESOURCES **34**
New Jersey Health Mapping 34
National Health Mapping Resources 37

OVERVIEW

Transportation has a profound impact on health. The way transportation systems are planned and designed shapes our built and social environments, providing or limiting opportunities to improve our health and well-being. A safe and multimodal transportation system enhances access to goods and services important for our health; conversely, a transportation system designed predominantly for private automobiles limits access to goods and services for people who do not own or drive a car. Research has shown that the availability and quality of bicycle and pedestrian infrastructure has a direct effect on the amount of active transportation activity, and higher rates of bicycling and walking for recreation and transportation have been shown to positively affect our physical and mental health (Brown et al., 2015; New Jersey Bicycle and Pedestrian Resource Center, 2022). Additionally, transportation also impacts health, often disproportionately in EJ Communities, through the risk of traffic crashes and injuries on roadways, as well as through exposure to transportation-related air, water and noise pollution. Understanding and strengthening connections between transportation and health can help agencies align goals and create financial efficiencies, leading to more effective and equitable transportation policies and planning decisions that improve health outcomes for all.

This report examines how states around the country incorporate and apply different data collection and analysis methods in partnerships between transportation and health agencies to proactively improve health and safety outcomes. While there are many ways of linking transportation and health initiatives on the state level, this research focuses on two types of partnerships. The first looks at how states incorporate health data in project selection and evaluation criteria as well as in the project scoping and planning processes. The second type of partnership looks at how health outcome data is linked with crash data through data linkage programs. In studying state-level data-sharing partnerships between transportation and health initiatives, this research can help to identify new areas of concern and strategies that could be applied in New Jersey, to improve not just public health and public transportation in the state, but quality of life as well.

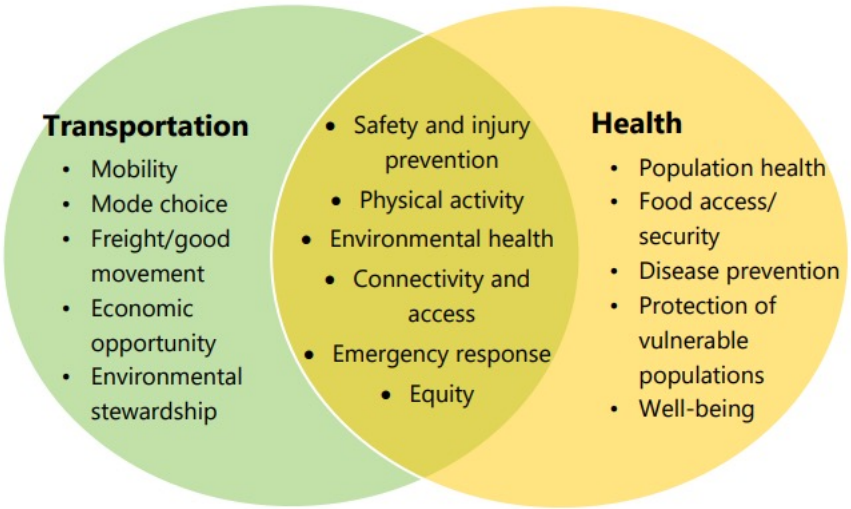

Figure 1. *Graphic by MnDOT showing the many areas where transportation and health intersect (Source: MnDOT)*

Health in All Policies (HiAP)

Health in All Policies (HiAP) is a collaborative approach that integrates health considerations into policymaking at all levels across sectors to improve the health of all communities and people. HiAP strategies help public health professionals work collaboratively with those in other disciplines to achieve goals that benefit all parties and promote health, equity, and sustainability.

The Society of Practitioners of Health Impact Assessment (SOPHIA) advances seven strategies for implementing HiAP:

1. Develop and structure cross-sector relationships.
2. Enhance workforce capacity.
3. Incorporate health in decision making processes.
4. Coordinate funding and investments.
5. Integrate research, evaluation, and data systems.
6. Implement accountability structures.
7. Synchronize communications and messaging.

An HiAP approach to decision-making can help establish collaboration across the public health and transportation sectors and offer a framework for continued partnership between the two disciplines. HiAP can also provide the context needed for catalyzing a cultural change wherein health-related factors are incorporated into transportation planning, policy, and decision-making processes.

Health Impact Assessments (HIAs)

Health impact assessments (HIAs) are procedures, tools, and methods that identify the health impacts of a proposed project, program, or policy decision. They recommend strategies to protect and promote public health through public engagement, equity considerations, short- and long-term vision, and the use of data. HIAs can support Health in All Policies goals by helping decision-makers, especially in non-health sectors, to understand the potential health-related impacts of different policy options. HIAs are a comprehensive way of analyzing potential health outcomes but can require resources that may not be available.

Social Determinants of Health (SDOH)

Social determinants of health (SDOH) refer to the conditions in the environments where people are born, live, work, and play that impact a range of health and quality-of-life outcomes and risks. The U.S. Department of Health and Human Services' (HHS) Healthy People 2030 initiative categorizes the social determinants of health into five domains:

1. Economic stability
2. Education access and quality
3. Health care access and quality
4. Neighborhood and built environment
5. Social and community context

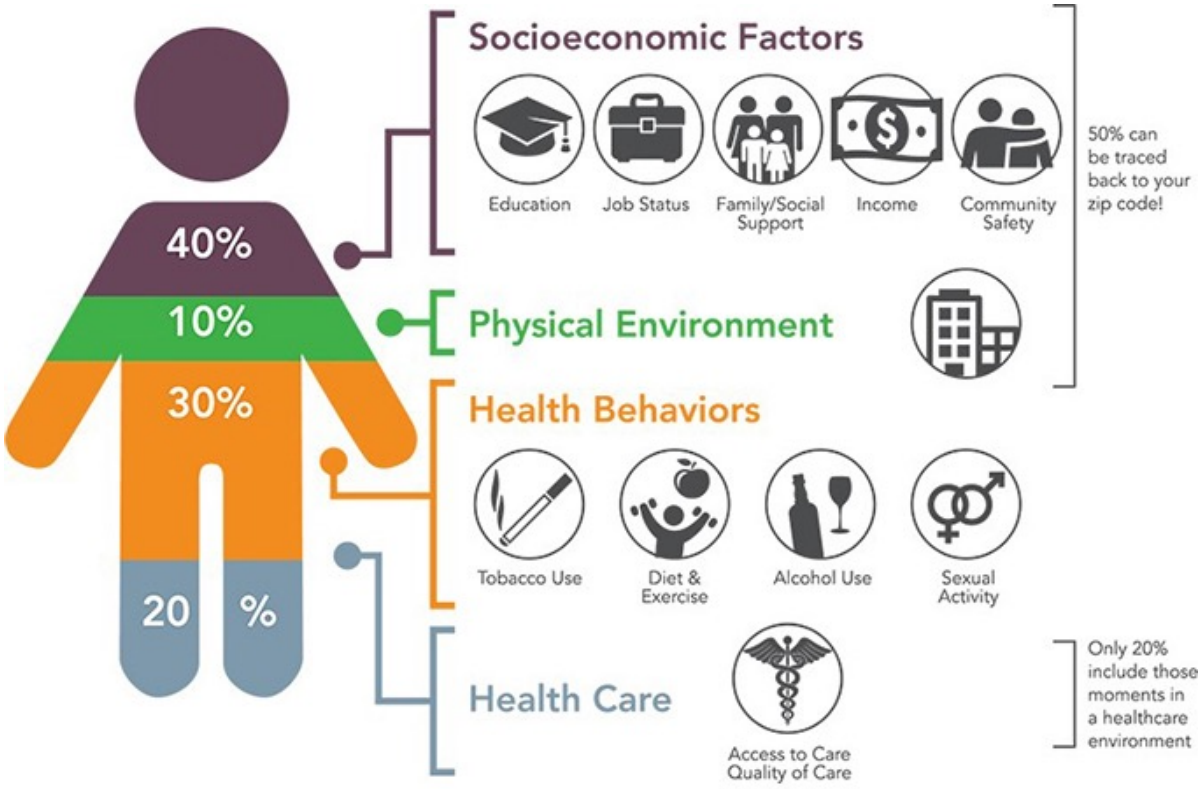

Figure 2. *50% of an individual's health outcomes can be linked to their zip code, while about 20% can be linked to health care quality and access. (Source: Institute for Clinical Systems Improvement, Going Beyond Clinical Walls; Solving Complex Problems, October 2014)*

Within these categories, examples of SDOH include:

- Safe housing and transportation
- Socioeconomic factors, such as education, job status, income, and community safety
- Air and water pollution
- Access to quality health care
- Access to healthy food and opportunities for physical activity
- Language and literacy skills
- Racism, discrimination, and violence

Importantly, SDOH contribute to health disparities and inequities. Health disparities are differences in health between different populations, neighborhoods, or communities resulting from systemic barriers to education, employment, housing, income, or self-determination. Health disparities impact those who have traditionally experienced greater obstacles to health based on their race, ethnicity, socioeconomic status, religion, age, mental health, cognitive or physical ability, sexual orientation, gender identity, or geographic location.

Understanding the impact of SDOH on the overall health and well-being of communities is critical to establishing effective partnerships between health and transportation agencies and professionals. By clearly illustrating the connections between transportation systems, land use, and public health, SDOH can serve as a framework for building partnerships in which transportation agencies, systems, and infrastructure support public health goals.

CURRENT EFFORTS IN NEW JERSEY AND BEYOND

New Jersey Safety and Health Outcomes (NJ-SHO) Data

About

The New Jersey Safety and Health Outcomes (NJ-SHO) Data Warehouse is used by researchers and other partners of the Center of Injury Research and Prevention (CIRP) of the Children's Hospital of Philadelphia (CHOP) Research Institute to advance safety and health research on injury prevention, traffic safety, and other areas of population health. The NJ-SHO Data Warehouse links crash data to other New Jersey statewide administrative databases that contain individual-level data spanning from the pre-injury period to the post-injury period. Through its novel data linkages, the NJ-SHO Data Warehouse can extend the study period of a crash event from a few minutes to a few decades and examine pre-injury factors and post-injury health outcomes for different populations.

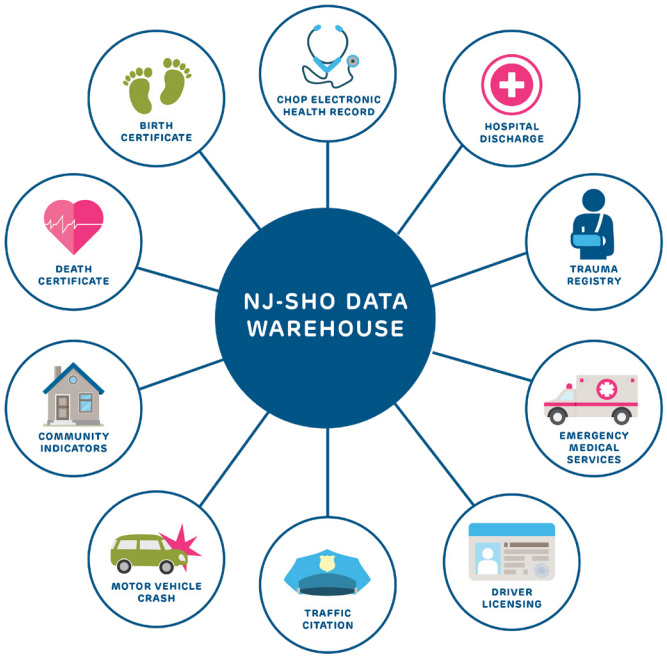

Figure 3. *Graphic showing data sources of NJ-SHO Data Warehouse (Source: Children's Hospital of Philadelphia)*

The Center of Injury Research and Prevention (CIRP)

CIRP, launched in 1997, is one of the centers of emphasis at the Children's Hospital of Philadelphia Research Institute. CIRP translates research into solutions to keep children, teens, and young adults safe from injury. With a multidisciplinary team of experts, CIRP conducts rigorous research, offers evidence-based information, practical tools, and resources, and engages with a broad range of for-profit, nonprofit, and government organizations, translating its research into real-world applications.

