Road Safety Culture for Local Agencies in the State of Idaho

A Thesis
Presented in Partial Fulfillment of the Requirements for the
Degree of Master of Science
with a
Major in Civil Engineering
in the
College of Graduate Studies
University of Idaho
by

Edinson Bautista

Major Professor: Kevin Chang, Ph.D.
Committee Members: Ahmed Abdel-Rahim, Ph.D.; Ahmed Ibrahim, Ph.D.
Department Administrator: Patricia J. S. Colberg, Ph.D.

May 2017

Authorization to Submit Thesis

The thesis of Edinson Bautista, submitted for the degree of Master of Science with a Major in Civil Engineering and titled "Road Safety Culture for Local Agencies in the State of Idaho," has been reviewed in final form. Permission, as indicated by the signatures and dates below, is now granted to submit final copies to the College of Graduate Studies for approval.

Major Professor: _____ Date: _____

Kevin Chang, Ph.D.

Committee Members:

_____ Date: _____

Ahmed Abdel-Rahim, Ph.D.

_____ Date: _____

Ahmed Ibrahim, Ph.D.

Department Administrator: _____ Date: _____

Patricia J. S. Colberg, Ph.D.

Abstract

According to the USDOT's Bureau of Transportation Statistics, approximately 76% of all roads are owned and maintained by local agencies. Unfortunately, the local roadway network experiences the highest overall crash rates. Local agencies responsible for these roadways often have limited resources, staffing, or knowledge of safety tools, though advancements in data collection capabilities have allowed these agencies to collect significant amounts of safety data. There is an immediate need to find out what types of safety data are being collected, what types of safety analysis can be conducted, and the engineering approaches that could be implemented to meet the safety objectives. A survey was developed and distributed to local transportation practitioners with the objective of identifying agency challenges and resources available for data collection and the analysis needed to address roadway safety. Using the information collected from the survey, a three-part training tool was developed, pilot-tested by a group of local practitioners, and revised for broad dissemination to practitioners in the future.

Acknowledgments

This thesis was made possible by the support of many individuals and organizations that backed my research at the University of Idaho. I would like to thank Kevin Chang for being my major professor. I would like to thank Ahmed Abdel-Rahim and Ahmed Ibrahim for serving on my committee. I would like to thank PacTrans, the Region 10 University Transportation Center, for funding this project. The PacTrans funding was administered by the National Institute for Advanced Transportation Technology (NIATT). Finally, I would like to thank my family for supporting me and my aspirations.

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Chapter 1: Introduction

According to USDOT's Bureau of Transportation Statistics, approximately 76% of all road miles in the United States are owned and maintained by local agencies such as towns, counties, highway districts, metropolitan planning organizations (MPOs), and other municipalities (State Transportation Statistics 2014). Based on the Fatality Analysis Reporting System report for 2013, rural roads contribute to approximately 54% of all fatal crashes in the United States (Traffic Safety Facts, 2015). In recent years, fatality and injury rates have generally decreased due to several safety measures implemented by road authorities and transportations agencies such as the use of seat belts, awareness programs, and speed limit control. The crash rate decrease represents positive progress toward the end goal of road safety but the existing number of traffic fatalities still signifies an opportunity to improve the safe management of the roadway system. Peter Kissinger, Director of AAA Foundation for Traffic Safety, stated that "we need to transform our culture from a culture that accepts loss of life and limb as a price of mobility to one in which elected officials, transportation professionals, and individual citizens expect safety, demand safety, and refuse to accept that an annual casualty count roughly equal to the population of Arkansas is a fair price to pay for mobility." (Ward, Otto, and Linkenbach, 2014) Changing the traffic safety culture is a difficult and problematic task but there is no reason why this culture could not be changed for the better.