Impetus

The NJ-SHO Data Warehouse was initially created as a resource and tool for advancing motor vehicle safety research. The databases that were integrated initially included licensing, crash reports, and traffic-related citation data, along with childhood electronic health records and census tract-level indicators. In 2017, the Warehouse was updated with the most recent data as well as three additional statewide databases maintained by the New Jersey Department of Health: birth certificates, death certificates, and hospital discharge data.

Data & Methodology

To integrate the different databases, the research team of CIRP conducted a large probabilistic linkage that includes all identifiable individual-level records from the databases. Probabilistic linkage attempts to link different databases together using multiple, yet possibly non-unique, pieces of shared information called keys. After the linkages were made, comparisons across multiple data elements

generated a match probability--the likelihood that the pair of data points is a true match. An evaluation of the linkage suggests that the linkage has a high true match probability along with low false non-match proportions. As Figure 3 shows, databases within NJ-SHO include the following: birth certificates, CHOP electronic health records, hospital discharge, trauma registry, emergency medical services, driver licensing, traffic citations, motor vehicle crashes, community indicators, and death certificates.

Contributions and Challenges

As of 2021, the Warehouse includes a total of 22.3 million distinct individuals, and as of the spring of 2023, 36 studies were conducted using NJ-SHO Data. Yet, Curry, et al. (2021) point out that the Warehouse cannot identify individuals who moved out of state, though it can identify when driver licenses are expired. Information for vehicle passengers was not available before 2009.

Future Plans and Vision

As noted by Curry et al. (2021), the Data Warehouse has the potential to be further linked to geographical data sources and additional individual-level databases, such as data for emergency medical services, trauma registry, rehabilitation, and prescription monitoring.

Healthy Community Planning New Jersey (HCP-NJ)

Healthy Community Planning (HCP-NJ) is a website co-developed by the New Jersey Department of Health (NJDOH) and the New Jersey Department of Environmental Protection (NJDEP). The site provides municipal-level reports with health and environmental data to help promote a healthy and safe environment. HCP-NJ is aimed at local government officials, health officers, environmental commissioners, planners, community organizations, non-profit and community groups, and state agencies working with these partners. The data included in HCP-NJ reports is intended to help municipalities prioritize local health and environmental concerns and guide public health decisions. The data can also empower community members to advocate for certain health and environmental actions.

HCP-NJ was developed by NJDOH and NJDEP working in partnership as part of the New Jersey Environmental Public Health Tracking (NJ EPHT) project, with funding from the federal Centers for Disease Control and Prevention.

NJ Public Health Adapt

NJ Public Health Adapt is a mapping tool created to aid state, regional, and local initiatives in comprehending the effects of changing climate conditions on public health. It also aims to support adaptation efforts that enhance health outcomes, particularly for populations experiencing climate-related health disparities including socio-demographic factors at greater risk of negative health outcomes.

USDOT/CDC Transportation and Health Tool

The Transportation and Health Tool (THT), developed by the U.S. Department of Transportation (USDOT) and the Centers for Disease Control (CDC), offers practitioners easy access to data on transportation and public health indicators for each U.S. state and metropolitan area. It examines how transportation systems impact safety, active transportation, air quality, and connectivity. The tool allows users to compare their region with others on key issues and provides resources to help agencies understand the connections between transportation and health, guiding strategies to enhance public health through improved transportation planning and policy.

Additional Health Mapping Resources in New Jersey and Across the United States

In addition to the initiatives and resources listed above, there are organizations throughout New Jersey and across the United States offering web-based health mapping resources. These health and equity data tools should be used by planners, engineers, health officials, and other practitioners to incorporate equity-based decision-making into transportation projects, processes, and plans. A list of currently available resources is included in Appendix A.

METHODOLOGY

The research team (including staff from Susan G. Blickstein, LLC, the Voorhees Transportation Center, and the New Jersey Department of Transportation) assembled an initial list of 21 potential examples of other states incorporating data collection and analysis in transportation and health partnerships. Based on the availability of information and relevance to this research effort, the list was narrowed to ten examples from nine states, including California, Massachusetts, Maryland, Minnesota, North Carolina, New Jersey, Oregon, and Virginia. The team selected examples that represent different types of health and transportation partnerships, such as linking crash data with other statewide medical or health data (NJ, NC, MD), using health index tools to inform transportation planning and policy decisions (WA, CA, VA), and incorporating health data and assessments in project selection and evaluation for transportation planning (MA, MN, OR). For each of the ten examples, the team conducted research and prepared internal memos with additional details.

The research team then selected four case studies to be further investigated: Minnesota, Massachusetts, Maryland, and North Carolina. Massachusetts and Minnesota were chosen for their incorporation of health data in project scoring and prioritization as well as in the project scoping and planning process. Maryland and North Carolina were chosen for their data linkage programs. The research team conducted interviews with representatives and SMEs from the four states. Key findings from the research process are included in this report.

KEY FINDINGS AND RECOMMENDATIONS

Key Findings

The four case studies prepared for this study shed light on how data is used and incorporated into various types of partnerships between transportation and health agencies. The following section summarizes lessons learned based on the research.

Having key personnel and resources is essential to promoting public health and transportation integration.

Advancing health and transportation partnerships requires a lot of effort to coordinate with other agencies and can be time- and resource-intensive. Health and transportation partnerships sometimes occur outside of formal transportation planning processes, requiring commitment and creativity to create opportunities for incorporating health into existing transportation decision-making processes. Devoting key personnel and associated resources to the task can ensure that health is not sidelined in the transportation planning process, while continuing to meet other regulatory requirements.

Defined processes are needed for collaboration and communication across government agencies.

Collaboration between public health and transportation is strengthened when there are defined structures and processes that support communication across government agencies. For instance, the lack of clearly defined processes for collaboration appears to have inadvertently discouraged MassDOT from allocating additional resources and staff, which in turn decreases the likelihood of future partnerships and coordination. In the case of data sharing, having consistent communication and strong relationships with data owners is needed to build and maintain trust and accountability. Collaboration and communication also help align goals and priorities across agencies so that agencies do not have competing interests that harm the ability to implement stated and acknowledged goals of public health integration.

HIAs provide important insights, but also present challenges.

While Health Impact Assessments provide important insights, especially for single projects that need to evaluate alternatives, both Massachusetts and Minnesota experienced challenges with carrying out HIAs. HIAs require a party with significant public health expertise, typically a public health agency or outside entity, to conduct them. HIAs are also time- and resource-intensive, and public health agencies are typically limited in the amount of time and resources they can provide for HIAs for transportation projects. Both Massachusetts and Minnesota have diverged from the use of traditional HIAs by creating a new form of assessment (Equity and Health Assessments) or by shifting the agency's focus toward different ways of incorporating health into the transportation decision-making process.

Consistent funding is critical to advancing public health and transportation integration.

The case studies in Maryland and North Carolina show that consistent funding is needed to maintain updated data linkage systems, because data linkage requires new data to be continuously linked. Funding is also required to explore new data sources and use improved linkage methodologies to enhance the quality of data linkage. In the case of North Carolina, funding is also needed to maintain and improve the public dashboard for displaying data and integrating it into the Vision Zero website.

Recommendations for Increasing Health and Transportation Partnerships in New Jersey

Establish roles for key personnel to support health and transportation integration.

Because partnerships between agencies require time and resources to coordinate, if New Jersey wishes to take on this effort, agencies with a role in either health or transportation should identify staff positions with responsibilities that support these activities. The New Jersey Department of Transportation (NJDOT), New Jersey Department of Health (NJDOH), NJ Department of Human Services (DHS), New Jersey Department of Environmental Protection (NJDEP), NJ Department of Community Affairs (NJDCA), and the state's three Metropolitan Planning Organizations (MPOs) can identify roles and staff responsibilities for creating and maintaining lasting partnerships between agencies. Additional recommendations include:

- Explore developing NJDOT health goals and incorporating them into the Healthy Community Planning collaboration established by NJDOH and NJDEP.
- Hire staff with health backgrounds into traditionally non-health roles to increase opportunities for collaboration and better engage on Social Determinants of Health.
- Identify and attend conferences, webinars, and trainings on public health priorities.
- Incorporate health-related data into project work.

Define processes for collaboration and communication across NJDOT, MPOs, and other state agencies.

To increase coordination, NJDOT and partner agencies should create clearly outlined processes for collaboration and communication across key state and regional entities to ensure the consideration of health in transportation project development, data collection, funding, and implementation processes, including:

- Identify opportunities for structured cross-sector relationships. This could be framed as an inter-agency task force or collaborative body focused around HiAP, similar to Massachusetts' Healthy Transportation Compact. Potential agency partners could include the NJ Department of Health, the NJ Department of Environmental Protection, the NJ Department of Community Affairs, the NJ Department of Human Services, the NJ Division of Highway Traffic Safety, and NJ TRANSIT.
- Offer webinars and training programs that familiarize staff with public health practices and data.
- Compile a list of projects where identifying health outcomes would benefit decisions and outcomes.
- Explore creating a Transportation and Health Tool for the State of New Jersey modeled on the national USDOT/CDC Transportation and Health Tool and in coordination with the NJDOH and NJDEP Healthy Community Planning tool.

Incorporate Health in All Policies into decision-making.

To improve health outcomes through transportation, NJDOT and partner agencies should seek to incorporate Health in All Policies into decision-making. Recommendations for NJDOT and other agencies include:

- Adopt an HiAP agency policy.
- ncorporate additional health elements into Complete Streets checklists and scoring of Local Aid grant applications addressing disease burdens, travel habits, physical activity participation, air pollution levels, and traffic injuries and fatalities.
- Incorporate health language and data benchmarking in the statewide master plans and other long-range plans.
- Incorporate comprehensive HIAs as part of Environmental Impact Statements.
- Explore incorporating a Health Lens Approach on upcoming projects.

Strengthen relationships with data owners.

Because data owners' unwillingness to share data can pose a challenge to building partnerships, NJDOT and partner agencies should strive to build trust with data owners and ensure that acquired data is not being misused. Partnerships with data owners should involve consistent communication and participation on interagency committees where applicable. Explore opportunities to incorporate both health outcomes and health determinants in databases. For this to succeed, NJDOT and partner agencies would need to identify consistent funding streams to support long-term data linkage systems.

Increase public accessibility of available data.

As was the case in North Carolina, publicly available health and transportation data can support communities in their Vision Zero planning efforts. NJDOT and partner agencies should identify ways to increase accessibility of health and transportation data among the public.

Coordinate funding and investments.

To minimize effort and cost, partner agencies should leverage each other's policies, programs, and funding to align goals and monitor health outcomes. To identify the mutual benefits of improving health, the agencies should build alignment between shared mission, vision, and goals. Support could involve shared technical assistance and/or aligned funding. For example, a pilot grant program combining resources and funding from multiple agencies could provide assistance to overburdened communities and integrate health outcomes into implementation.

Be specific about health barriers and systemic disparities.

Achieving a culture change across multiple sectors is challenging. However, all state agencies have stated equity goals of aligning resources with the communities and populations with the greatest need. State agencies without a specific health focus should reinforce ongoing efforts by identifying systemic health-related barriers and disparities in order to achieve equity goals. Recommendations include:

- Acknowledge that systemic disparities exist and communicate how they manifest in communities and people's everyday lives.
- Develop leadership strategies that prioritize and address systemic health barriers.
- Identify opportunities to incorporate health data into research projects to highlight health impacts, including qualitative data that emphasizes lived experiences such as focus groups, community stories, and interviews.
- Demonstrate how health aligns with plans, goals, and budgets.
- Identify ways to incorporate potential health outcomes into agency reports and other decision-making mechanisms, including scorecards, checklists, and project screening.

CASE STUDIES

This section presents information about the four case studies, which were gathered through online research and interviews with subject matter experts (SMEs). A summary table of the four case studies is included with more details to follow on the individual cases below. The case studies are:

1. Massachusetts: Healthy Transportation Compact/Project Prioritization and Scoring Process
2. Minnesota: Health and Equity Assessment for the Highway 252/I-94 Corridor
3. Maryland: Crash Outcomes Data Evaluation System (CODES)
4. North Carolina: North Carolina Crash Injury Surveillance System (NC-CISS)

Case Studies Summary Table

State/Project	MASSACHUSETTS Project Prioritization and Scoring Process	MINNESOTA Equity and Health Assessment for the Hwy 252/I-94 Corridor	MARYLAND Crash Outcome Data Evaluation System (CODES)	NORTH CAROLINA North Carolina Crash Injury Surveillance System (NC-CISS)
Impetus	To advance transportation-related initiatives and planning processes that promote better health outcomes that have been promoted through the Healthy Transportation Compact (HTC)	To address safety issues and repairs needed for the corridor and to advance the Minnesota GO Vision for Transportation and the Advancing Transportation Equity Initiative	To gain a deeper understanding of crashes through data linkage	To provide a more complete picture of the circumstances and outcomes associated with crash injuries
Focus	Using a breadth-over-depth approach to incorporate health in transportation projects via the project scoring and prioritization process	Using an Equity Health Assessment (EHA) to evaluate the equity and health impacts of potential Hwy 252/I-94 alternatives for communities in the project area and to provide recommendations to advance community priorities for the project's EIS	Linking core data sets (crash, EMS, and hospital) and ancillary data sets (licensing, registration, citation, motorcycle training, trauma registry, etc.)	Establishing a replicable data linkage methodology to link crash report data with data for emergency department visits and death certificates

State/Project	MASSACHUSETTS Project Prioritization and Scoring Process	MINNESOTA Equity and Health Assessment for the Hwy 252/I-94 Corridor	MARYLAND Crash Outcome Data Evaluation System (CODES)	NORTH CAROLINA North Carolina Crash Injury Surveillance System (NC-CISS)
Funding	Dependent on the project	Mostly federal with some state funding	Funded through grants and agencies that receive data analysis assistance	Previously funded by the CDC and the State, currently awaiting funding until new cycle begins
Involved Agencies	MassDOT	MnDOT's Sustainability and Public Health Division, with support from an interagency working group	The University of Maryland's National Study Center (NSC) for Trauma and Emergency Medical Services	University of North Carolina Injury Prevention Research Center and the Injury and Violence Prevention Group in the North Carolina Division of Public Health
Applications	The Controlling Criteria dictate how projects are designed, requiring the inclusion of active transportation components. Integrating health in scoring categories helps to prioritize transportation projects, which can improve health outcomes.	The EHA process produced three reports that inform the Scoping Decision Document and feed into the EIS as public comment.	The NSC fulfills one-time analysis requests for the Maryland Highway Safety Office and other communities; they conduct research and study effectiveness of existing programs, policies, laws, and campaigns.	NC-CISS created a publicly available dashboard to view linked data and supported Vision Zero communities with more sophisticated data analysis tailored to their specific geographies.
Challenges	The lack of streamlined and clearly-defined processes for collaboration between transportation and health discourages MassDOT from allocating additional resources and staff.	Keeping the EHA as a separate parallel process while leading it in-house	Agencies feel their data can be misused; lack of funding to continuously link new data with improved methodologies at higher success rates	Data owners' unwillingness to share data sources; the lack of funding to maintain the system and provide technical assistance to communities; a pause in funding also set the project back, needing time to catch up to where they were in the last funding cycle.

State/Project	MASSACHUSETTS Project Prioritization and Scoring Process	MINNESOTA Equity and Health Assessment for the Hwy 252/I-94 Corridor	MARYLAND Crash Outcome Data Evaluation System (CODES)	NORTH CAROLINA North Carolina Crash Injury Surveillance System (NC-CISS)
Contributions/ Strengths	The project prioritization and scoring process is rooted in existing processes and is one of the deeper collaborations between MassDOT and the Massachusetts Department of Health (DPH).	The EHA process broadened the understanding of how MnDOT can engage with historically underserved and overburdened communities in transportation decisions through a community-driven assessment of equity and health impacts.	Strong two-way relationships with the University, the Traffic Records Coordinating Committee, and data owners help build trust and accountability with data use.	History of collaboration between UNC and the Division of Public Health. There are plans to improve the dashboard and integrate it into the Vision Zero website and train Vision Zero communities to understand and use the data.

Massachusetts: Healthy Transportation Compact/Project Prioritization and Scoring Process

About

The Massachusetts Healthy Transportation Compact (HTC) was created in 2009 to promote and facilitate collaboration among agencies in order to advance transportation-related initiatives that promote better health outcomes. It was established to address the lack of coordination between the state's various transportation agencies and its growing concern around public health, partially because of a lack of active transportation. The HTC also ensures that agencies take public health into account for transportation or land use decisions. The HTC is co-chaired by the Transportation and Health and Human Services Secretaries. It also includes the Secretary of Energy and Environmental Affairs, the MassDOT Highway Administrator, the MassDOT Transit Administrator, and the Commissioner of Public Health. The HTC has facilitated a partnership between the Massachusetts Department of Transportation (MassDOT) and the Massachusetts Department of Public Health (DPH).

HTC has promoted several key policies and resources, one of which is the Healthy Transportation Policy Directive, created in 2013. The Directive ensures that all MassDOT projects are designed and implemented so that people can have access to safe and comfortable healthy transportation options, such as walking, bicycling, and taking transit at all MassDOT facilities and services. The HTC is also charged with creating the framework and instituting the use of Health Impact Assessments (HIAs) to determine the effect of transportation projects on public health and vulnerable populations. In recent years, MassDOT has shifted its focus to incorporating health in transportation decisions via the project prioritization and scoring process.

Health Impact Assessment (HIA)

Health impact assessments are a tool to identify the impacts of a proposal. They bring public health considerations into the overall equation of the costs and benefits of a proposed project, program, or policy on public health. HIAs recommend strategies to protect and promote public health through public engagement, equity considerations, short- and long-term vision, and the use of data. HIAs are a more comprehensive way of analyzing potential health outcomes but require additional resources that may not be available.

Partnerships between MassDOT and DPH

There are a few ongoing partnerships between the DPH and MassDOT, including research projects, Safe Routes to School applications, Mass in Motion, and project scoring that incorporates public health metrics. Mass in Motion lies at the intersection of the two agencies, as it is a program where coordinators are hired to work in municipalities to help apply for grants for active transportation initiatives.

Grounding McGrath Study HIA

One example of a Health Impact Assessment that was conducted in Massachusetts is the Grounding McGrath Study HIA. Completed in 2013, the study was the pilot HIA conducted by MassDOT and DPH. It looked at health outcomes for alternative proposals for a structurally deficient portion of the McGrath Highway in Somerville and Cambridge. Alternatives included a boulevard, access road, hybrid U-turn/roundabout, and boulevard with inner belt connection, as well as a no-build option.

The HIA looked at the impact of these alternatives on various aspects of public health. The primary focus was on air quality, noise levels, mobility and connectivity, public

safety, and land use/economic development. Baseline health data considered in the HIA included hospitalization, cancer, pediatric asthma, childhood obesity, and childhood depression.

The community within the study area was designated as an Environmental Justice Community according to criteria established by the Massachusetts Executive Office of Energy and Environmental Affairs (EOEEA), so extra consideration was given regarding various socioeconomic factors, such as income, housing availability and cost, and access to goods and services. The HIA for the Grounding McGrath Study achieved the goal of refocusing the project on people, especially people living along the corridor. It also helped spur future research efforts involving public health and transportation.

Although there were intentions to continue with HIAs as a method of public health integration, it was ultimately decided that HIAs were too labor- and time-intensive. Massachusetts found that HIAs are better used for single projects to evaluate alternatives than for project prioritization and scoring processes for allocating budget and resources. It was determined that the existing project evaluation process which must take place for every project was sufficiently robust to incorporate public health.

Controlling Criteria

MassDOT chose to focus on a breadth-over-depth approach to incorporate health in transportation projects via the project scoring and prioritization process. One important element of this process is the use of Controlling Criteria. An Engineering Directive, adopted in January 2020, details the Controlling Criteria and appropriate design guidance that must be applied to all MassDOT Highway Division projects not yet advertised for construction. The Controlling Criteria dictate how such projects are designed, unless an exception to the criteria is requested for cases in which unusual constraints exist. All exceptions need to be vetted in a public Design Justification Workbook and then approved by the Secretary of Transportation. If exceptions were not granted, projects brought to the review committee that failed to account for active transportation were almost universally denied.

FHWA's Controlling Criteria

FHWA's ten Controlling Criteria were adopted at the federal level in May 2016. The Controlling Criteria include Design Speed, Design Loading Structural Capacity, Lane Width, Shoulder Width, Horizontal Curve Radius, Superelevation Rate, Stopping Sight Distance, Maximum Grade, Cross Slope, and Vertical Clearance. FHWA notes that "states may adopt policies that are more restrictive than the revised FHWA policy… to develop context sensitive solutions that enhance communities and provide multiple transportation options to connect people to work, school, and other critical destinations."

There are 14 controlling criteria, with ten of them known as the FHWA Controlling Criteria, and four of them known as the MassDOT Controlling Criteria. The MassDOT Controlling Criteria include Pedestrian Facilities, Bicycle Facilities, Transit Provisions, and Ramp Length (for Roadways). The first three are also known as the Complete Streets Criteria. These Controlling Criteria require the inclusion of active transportation components.