No single action or strategy can be expected to produce such a cultural change. Rather, many combined actions and strategies at different levels of the transportation system will help foster this change. In recent years, one strategy to improve safety has been to encourage state departments of transportation (DOTs) to increase their level of interaction with local agencies with regard to road safety planning and programming. Historically, most states have focused their safety planning efforts and funding on state highways. (Preston and Storm, 2014) The investment on state highways rather than local roadways is due to several factors such as limited data in the form of crash information, roadway characteristics, and traffic control devices on local roads, or the lack of safety planning expertise at local agencies or of a champion within state DOTs seeking to expand opportunities for local agencies. The complex process and paperwork requirements may discourage local agencies from competing in state-level highway safety programs as many local agencies lack the administrative and financial resources to

proactively address road safety problems and therefore must rely on the assistance of staff from state DOTs to address local road safety issues.

Local and rural road owners may have limited financial resources available to implement highway safety improvements. For this reason, it is important that safety improvements return the highest level of benefit. A primary benefit of a safety improvement is to reduce the number of crashes and fatalities, so it is useful for local and rural road owners to understand how a particular safety improvement, or set of safety improvements, can reduce crashes.

Advancements in data collection capabilities have allowed local agencies to collect significant amounts of safety data. This has created an immediate need to find out what types of safety data are being collected, what types of safety analysis can be done with the collected data, and what other types of safety data and analysis approaches are required to meet safety objectives. With the increased complexity of various safety data management and analysis activities, and with most local agencies faced with limited staff and financial resources, there is an opportunity to provide the transportation workforce with the resources needed to effectively understand, manage, and analyze safety data. Safety data collection, management, integration, improvement, and analysis activities are integral to developing a robust data program that leads to more informed decision-making, better targeted safety investments, and overall improved safety outcomes.

A structured methodology was developed in order to better understand how local agencies collect and use roadway safety data and how agency staff is trained. The first step was to conduct a preliminary assessment of past studies that focused on the basic concepts of road safety and agency involvement. This effort established a baseline understanding of road safety. After the preliminary assessment, a survey was created to collect information on current agency practices. These data were analyzed to identify the challenges and the resources currently used by the local agencies. With the collected and analyzed data, a set of training tools were developed and modified with the support of staff from Idaho's local agencies. These training tools were developed and modified by the National Institute for Advanced Transportation Technology (NIATT) program at the University of Idaho.

Chapter 2: Literature Review

Residents of the United States value safe travel and desire a high level of motor safety. A majority of drivers believe that traffic safety is a serious issue that warrants attention. One study found that nearly one in five drivers has, at some point in their lives, been involved in a serious crash in which someone needed to go to the hospital and one in nine has been seriously injured in a crash. (AAA Foundation for Traffic Safety, 2017)

One of the major factors that contribute to high overall crashes in the United States is the safety culture of the country. One consistent, often puzzling, finding in psychological science is how actions can be disconnected from attitudes. Younger drivers rate texting as one of the riskiest behaviors they can engage while driving (Atchley, Atwood, & Boulton, 2011) and also indicate that a texting driver is more responsible for a crash than a drunk driver (Atchley, Hadlock, & Lane, 2012). A person's behaviors are influenced by a wide range of subtle influences of which they are often unaware. The perceived norms that influence the willingness to engage in risky behaviors or the willingness to choose best safety practices can be collectively referred to as "safety culture". To improve traffic safety, it is important to understanding how to assess the influence of culture on traffic safety. Traffic safety culture is surrounded by the larger context of a country's cultural norms and values which can produce different safety outcomes even when factors are similar. The United States has a cultural view of the automobile as a representation of freedom, leading to choices that result in higher crash rates than many countries around the world. (Atchley, Shi, Yamamoto, 2014)

Local roads account for approximately 76% of the nationwide road and street network or about 2.93 million miles. The local roadway network consists of thousands of miles of paved and unpaved roads and accounts for over 15,000 fatal crashes each year or fifty percent of the total number of fatal crashes. (Traffic Safety Facts, 2015). A question arises from this data; what can local agencies do to reduce fatalities and injury crashes? To achieve the goal of a one hundred percent reduction in fatalities and injuries, local agencies must be active participants and take the lead if there is to be program success. Local agencies responsible for these roadways often lack resources such as staff, funding, or training of safety tools. This situation worsens when local agencies do not have a defined safety program.