To make sure that projects comply with all of the Controlling Criteria, MassDOT requires a Design Justification Workbook to be submitted at the 25 Percent Design stage for all projects. The Workbook provides a uniform method for considering and evaluating controlling criteria and for documenting design decisions. The Workbook contains entries for all 14 controlling criteria, and it must be filled out completely regardless of whether there are exceptions granted from the need to comply with certain controlling criteria. A review committee tracks and reports on all Design Justification issues to ensure consistency in the application of design standards and the documentation of design justifications.

Pedestrian facilities (including sidewalks, shared-use paths, and side paths) need to be at least five feet wide and are required on both sides of a roadway for all roads in urbanized areas, urban clusters, or rural villages, for all bridge projects, and all roadways with a High Potential for Walkable Trips, as defined in the latest version of the Massachusetts Pedestrian Transportation Plan. Marked crosswalks are required at every leg of a signalized intersection where sidewalks are present and/or proposed as well as at existing crosswalks, regardless of the existence of any sidewalk(s).

Bicycle facilities are required for each direction of vehicular travel for all roadways where bicycles are legally allowed, except for local roadways. A shared-use path, side path, separated bicycle lane, or buffered bicycle lane is required for all roadways with a speed limit greater than or equal to 40 miles per hour, or where traffic volumes are greater than or equal to 10,000 vehicles per day, or at locations with more than one travel lane in a single direction. They are also required for any intersection with more than one travel lane in a single direction and for any roadway classified as a corridor with a High Potential for Everyday Biking, as defined in the Massachusetts Bicycle Transportation Plan.

Crosswalks or other means of facilitating accessible pedestrian access shall be provided between both sides of a roadway within 250 feet of existing or proposed transit stops. A shelter or bench shall be provided at all transit stops with 100 or more boardings per day. Transit priority treatments shall be provided along transit routes with headways of 15 minutes or less.

In addition to the Controlling Criteria, eight categories are used for project prioritization and scoring. These categories assess whether the project is a high priority based on the defined factors and criteria of each category. The categories include system preservation, mobility, safety, economic impact, social equity and health effects, environmental, policy support and project risk, and cost effectiveness. Many of the categories consider the impact of transportation on health outcomes. Each of these criteria contains multiple factors that are scored with values from a range of -1 to 3. Some of these criteria are data-driven and others are qualitative. The eight categories included in the process are weighed differently.

The report, "Public Health Assessments for Transportation Projects" by Christofa, et al. (2020) indicates that while the current framework considers a wide range of criteria that capture health-related factors, it is still insufficient in incorporating health outcomes. For instance, the severity of crashes is not captured and physical activity is not explicitly addressed. The report proposes five categories for health assessment, which include air quality, accessibility, equity, physical activity, and safety (Figure 4). Nine project scoring criteria have been developed based on the five categories.

Proposed criteria for the MassDOT Highway Division project scoring framework

Factor	New Criteria
Air Quality	• **$PM_{2.5}$ mass concentration and NO_2 concentration**
Accessibility	• **Job accessibility** • Accessibility by walk/bike to other points of interest • Transportation disadvantage access (composite indicator)
Equity	• Transportation disadvantage access (composite indicator) • Community engagement
Physical Activity	• Physical activity-related chronic disease
Safety	• Bicycle/Pedestrian crash rate • Annual number of fatal and severe injury crashes

Note: Criteria in bold indicate the criteria that have already been included in the latest version (version 4.0) of the MassDOT Highway Division project scoring framework.

Figure 4. *Proposed criteria for MassDOT Highway Division project scoring framework (Source: MassDOT)*

Funding

Because the project prioritization and scoring process is not a particular project, it is sustained by MassDOT. Funding would depend on specific projects that use the process.

Strengths and Contributions

Among other state DOTs across the United States, MassDOT was the first to dedicate efforts to connecting transportation and health through a Healthy Transportation Compact. Focusing on integrating health into transportation via the project scoring and prioritization process allows MassDOT to enhance transparency in decision-making for transportation projects and reach statewide objectives and goals related to transportation. The scoring criteria also serve as a guide for municipality-led projects to realign goals and consider health elements more seriously for transportation projects. The project prioritization and scoring process is perhaps most rooted in existing processes and is one of the deeper collaborations between MassDOT and DPH.

Challenges

The relationship between MassDOT and DPH has weakened over time, with less frequent meetings on data sharing and project scoring. While both agencies still attend each other's meetings, consultations are no longer held for coordination and alignment of goals. MassDOT's implementation of public health in transportation efforts, while present to a certain degree, is not systematic.

Specifically, collaboration with public health partners presents a challenge when it comes to effectively integrating and applying input to establish a meaningful and lasting connection between public health and transportation. While there is general agreement that employing tools such as project scoring, HIAs, and public health data to inform projects would be an ideal approach, it is difficult to use these tools as the primary factors in determining which projects to prioritize, especially when considering other competing factors and interests, such as federal funding, bureaucratic obstacles, and staff turnover. All agree that there should be more collaboration, but prioritization of public health gets lost among other competing factors.

While the allocation of additional dedicated staff could potentially resolve this issue, the lack of clearly defined processes for collaboration appears to have discouraged MassDOT from allocating these resources, which in turn decreases the likelihood of these processes becoming established. The development of a clear, sustainable, and replicable model for collaboration would be very helpful in overcoming these challenges.

Future Plans and Vision

Because the Bipartisan Infrastructure Law has facilitated the hiring of additional staff at MassDOT, there is a renewed interest and focus on partnerships with public health. At the time of this report, it is something the agency has the desire to do, and it includes rebuilding the relationship with the DPH to allow for better cooperation. Future collaborative research projects are also a possibility.

Minnesota: Equity and Health Assessment for the Highway 252/I-94 Corridor

About

The Highway 252/I-94 corridor, located in Brooklyn Center, Brooklyn Park, and north Minneapolis, Minnesota, was constructed in the 1960s. The corridor is in need of safety improvements and repairs, as it experiences high crash rates, significant traffic congestion problems, and barriers to walking and bicycling safely. The project location is shown in Figure 5.

Since 2020, MnDOT has been conducting an Equity and Health Assessment (EHA) as part of the Environmental Impact Statement (EIS) for the project. The EIS is a process required by the National Environment Policy Act (NEPA) and is used by agencies to identify community impacts when developing transportation projects with the potential for significant impacts on the surrounding environment. The purpose of the EHA is to evaluate the equity and health impacts of potential project alternatives for communities in the project area and to provide recommendations for proposed alternatives to advance community priorities. The EHA is also used to document any findings and to develop recommendations for future action that are not addressed in the final EIS, in partnership with the surrounding communities.

Figure 5. *Map of Hwy 252/I-94 environmental review area (Source: MnDOT)*

Impetus

Conducting an EHA for the Highway 252/I-94 Corridor is an opportunity to advance the Minnesota GO Vision for Transportation and the Advancing Transportation Equity Initiative. The Minnesota GO Vision for Transportation envisions a multimodal transportation system that maximizes the health of people, the environment, and the economy. The Advancing Transportation Equity Initiative incorporates equity in transportation decision-making. It aims to improve access and opportunities for underserved communities in Minnesota.

Enhancing health and equity in transportation is especially important for Highway 252/I-94 because it runs through many racially and ethnically diverse areas in the state, with almost 60 percent of the population surrounding the corridor identifying as Black or African American, Asian, or Hispanic/Latino.

Involved Agencies

The Highway 252/I-94 Corridor EHA is administered by the Sustainability and Public Health Division in MnDOT, with support from an interagency working group. The Division coordinates various sustainability and public health initiatives for MnDOT to incorporate into transportation projects, and advances MnDOT's Vision for a multimodal transportation system that maximizes the health of people, the economy, and the environment. The recent establishment of the Division builds on the interagency agreement between the Minnesota Department of Health (MDH) and MnDOT to integrate health into transportation decisions.

In addition to the Sustainability and Public Health Division, there is also an interagency working group and a group of Equity and Health Neighborhood Advisors (EHNA), which have been supporting the project. The structure of the interagency working group and the EHNA is based on Health Impact Assessment (HIA) best practices. An HIA typically has a project steering committee that weighs in on major decision points and approaches.

Partnership between MnDOT and MDH

The Department of Health and MnDOT have a strong history of collaboration. In 2015, MnDOT and MDH signed an interagency agreement to collaborate and integrate health into transportation decisions. The two agencies have partnered on the Towards Zero Deaths Initiative, which focuses on decreasing fatalities on roadways, as well as several joint efforts for active transportation. MnDOT also previously commissioned MDH to conduct a Health Impact Assessment for the State Multimodal Transportation Plan, which looks at how health can be considered and what recommendations can be made concerning public health.

The EHA interagency working group provides support and assistance to the Highway 252/I-94 Corridor EHA. The working group convenes to give input on the direction of EHA reports and on sources of data to complete the deliverables. It is a smaller group made up of representatives from MnDOT's Livability Office, Hennepin County Health and Human Services, the Center for Urban and Regional Affairs at the University of Minnesota, Metro Transit, and the FHWA. At the beginning of the process, the interagency workgroup was quite large and included members from the project team. However, it became important for the Division to be able to distinguish the EHA for the project from the project itself. Participants who had been involved in the project on a day-to-day basis were removed, so the remaining working group members could look at the project solely from the point of view of the EHA.

To facilitate greater community engagement for the project, the Equity and Health Neighborhood Advisors Group (EHNA) was created. The EHNA provided an opportunity for community members to weigh in on the project's process and to give feedback on the perception of the project and the EHA. For instance, the group provided input on the places that the Division should conduct targeted engagement. The value of this group was in building relationships which were transparent and transformative, rather than extractive and transactional. MnDOT provided the space for them to meet and hired a community facilitator to run meetings. The goal was to break down silos in government and listen to the community, understanding their concerns and trying to find answers on how those concerns could be ameliorated.

Funding

The project has received federal funding and state funding. MnDOT and project partners have also identified funding opportunities in capital programs to support the project.

Development of the EHA

The Highway 252/I-94 Equity and Health Assessment was developed out of the principles and practices of Health Impact Assessments and Community Impact Assessments (CIAs), which are both used by agencies across the US in order to understand and address equity and health impacts on transportation projects.

The Sustainability and Public Health Division considered using a Health Impact Assessment for the project. However, based on the capacity at the time, the use of HIAs was out of the question because MDH was fully engaged with the response to COVID-19, and the HIA process hinges on having a third party to conduct them. The Division also looked at Community Impact Assessments, a methodology supported by FHWA. CIAs are similar to HIAs but are specifically focused on the transportation process. They are more iterative than HIAs, with community feedback loops throughout the process. CIAs are conducted by FHWA, DOT, and a community partner. The Division did not consider using CIAs because at the time, the concept was relatively new. The Division also looked at Health in All Policies (HiAP) as a more informal way to bring health experts to the table throughout the project.

Ultimately, the Division decided to reference and incorporate some aspects of HIAs, CIAs, and HiAP when developing the EHA to customize a process suitable for the project based on their capacity and needs. In addition, the EHA also integrated some of the guiding questions from MnDOT's Equity Lens, which was designed as a general starting point to guide planning and development discussions for identifying and implementing equitable outcomes.

The EHA Process

The Equity and Health Assessment was a pilot effort conducted during the scoping phase of the Environmental Impact Statement for Highway 252/I-94. While the EHA was conducted in-house by MnDOT, its development was kept as a separate parallel process alongside the Highway 252/I-94 project. The EHA is outside state and federal regulations on environmental review, and all EHA reports are considered public comment in the EIS. The Division has been working with FHWA throughout the project, and FHWA is open to integrating the EHA approach. However, the Division must follow the NEPA process closely and ensure that project efforts are approved.

The Highway 252/I-94 Corridor EHA process entailed a combination of quantitative analysis of health data as well as qualitative input via community engagement. The EHA included three reports. Reports 1 and 2 documented health conditions and community priorities. Based on Reports 1 and 2, Report 3 assessed the health and equity impacts of project alternatives and provided recommendations (Figure 6).

Figure 6. *Information about the three reports that are part of the EHA process (Source: MnDOT)*

EHA Report 1: Baseline Conditions documented the health conditions and disparities of the communities surrounding the corridor using 31 health indicators which were selected through a wider survey of health indicators and judged on their suitability for the project. The baseline conditions from all health indicators were then prioritized and synthesized into six equity and health focus areas: environment and human health, sense of community, property impacts, transportation safety, transportation options, and access to destinations. The purpose of establishing the equity and health focus areas was to provide a data-driven framework for illustrating the impact of transportation on equity and health along the corridor.

EHA Report 2: Community Priorities summarized the process and findings from engaging with historically underserved and overburdened communities in the project area. It also identified three top priorities based on the health and equity focus areas from Report 1: Community Livability, Transportation Equity, and Roadway Safety.

EHA Report 3: Impacts assessed the health and equity impacts of project alternatives and provided recommendations, including changes that should be considered for project alternatives. The community priorities identified in Report 2 guided the development of EHA elements. The elements are factors in the project alternatives that are important for advancing equity and health and are also used to identify the impacts of project alternatives in the scoping document.

All reports fed into the project as public comment for the EHA. Findings from the EHA will inform the Scoping Decision Document (SDD), which looks at possible project alternatives and conducts a high-level analysis of the different alternatives to be studied in the draft EIS phase. Those alternatives will be narrowed down to a smaller set of preferred alternatives in the draft EIS, and later, the final EIS will be submitted to FHWA for review. After the EIS, the project will move to the federal process, which has a more detailed analysis that looks at noise, stormwater, water, and air quality impacts for safety on the alternatives.

Strengths and Contributions

Because the project is still ongoing as of fall of 2023, physical improvements to Highway 252/I-94 and impacts to surrounding communities cannot yet be evaluated. However, the EHA process thus far has broadened MnDOT's understanding of the relationship between transportation and health. It has also provided a model for how state DOTs can include historically underserved and overburdened communities in transportation decisions through a community-driven assessment of equity and health impacts.

During the process of working on Reports 1 and 2, MnDOT received many community responses that differed from the agency's typical understanding of issues at the intersection of health and transportation. For instance, the Sustainability and Public Health Division received feedback on issues such as housing and police enforcement, which, while still linked to transportation for the community, exist outside of MnDOT's jurisdiction. In this way, the EHA process further helped to reveal several issues outside of the scope of the project.

While some of the issues that arose during the engagement process may not directly inform changes to the Highway 252/I-94 project, they have led MnDOT to ask questions about their role as a partner and supporter of communities. For example, if there are questions around police enforcement for reckless driving behavior, MnDOT can take a role outside of the project process by raising that concern to law enforcement partners and by being supportive in finding a solution.

The EHA process has also changed the way that MnDOT considers community input as well as its own role in public health. The EHA presents opportunities to ask different questions, have different conversations, and use a new approach to incorporate community input into the planning process. In embarking on the challenge of creating the EHA, some staff at DOT have come to see themselves not just as transportation professionals, but as public health professionals as well.

Challenges

Keeping the EHA as a separate parallel process while leading it in-house was challenging both internally and externally. Because the EHA was a pilot effort, it was at times difficult for those involved internally to stay on the same page. Externally, the public found it difficult to differentiate the EHA process from the rest of the project. This is because, while all EHA reports were posted on MnDOT's website, they were not considered to have been authored by MnDOT. The reports were not branded as such because they were meant to come from the community and represent the community's perspective. If an HIA had been conducted instead of an EHA, the distinction would have been more apparent, since HIAs are often produced by a third party and deliverables are often posted on third-party websites.

Future Plans and Vision

The Highway 252/I-94 Corridor project is still underway as of February 2024, and updates continue to be posted on the project website. EHA reports 1-3 and the Scoping Decision Document are currently available online. According to the website, the draft Environmental Impact Statement and formal public comment period will continue through 2025, with approval of a final Environmental Impact Statement/Record of Decision anticipated in 2026. Construction is scheduled to begin in 2028.

The next steps include determining how to move the EHA process into the federal phase of the project. The project team needs to identify how to continue with targeted and enhanced community engagement and use that information in a way that meaningfully impacts decisions. This project corridor is located in the Metro District of Minnesota, but there are also several other districts, each with its own dedicated staff. The Sustainability and Public Health Division is coordinating with other districts about how to better integrate health into their projects, how they can build relationships on a local level, and how to identify projects that can either apply a process like the EHA or work with the Minnesota Department of Health to conduct an HIA. There are many opportunities to build on what was discovered during the Highway 252/I-94 Corridor EHA process and apply the lessons learned at the project or policy level in other areas of Minnesota.

Maryland Crash Outcome Data Evaluation System (CODES)

About

The National Study Center for Trauma and Emergency Medical Services (NSC) at the University of Maryland conducts analyses utilizing the Crash Outcome Data Evaluation System (CODES) methodology. CODES uses the probabilistic method to link crash data to other data sets in order to gain a more comprehensive understanding of motor vehicle crashes. CODES data is a resource available to state and local agencies as well as other stakeholders.

Impetus/History of CODES

The CODES program was initially created by the National Highway Traffic Safety Administration (NHTSA) in 1992. Its purpose was to help states develop data linkage programs linking crash records to other data. NHTSA supported CODES until 2013, at which point states were anticipated to continue the effort with their own funding. In Maryland, the NSC had already been conducting CODES-type analysis before joining the NHTSA program. In 1994, Maryland joined NHTSA's CODES program to institutionalize existing data analysis efforts, and after NHTSA support ended in 2013, the state was able to continue its CODES program to support a variety of agencies and programs.

Involved Agencies

The National Study Center for Trauma and EMS has a 20+ year history of linking hospital and transportation-related data. The NSC was established by Congress in 1986. It is an independent organization that aims to prevent death and disability caused by injury and sudden illness. It is part of the Shock, Trauma, and Anesthesiology Research Center (STAR) at the University of Maryland School of Medicine.

Funding

Funding for the CODES program was initially provided by NHTSA. The University also received supplemental funding through organizations that they served, such as the Maryland Motor Vehicle Administration (MVA), Maryland Highway Safety Office (MHSO), Maryland State Highway Administration (SHA), and Maryland State Police, among others. Currently, the NSC is fully funded through grants and specific requests from those agencies and organizations that receive data analysis assistance.

Data and Methodology

The CODES program includes three core data sets: crash, emergency medical services (EMS), and hospital. It also has a large number of ancillary data sets, such as licensing, registration, citation, motorcycle training, trauma registry, and others. To perform data linkage, the NSC uses probabilistic linkage to match data records based on linking variables common among source databases to quantify the probability that two or more records match. Currently, the NSC links data on an as-needed basis. When the NSC needs data for a particular project, the Center accesses the databases of data owners, collects the data, and then uses that data. Once the project is completed, the NSC does not revisit the dataset and the data is destroyed. The NSC does not keep the linked data. Some data use agreements do not allow the NSC to store data on NSC systems. The NSC also does not have a public dashboard for the linked data.

Applications

The Maryland-based NSC has used CODES for a wide variety of efforts and analyses. Some examples include: performing data queries in response to inquiries, developing program-specific fact sheets, contributing data for the MHSO's benchmark/annual reports, providing data for problem identification to Maryland's 24 subdivisions, as well as contributing data and expertise to the State Highway Administration to assist in the development of a statewide strategic plan, which will guide the direction of traffic records and highway safety in the State.

For data requests and queries, the NSC primarily partners with the Maryland Highway Safety Office, where certain priorities require data analysis, such as safety and occupant protection. For other communities, there is an open online portal where people can submit data requests. The NSC usually takes two weeks to fulfill these requests. They provide only the data analysis, not the data itself.

To fulfill different data analysis requests, the NSC uses a variety of tools, including Fuzzy logic, the Statistical Analysis System package from SAS, and Geographic Information Systems (GIS). Fuzzy logic allows for matches when the values of the linking variables are similar but do not match exactly. For instance, crash time across different data sets should be similar, but would rarely match precisely. The NSC also uses the SAS package, which is a standard data management and statistical analysis tool with robust procedures for data linking and data manipulation among multiple source files. GIS is also used for all location-based data storage and reporting in Maryland.

There have been several interesting and insightful findings from past NSC data analysis efforts. For example, the NSC recently submitted a paper to the Transportation Research Board that examines how different crash factors and toxicology converge to impact the severity of the crash. Data findings suggest that injuries from crashes on interstates and freeways are much less severe than crashes that occur on local roads. These kinds of data results can help guide Vision Zero approaches and strategies, such as emphasizing a focus on local roads rather than on interstates.

Some data findings surprised staff at the NSC. Research indicated that people who use drugs have a lower likelihood of being seriously injured in a crash. On the other hand, studies showed that people who consume alcohol and are drunk are more likely to be seriously injured. The relationship between alcohol consumption and crash severity was expected, but the relationship between other drug consumption and crash severity was not. The findings indicated a need for further research.

For the last couple of years, the NSC has been conducting research on vulnerable roadway users. The Center has linked hospital data with crash data, which shows that the number of people injured in crashes in Maryland is greater than the number of people indicated in police reports. Studies show that there are 25-40% more people injured in transportation crashes than the number of people currently reported in the police data. North Carolina and South Carolina also showed similar results.

The NSC has also done research on e-scooter users. Anecdotally, the Center had heard that people use e-scooters to go bar-hopping, and data shows that almost 60% of e-scooter crashes in Baltimore involved riders that had amounts of alcohol or drugs in their system that were above the legal limit. Data linkage helps to deepen understanding of e-scooter use. For instance, for e-scooters, there are papers that examine impairment, injury severity, or cost separately. However, data linkage allows all three factors to be examined at the same time, providing new insights. Other types of data analysis and linkage that the NSC has performed include studies of advanced driver assistance systems and the efficacy of advanced automatic crash modification.

Strengths

The NSC's CODES program has been successful because it was able to institutionalize and find supplemental funding opportunities before the end of NHTSA's funding support. The NSC also broadened the initial intent of the CODES program by studying the implications and effectiveness of programs, policies, laws, and education/enforcement campaigns to fulfill the needs of different agencies. By expanding the scope of the CODES program, the NSC has been able to attract more agencies to the CODES program, helping to provide additional funding.

Having a Board of Directors has also helped the CODES program to grow partnerships so the NSC is able to fulfill data requests from various types of agencies. The Board meets once a year. Positive relationships formed by the CODES Board of Directors and the establishment of data use agreements allow the University to continue to work with different agencies and respond to data requests, even without the support of NHTSA.

The NSC has put a significant amount of effort toward building trust and accountability with data use. One way the Center does so is through participating in the State's Traffic Records Coordinating Committee. This committee helps to set expectations at all levels and maintains contact with the NSC on a regular basis. They meet at least six times a year. The executive council, consisting of heads of organizations, meets twice a year. The four other meetings are for the technical council, where people involved in the work discuss key issues. The committee also asks the NSC for support when it needs analysis done.

Being a part of Maryland's state university also greatly helps the NSC because there is a strong Institutional Review Board (IRB) that is widely trusted. The IRB is connected with the Maryland Department of Health Institutional Review Board. This means that the NSC does not need to worry about data breaches because there are checks and balances within the hospital system and within the Department of Health system. The university connection also allows the NSC to more easily and securely access sensitive, personally identifiable information.

A third way of ensuring trust is through the NSC's output, conducting research with linked data, publishing papers, and presenting research efforts at conferences. Results of research are shared with the network of organizations that provide data to the NSC to show that the information is being used for valuable research that could not have been accomplished without the data linkage program. Research results are provided to organizations before they are published. If data owners provide feedback on the NSC's research results, then the NSC can change their methods to incorporate that feedback. This speaks to the two-way relationship between the NSC and data owners.

Lastly, Maryland provides a centralized location for collected data and manages data agreements with different organizations, which makes accessing data easier. Other states have decentralized data, which is a big problem, especially when needing to access data for data linkage.

Challenges

Despite all the methods that the NSC uses to build trust, the biggest challenge that the Center faces is that agencies fear their data may be misused or released by the NSC. Agencies also fear that NSC publications and research might reflect poorly on them. Keeping data owners satisfied is important work because requirements for data sharing have become stricter. The NSC has to manage expectations and build trust and accountability with data use.

Obtaining consistent funding support is another challenge for the NSC. The projects that the Center works on provide the funds needed to perform the data linkage. Since data linking is a resource-intensive task, the NSC sometimes does not receive enough funds to complete a project. If this is the case, the NSC can instead conduct a siloed analysis, where data sets are compared instead of linked. In the opinion of NSC staff interviewed for this report, a dedicated line of funding, as well as increased funding, would make the work of data linkage easier and more consistent.

Because of limited funding, earlier CODES states no longer have up-to-date linked data sets. The data are only linked until 2016 or 2017. While these data sources are still accurate and of good quality, they are not updated beyond 2017. Steady funding would both permit the continuation of linking data and ensure that new data is linked with improved methodologies.

Future Plans and Vision

Currently, the NSC does not have a long-term strategic plan or other future concrete plans. The Center will continue to fulfill requests whenever they see funding opportunities and projects.

North Carolina Crash Injury Surveillance System (NC-CISS)

About

The North Carolina Crash Injury Surveillance System (NC-CISS) links crash report data with health outcome data, specifically data for emergency department visits and death certificates. These linked datasets provide a more complete picture of the circumstances and outcomes associated with motor vehicle crash injuries that have occurred in North Carolina.

NC-CISS is a partnership between the University of North Carolina (UNC) and the North Carolina Division of Public Health (NCDPH). More specifically, the project is a collaboration between the UNC Injury Prevention Research Center, the UNC Highway Safety Research Center, the UNC Carolina Center for Health Informatics, the Injury and Violence Prevention Branch of the NC Division of Public Health, the CDC, and others.

Collaboration Between UNC and NCDPH

There has been a long history of collaboration between the UNC Injury Prevention Research Center and the Injury and Violence Prevention Group in the NC Division of Public Health since the 1980s. The collaboration was proposed as a way of bringing together the academic and practical sides of injury prevention from UNC and the state, respectively. The partnership has been particularly strong in the past 15 years, under the leadership of the head epidemiologist at the state. CDC funding has also helped to sustain this relationship.

Impetus

Motor vehicle crashes are a significant cause of injury and fatality in North Carolina. Emergency department visit data sheds light on the demographics, treatment, and nature and severity of injuries of people treated for crash injuries, while police-reported crash data provides the circumstances of the crash. Looking at the two datasets separately can limit understanding of how and why crashes happen. Linking health outcomes data with crash data can give insight into various crash and socio-demographic factors that contribute to the health outcomes of crashes.

The NC-CISS builds on a previous project, Linking Health Outcome Data with Police Crash Report Data in North Carolina. This study was funded by the North Carolina Governor's Highway Safety Program (GHSP). From 2016 to 2020, GHSP funded the Carolina Center for Health Informatics (CCHI) to link health outcome data with police crash report data to improve injury surveillance in the state. It focused on crash records involving bicyclists and pedestrians and used a data linkage method called hierarchical deterministic linkage, which sequentially links data according to a list of predefined variables. This effort demonstrated the usefulness of linking crash and health outcome data, and the NC-CISS builds on this project by incorporating all motor vehicle crashes and using a more refined data linkage technique.

Data and Methodology

The main data sets involved in the NC-CISS are crash reports, death certificates, and records of emergency department visits. Crash report data was recorded by law enforcement officers for crashes involving a motor vehicle resulting in at least one harmful event, including either a fatality, a non-fatal personal injury, or property damage of at least $1000. Death certificate data was taken from the North Carolina Vital Records Office and includes resident and non-resident deaths within state boundaries. Emergency department visit data was taken from the North Carolina Disease Event Tracking and Epidemiologic Collection Tool (NC DETECT).

These data sets were the result of a previous project, which explored 13 data sources, developed a standardized documentation for them, and identified the pros and cons of using them. This documentation helped determine which data sets were accessible. Pilot demonstration projects were also carried out, to varying levels of success. For instance, other data linkages that were attempted, but unsuccessful, included linking hospital discharges with crash data. Another example was linking with trauma registry data, which was initially viewed as more feasible, but not published to the dashboard because of a failure to receive permission from data owners.

NC-CISS uses cascading hierarchical deterministic (CHD) linkage with block filtering using the programming language R. The other data linkage methodologies considered were recursive partitioning trees (RPT) in R and probabilistic linkage using LinkSolv. CHD was chosen because the other options required more computing resources and could have been more challenging for multi-disciplinary audiences. CHD linkage consists of a series of linkage passes with variations on exact matches and filters. After each step, the linked records are removed from subsequent linkage steps, and the process repeats through each of the linkage passes to create the final linked dataset. The benefits of the CHD process are that the process is fast, transparent, and replicable, and the data linkages that the CHD process produces are high quality.

Funding

NC-CISS is 100% grant funded. The project was funded through a year-four motor vehicle supplement of the five-year CDC grant Core State Violence and Injury Prevention Program. NC-CISS also received funding through the Governor's Highway Safety Program. Much of the work the project wanted to achieve in terms of developing linkages, creating the publicly available dashboard, and providing assistance to Vision Zero communities, would not have been possible without the two years of overlapping funding from NCDOT and the CDC.

Applications

The three data sets (crash reports, ER data, and death certificates) were linked and published to a publicly available dashboard for communities to view and use. The dashboard allows the public to use a public health approach to examine motor vehicle crashes in North Carolina. It also raises public awareness of the causes of crashes, a safe system approach to crash prevention, and concepts of equity and outcome disparity. These concepts are then applied to various topics of interest, such as child passenger protection, the impacts of COVID-19, and pedestrian injuries and fatalities. The dashboard also provides key text and framing that communities can use to tell stories of their motor-vehicle crashes. Figure 7 shows a screenshot of the dashboard.

In addition to the publicly available dashboard, the data was also used to help Vision Zero efforts in North Carolina. While the dashboard provides helpful information, it does not provide enough detail on its own, as it is not tailored to specific geographies or analyses that might interest communities. For this reason, UNC also produced reports for Vision Zero communities to help with various data inquiries.

NC-CISS has found that serious injuries are highly underrepresented in the crash data. The UNC team found that because police who respond to crashes are not medical experts, there is a tendency to incorrectly evaluate the severity of certain injuries. The team also discovered equity issues in crash reports, with Black men and child pedestrians being greatly underrepresented in the crash report data. This suggests that linked data should be used to better inform the selection process for highway safety projects.

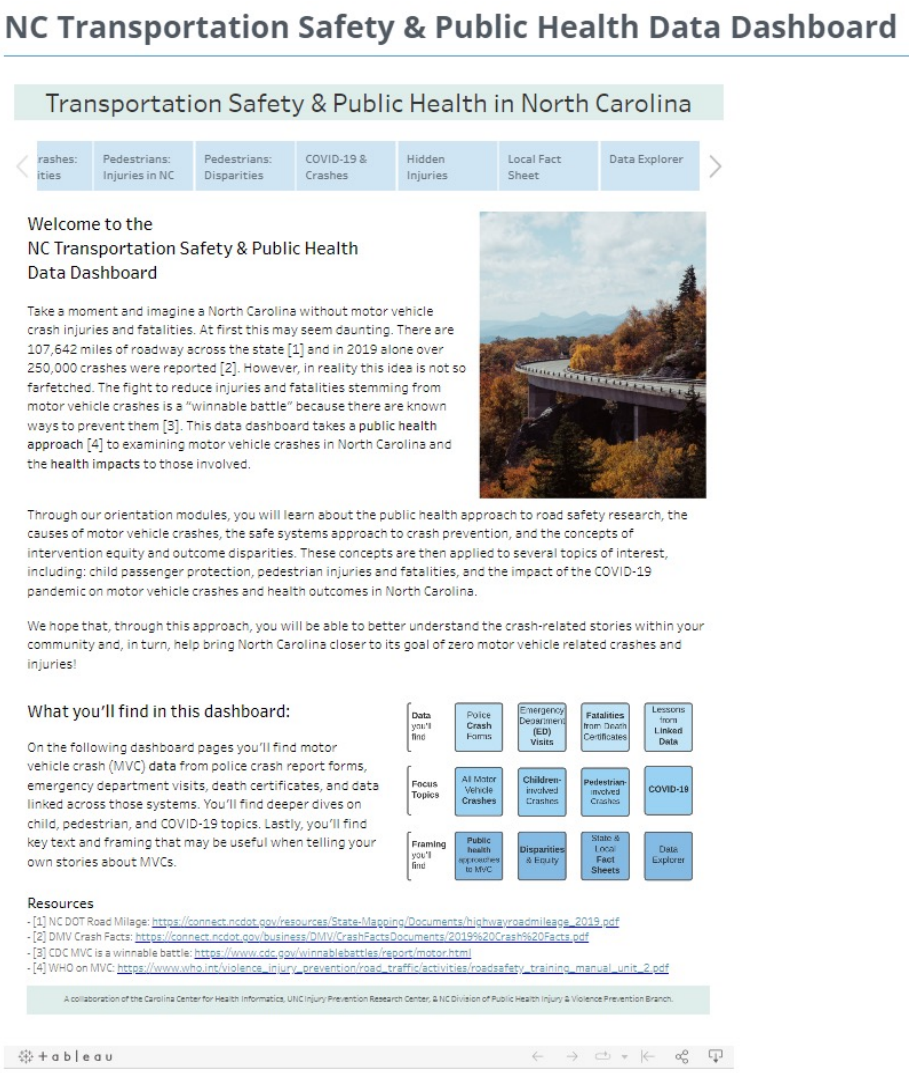

Figure 7. *Screenshot of the NC Transportation Safety & Public Health Data Dashboard (Source: University of North Carolina)*

Strengths

According to those interviewed for this report, there is a culture of collaboration as well as a history of staff with roles at both UNC and the Division of Public Health or staff joining one organization from the other. Familiarity within both entities facilitated data sharing and helped cut through bureaucratic red tape. In addition, convening people from UNC and the Division of Public Health to strategize and discuss the planning of the project was helpful, especially because arriving at a consensus in terms of the value of data linkage and willingness to share data was very difficult.

Challenges

The project team faced several challenges. For the data linkage process, a lack of common unique identifiers across data sources made linking datasets more challenging, requiring combinations of linkage variables to increase the likelihood of true matches. Issues with data quality and completeness, such as missing data and data entry errors, impacted the ability to link datasets. However, the main difficulty of NC-CISS was not in the data linkage process itself. While that process took time, it was much more difficult to convince data owners to grant the project team access. Often, data owners would not give full access to the data, resulting in UNC staff walking the data owners through the process of data linkage without

being able to look at the data themselves. Because the data owners were not experienced with data linkage, linking data sets took up to a year - much longer than anticipated. Additionally, without having access to the data, it was difficult for the UNC staff to evaluate the quality of the linkage, which hurt the scientific rigor of the process.

For these reasons, NC-CISS would only agree to work with data sets that they were able to fully access. While there are companies that sell software that can automatically perform data linkage, and presumably save time and resources during the data linkage process, they are poor replacements for the real knowledge of the data that is needed to perform the process. According to the NC-CISS team, there are no software products that do a sufficient job of linking data sets on their own.

Consensus building among partners involved in the project was also challenging because traffic safety involves many different agencies that need to work together. Having many partnering agencies made it easy to defer responsibilities to other entities, and as such, injury prevention and public health goals became lost in the process. UNC staff believes that greater leadership at the federal level is also needed to support the states in efforts to promote public health and traffic safety.

The limited funding for NC-CISS was also another big challenge. While the funding sources were available to help build the system of data linkage and the dashboard, they were not able to help maintain the system once it was built. Funding was also not provided to offer technical assistance to communities for their data needs. The launch of the public dashboard in the final year of funding helped make a case for the project's future funding. However, because of the gap in funding, no staff is currently working on data linkage, meaning that the first year of a future funding cycle will largely be spent catching up to the point where NC-CISS left off before funding was cut.

Future Plans and Vision

As a result of the project, the NC-CISS team has several pieces of advice for future data linkage endeavors. First, it helped to have a project team that was knowledgeable about, experienced in, and committed to data linkage. Other recommendations centered around better data acquisition, preparation, linkage, processing, and coding techniques, such as ensuring that potential data linkage datasets have adequate candidate variables for linkage or preparing data to easily allow the entry of data from additional years to the dataset.

With two years of additional funding secured, future plans are to first ensure that the necessary data is available and accessible. This will facilitate the data linkage process and update the data. According to UNC staff, the director of the Highway Safety Program also wants to incorporate the dashboard into the state's Vision Zero website, creating a more seamless and accessible experience for communities. Presentations on the NC-CISS are also planned for Vision Zero communities so they can understand what the data can be used for. This helps facilitate requests for data, which the team plans to respond to more specifically. Other plans will build on what has already been done, incorporating emergency medical services (EMS) data and potentially geolocating EMS and crash data.

REFERENCES

American Public Health Association (n.d.). Health Impact Assessment (HIA): A Tool to Benefit Health in All Policies. https://www.apha.org/-/media/Files/PDF/factsheets/HIABenefitHlth.pdf

Association of State and Territorial Health Officials (n.d.). Health in All Policies. https://www.astho.org/topic/health-equity/hiap/

Ben-Shlomo, Y., Blom, A. W., Sayers, A., & Steele, F. (2016). Probabilistic record linkage. International Journal of Epidemiology, 45(3), 954–964. https://doi.org/10.1093/ije/dyv322

Brown, C., Klein, N.J., Noland, R. B., & Sinclair, J. (2015). Road Infrastructure as a Contributing Factor to Pedestrian Fatalities in New Jersey. New Jersey Bicycle and Pedestrian Resource Center.

Brown, R., Haney, K., DeFisher, J., Zhou, Y., Benac, J., Cross, A., Chestnutt, C., & Scopatz, B. (2021). Guide to updating state crash data systems (Report No. DOT HS 813 217). National Highway Traffic Safety Administration.

Carolina Center for Health Informatics. (n.d.). Transportation & Health Data. https://cchi.web.unc.edu/transportation-health-data/

Center for Health Care Strategies (2018). Making a compact to strategically connect transportation and public health goals in Massachusetts. https://www.chcs.org/resource/making-a-compact-to-strategically-connect-transportation-and-public-health-goals-in-massachusetts/

Children's Hospital of Philadelphia Center of Injury Research & Prevention (n.d.). New Jersey Safety And Health Outcomes (NJ-SHO) Data Warehouse. https://injury.research.chop.edu/new-jersey-safety-and-health-outcomes-data-warehouse

Christofa, E., Deliali, A., Esenther, S., Frisard, C., Goins, K.V., Lemon, S., Page, M., Pollitt, K. (2020). Public Health Assessment for Transportation Projects. University of Massachusetts Amherst. https://www.mass.gov/doc/public-health-assessment-for-transportation-projects/download

Curry, A. E., Pfeiffer, M. R., Metzger, K. B., Carey, M. E., & Cook, L. J. (2021). Development of the integrated New Jersey Safety and Health Outcomes (NJ-SHO) data warehouse: catalysing advancements in injury prevention research. Injury Prevention, 27(5), 472–478. https://doi.org/10.1136/injuryprev-2020-044101

Fan. Y, & Phua, P. (2022). The Health and Transportation Nexus: A Conceptual Framework for Collaborative and Equitable Planning. Minnesota Department of Transportation.

Fliss, M.D., Harmon, K. J., Peticolas, K., & Waller, A.E. (2021). Descriptive Overview of Linked 2018 Crash and Death Certificate Data: North Carolina Crash Injury Surveillance System. The University of North Carolina at Chapel Hill. https://cchi.web.unc.edu/wp-content/uploads/sites/2506/2021/03/2018CrashDeathLinkedDatasetsDescriptionRev20210315.pdf

Fliss, M.D., Harmon, K. J., Peticolas, K., & Waller, A.E. (2021). North Carolina Crash Injury Surveillance System (NC-CISS) Year 1 Final Report. The University of North Carolina at Chapel Hill. https://cchi.web.unc.edu/wp-content/uploads/sites/2506/2021/03/NC-CISSFinalReport_20210316.pdf

Goughnour E. & Scopatz, R. A. (2016). Maryland's Data Linkage and Analysis to Support Decision Making: Roadway September 2016 Safety Data and Analysis Case Study. Federal Highway Administration Office of Safety. https://safety.fhwa.dot.gov/rsdp/downloads/fhwasa16049.pdf

Harmon, K. J., Peticolas, K., & Waller, A.E. (2019). North Carolina Linkage Study for Motor Vehicle Crashes Involving Pedestrians and Bicyclists. The University of North Carolina at Chapel Hill. https://cchi.web.unc.edu/wp-content/uploads/sites/2506/2019/08/Final-NC-DETECT-Crash-Ped-Bike-Linkage-Study.pdf

Maryland Department of Transportation Motor Vehicle Administration (n.d.). Maryland Traffic Records Coordination Committee. https://mva.maryland.gov/safety/Pages/mhso/traffic-records-coordinating-committee.aspx

Massachusetts Environmental Public Health Tracking (2023). Health Impact Assessment. https://matracking.ehs.state.ma.us/planning_and_tools/hia/index.html#MyPopup

Massachusetts Department of Public Health and Bureau of Environmental Health (2013). Health Impact Assessment of The Massachusetts Department of Transportation (MASSDOT) Grounding McGrath Study. https://www.mass.gov/doc/executive-summary-of-the-health-impact-assessment-hia-of-the-massachusetts-department-of/download

MassDOT (2013). Healthy Transportation Policy Directive. https://www.mass.gov/doc/healthy-transportation-policy-directive/download

MassDOT (2020). Controlling Criteria and Design Justification Process for MassDOT Highway Division Projects. https://www.mass.gov/doc/controlling-criteria-and-design-justification-process-for-massdot-highway-division-projects-e/download

Milani, J., Kindelberger, J., Bergen, G. Novicki, E. J., Burch, C., Ho, S. M., & West, B. A. (2015). Assessment of characteristics of state data linkage systems. (Report No. DOT HS 812 180). Washington, DC: National Highway Traffic Safety Administration, and Atlanta: Centers for Disease Control and Prevention.

MilNeil, C. (2021). "New 'Controlling Criteria' Will Require Sidewalks, Bike Lanes In State Road Projects - Streetsblog Massachusetts." Streetsblog Mass. https://mass.streetsblog.org/2021/03/22/new-controlling-criteria-will-make-sidewalks-bike-lanes-a-default-feature-in-state-road-projects

MnDOT (n.d.). Advancing Transportation Equity Initiative. https://www.dot.state.mn.us/planning/program/advancing-transportation-equity/

MnDOT (n.d.). Applying The Equity Lens Framework. https://www.minnesotago.org/application/files/5016/1609/8217/Equity_Lens_Companion_Guide.pdf

MnDOT (n.d.). Crafting a Transportation Vision for Generations. https://minnesotago.org/learn-about-plans/minnesota-go-vision

MnDOT (n.d.). Highway 252/I-94 Environmental Review: Brooklyn Center, Brooklyn Park and Minneapolis. https://www.dot.state.mn.us/metro/projects/hwy252study/eha.html

MnDOT (n.d.). Highway 252/I-94 Equity and Health Assessment. https://edocs-public.dot.state.mn.us/edocs_public/DMResultSet/download?docId=18201287

MnDOT (n.d.). MnDOT Vision. https://dot.state.mn.us/vision/

MnDOT (n.d.). Sustainability and Public Health. https://www.dot.state.mn.us/sustainability/index.html

MnDOT (2022). Highway 252/I-94 Equity and Health Assessment Report #1: Baseline Conditions. https://edocs-public.dot.state.mn.us/edocs_public/DMResultSet/download?docId=18201230

MnDOT (2022). Highway 252/I-94 Equity and Health Assessment Report #2: Community Priorities. https://edocs-public.dot.state.mn.us/edocs_public/DMResultSet/download?docId=19623242

MnDOT (2023). Highway 252/I-94 Equity and Health Assessment Report #3: Impacts. https://edocs-public.dot.state.mn.us/edocs_public/DMResultSet/download?docId=32020423

Mooney, R. (2016). "Information: Revisions to the Controlling Criteria for Design and Documentation for Design Exceptions." Federal Highway Administration. https://www.fhwa.dot.gov/design/standards/160505.cfm

National Diabetes Prevention Program (2024). National DPP Coverage Toolkit. Defining Health Equity. https://coveragetoolkit.org/health-equity/defining-health-equity/

New Jersey Bicycle and Pedestrian Resource Center (2022). Title 39 & Parking Protected Bike Lanes. https://njbikeped.org/title-39-parking-protected-bike-lanes

New Jersey Department of Health (n.d.). Healthy Community Planning NJ. https://www.nj.gov/health/hcpnj/

New Jersey Safety and Health Outcomes (NJ-SHO) Data Warehouse. (n.d.). Center for Injury Research and Prevention. https://injury.research.chop.edu/new-jersey-safety-and-health-outcomes-data-warehouse

NHTSA (n.d.). The Crash Outcome Data Evaluation System (CODES) And Applications to Improve Traffic Safety Decision-Making. https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/811181

SOPHIA (n.d.). SOPHIA Guide for Health in All Policies (HiAP) Implementation. https://hiasociety.org/resources/Documents/HiAP_Implementation_Guide.pdf

United States Department of Health and Human Services (n.d.). Healthy People 2030. Social Determinants of Health. https://health.gov/healthypeople/priority-areas/social-determinants-health

The University of North Carolina at Chapel Hill (2023). The North Carolina Disease Event Tracking and Epidemiologic Collection Tool (NC DETECT). https://ncdetect.org/

University of Maryland School of Medicine (n.d.). Center for Shock, Trauma and Anesthesiology Research. https://www.medschool.umaryland.edu/nsc_trauma/

Whitfield, Geoffrey P., Meehan, Leslie A., Maizlish, Neil, and Wendel, Arthur M. (2017). The Integrated Transport and Health Impact Modeling Tool in Nashville, Tennessee, USA: Implementation Steps and Lessons Learned. Journal of Transport & Health, Volume 5. Pages 172-181, ISSN 2214-1405, https://doi.org/10.1016/j.jth.2016.06.009.

APPENDIX A: HEALTH MAPPING RESOURCES

New Jersey Health Mapping

Title	Organization	Description	Link
NJDCA Community Asset Map	NJ Department of Community Affairs	The NJDCA Community Asset Map allows users to view data layers including walk score, opportunity zones, improvement districts, areas in need of redevelopment, and more.	https://www.nj.gov/dca/communityassetmap
NJDOH State Health Assessment Data (NJSHAD)	NJ Department of Health	The NJDOH's State Health Assessment Data (NJSHAD) System provides access to public health datasets, statistics, and information on the health status of New Jerseyans.	https://www-doh.state.nj.us/doh-shad/
NJ Healthy Community Planning	NJ Department of Health & NJ Department of Environmental Protection	The NJDOH and the NJDEP collect data on health, human exposures, and environmental hazards. The NJ Tracking Program collaborates to enhance the state's environmental and public health data, infrastructure, and expertise to improve the health of residents.	https://www.nj.gov/health/hcpnj/
NJDEP Overburdened Communities	NJ Department of Environmental Protection	Pursuant to New Jersey's Environmental Justice Law, the NJDEP has published a list of block groups identified as Overburdened Communities (OBCs), an Environmental Justice Mapping Tool, and associated data.	https://www.nj.gov/dep/ej/
ALICE in New Jersey - United Way	United For ALICE	Through a standardized methodology that assesses the cost of living in every county, the United for ALICE project looks at asset limited, income constrained, employed households to providee a comprehensive view of financial hardship across the United States.	https://www.unitedforalice.org/new-jersey

Title	Organization	Description	Link
NJ Adapt	New Jersey Climate Change Resource Center, Rutgers	NJ Adapt is a suite of online data visualization and mapping tools designed to provide data to planners, decision-makers, practitioners, and others addressing climate change in New Jersey. NJ Adapt contains tools like NJ Flood Mapper, NJ Forest Adapt, NJ HazAdapt, and more.	https://njclimateresourcecenter.rutgers.edu/nj-adapt/
NJ Public Health Adapt	New Jersey Climate Change Resource Center, Rutgers	NJ Public Health Adapt was developed to support efforts at the state, regional and local levels to understand the impacts the changing climate conditions may have on public health as well as to support efforts to adapt to changing climate conditions.	https://njhealthadapt.rutgers.edu/
New Jersey Transit Friendly Data Application	NJ Transit	The NJ Transit Friendly Data Application allows users to map, report, and download a range of land use, travel, public transit, demographic, and real estate development data. The data available in the application are useful to elected officials, community and economic development professionals, real estate developers, land use planners, transit service planners, and others engaged in the land use and transportation planning process.	https://njlutrans.org/
NJ Conservation Blueprint	The Nature Conservancy, Rowan University, and the NJ Conservation Foundation	The NJ Conservation Blueprint allows users to discover the conservation value of land, identify its natural and cultural features, and find conservation partners that work in the region. Data can be viewed at a statewide, regional, hometown, or parcel scale.	https://www.njmap2.com/blueprint/
New Jersey Safety and Health Outcomes (NJ-SHO) Data Warehouse	Children's Hospital of Philadelphia (CHOP) Research Institute	The New Jersey Safety and Health Outcomes (NJ-SHO) Data Warehouse advances safety and health research through novel administrative data linkages. The comprehensive data warehouse integrates various New Jersey statewide administrative databases and contains information spanning the pre-injury period to the post-injury period, supporting critical, high-priority research questions on injury prevention.	https://injury.research.chop.edu/new-jersey-safety-and-health-outcomes-data-warehouse

Title	Organization	Description	Link
"DVRPC Environmental Justice Maps"	Delaware Valley Regional Planning Commission	DVRPC provides interactive maps displaying environmental justice data including carless households, elderly populations, limited english proficiency populations, households in poverty, and more.	https://www.dvrpc.org/getinvolved/titlevi/ejmaps.htm
NJTPA Equity Analysis Application	North Jersey Transportation Planning Authority	The NJTPA Equity Analysis Application displays a composite score based on Federal equity factors at the U.S. Census Tract, municipality, and county levels. Composite scores range from 0-40, with higher numbers indicating greater burden.	https://njtpa.maps.arcgis.com/apps/webappviewer/index.

National Health Mapping Resources

Title	Organization	Description	Link
US Census Data	United States Census Bureau	The census is conducted every ten years to provide an official count of the entire U.S. population to Congress.	https://www.census.gov/en.html
American Community Survey	United States Census Bureau	The American Community Survey provides annual information about the social and economic needs of communities, including data related to education, housing, jobs, and more.	https://www.census.gov/programs-surveys/acs
City Health Dashboard	NYU Langone Health and the Robert Wood Johnson Foundation	Run by NYU Langone Health and supported by the Robert Wood Johnson Foundation, the City Health Dashboard provides health data for over 750 cities across the U.S., including more than 80 municipalities in New Jersey.	www.cityhealthdashboard.com
PLACES: Local Data for Better Health	Centers for Disease Control, Robert Wood Johnson Foundation, and the CDC Foundation	PLACES provides model-based population-level analysis and community estimates to all counties, places (incorporated and census designated places), census tracts, and ZIP Code Tabulation Areas (ZCTAs) across the United States.	https://www.cdc.gov/places/index.html
"HDPulse: Ecosystem of Health Disparities and Minority Health Resources"	National Institutes of Health	The HDPulse Data Portal characterizes the health disparities burden in a standardized manner to motivate action, integrate surveillance into public health planning, and expose health disparities. The focus is on diseases with evidence-based control interventions. Interactive graphics and maps provide support for deciding where to focus public health efforts. The data portal is one part of the HDPulse Website, which provides access to web-based resources.	https://hdpulse.nimhd.nih.gov/data-portal/home

Title	Organization	Description	Link
National Equity Atlas	PolicyLink and USC Dornsife Equity Research Institute	The National Equity Atlas draws its data from a unique regional equity indicators database developed and maintained by PolicyLink and ERI. The database incorporates measures of well-being and racial gaps, provides several decades of data for cities and metropolitan regions, and includes data disaggregated by race/ethnicity, gender, nativity, and income.	https://nationalequityatlas.org/
County Health Rankings & Roadmaps	University of Wisconsin Population Health Institute	The annual Rankings provide a revealing snapshot of how health is influenced by where people live, learn, work, and play, providing a starting point for change in communities.	https://www.countyhealthrankings.org/
EnviroAtlas	US Environmental Protection Agency	EnviroAtlas provides geospatial data, easy-to-use tools, and other resources related to ecosystem services, their chemical and non-chemical stressors, and human health. The tool uses seven broad benefit categories to organize data on ecosystem services: Clean Air; Clean and Plentiful Water; Natural Hazard Mitigation; Climate Stabilization; Recreation, Culture, and Aesthetics; Food, Fuel, and Materials; and Biodiversity Conservation.	https://www.epa.gov/enviroatlas
EJScreen	US Environmental Protection Agency	EJScreen is an environmental justice mapping and screening tool that provides the EPA with a nationally consistent dataset and approach for combining environmental and demographic indicators in maps and reports.	https://www.epa.gov/ejscreen

Title	Organization	Description	Link
CDC/ ATSDR Social Vulnerability Index	Centers for Disease Control and the Agency for Toxic Substances and Disease Registry	The CDC/ATSDR Social Vulnerability Index uses 15 U.S. census variables to help local officials identify communities that may need support before, during, or after disasters. Social vulnerability refers to the potential negative effects on communities caused by external stresses on human health. Such stresses include natural or human caused disasters, or disease outbreaks. Reducing social vulnerability can decrease both human suffering and economic loss.	https://www.atsdr.cdc.gov/placeandhealth/svi/index.html
Resilience Analysis and Planning Tool (RAPT)	Federal Emergency Management Agency	The Resilience Analysis and Planning Tool provides access to powerful data and GIS mapping that can help people understand their communities. RAPT includes over 100 preloaded layers including updated community resilience indicators from peer-reviewed research, the most current census tract demographic data, new data layers on climate predictions and equity, analysis tools, and an improved user experience.	https://www.fema.gov/about/reports-and-data/resilience-analysis-planning-tool
Health Law Atlas	Temple University Center for Public Health Law Research	The Health Law Atlas uses policy surveillance to capture the characteristics of laws and policies of public health significance, including Complete Streets Legislation and Health in All Policy legislation.	https://lawatlas.org/
HiAP Toolkit	ChangeLab Solutions	ChangeLab Solutions developed a comprehensive HiAP toolkit for anyone interested in building healthier communities through more collaborative and efficient policymaking, and to offer best practices and lessons learned from community leaders.	https://www.changelabsolutions.org/health-all-policies
Comprehensive Plan Review Checklists	Design for Health	The Comprehensive Plan Review Checklists are designed for comprehensive land use plans, transportation plans, and neighborhood plans in a variety of locations and place types.	http://designforhealth.net/integrating-health-into-comprehensive-planning http://designforhealth.net/resources/legacy/checklists/

Title	Organization	Description	Link
Health in Comprehensive Plans	Minnesota Department of Health	MDH undertook two studies to review metro area comprehensive plans for 23 health indicators. Comprehensive plans are one of the primary tools used by local governments to achieve the community vision, regulate land uses and guide future investments. They typically include chapters on land use, housing, transportation, parks, community facilities and services, and implementation tools.	https://www.health.state.mn.us/communities/environment/places/plans.html
Planning and Community Health	American Planning Association	The APA's Planning and Community Health program is a nationwide program linking public health and planning practice. The program includes several initiatives aimed at expanding resources and improving public health planning.	https://www.planning.org/nationalcenters/health/ "

RUTGERS–NEW BRUNSWICK
Edward J. Bloustein School
of Planning and Public Policy