Even under ideal conditions, addressing safety issues on this extensive rural road network is difficult, and the lack of resources further complicate the problem. Local agencies often manage their roadway by just considering road maintenance. Safety issues are often ignored or not identified because these networks carry very low traffic volumes. Counties manage about 1.74 million miles of roadway, while cities and townships manage the remaining portion of the 2.93 million mile total. Safety remains a problem for all local road and street agencies, and safety improvements are needed because fatal crash rates are highest on local roadways.

States are using a variety of approaches to engage local agencies as they frequently lack the resources to plan and implement road safety projects and programs. State DOTs coordinate through their Local Technical Assistance Program (LTAP) centers to address issues on local road safety or to facilitate the distribution of limited funds for local road safety. Many states have developed low-cost treatment options that improve safety on local roads, and local agencies rely on crash databases to determine safety improvement focus areas. Park, McTish, Holman, Giancola, and Davenport (2016) identified that local road programs or projects are implemented by the state DOT through both central offices and district office staff, and state DOTs most frequently provided technical assistance and support to local agencies at all project stages. Federal funding was identified as the major source of support in most states for local safety programs, while crash data and risk analysis were identified as the most commonly applied criteria used to determine the funding allocation for local safety programs. Most states included an element in their State Highway Strategic Plan (SHSP) that identified and addressed goals and initiatives to improve safety on local roads.

Previous studies have also explained how state DOTs engage local agencies in the safety process and determine what organizational characteristics influence how well they accomplish this goal. Characteristics such as: establishing partnerships with MPOs, LTAPs, and various coalitions of local agencies, designating staff working as liaisons to local agencies with outreach programs, choosing projects that benefitted local road systems, and providing DOT leadership support for engaging local agencies in statewide safety planning efforts were not necessarily distinguishable between high and low performing states. Many of these characteristics are

foundational elements to engaging local agencies. Characteristics that were distinguishable among the higher performing states were: professional staff dedicated to supporting local agencies, adopting zero traffic fatalities as their long term goal, directing highway safety improvement program dollars to fund improvements on local road systems, HSIP commitment proportional to the number of serious crashes on local roads, commitment to increase engagement with local agencies as part of the state's SHSP, and adding a systemic component to their HSIPs, including technical assistance to prepare local safety plans and encourage multiagency projects. (Preston and Storm, 2014)

It is the goal of local road safety programs to save lives by reducing fatalities and serious injuries on local roads. States are focused on improving safety on a system-wide level and consider local roadways as another opportunity to achieve the goals and objectives identified in SHSPs. Addressing local road safety issues requires knowledge of various funding mechanisms, access to essential traffic safety data, traffic engineering and safety expertise, and partnerships amongst and between a wide array of local elected officials, planners, engineers, and other decision-makers. Realizing the complexities of local road safety, many state DOTs offer support in the form of information, training, technical assistance, and project implementation to agencies to assist with local road safety projects. Previous assessments revealed a variety of efforts that state DOTs have implemented to improve local road safety. The noteworthy practices serve as a menu of options for DOTs and local agencies to consider when enhancing local road safety. The level of support needed varies across states and depends on the extent of the local road safety problem, the expertise of local agencies within the state, and the resources available for a DOT to provide this support. (Gaines, Waldheim, and Herbel, 2013)

Safety tools for local agencies that are practical and easy to implement are important resources to have available. However, these tools alone cannot help reduce crashes if they are not correctly applied. Meeting the safety needs of local agencies is considerably challenging, given that these agencies operate in an environment of limited resources. The safety practices should be specifically tailored to address the problems and match up with the resources of each agency; there is no one-size-fits-all safety solution, and large financial commitments or complex analyses are not always conducive to implementing a successful local safety program. A

documented local roadway safety program can be a proven safety tool, and recognizing the need to implement even a rudimentary safety program is a necessary first step. (Wilson, 2003)

After identifying the challenges that local agencies face when addressing road safety, the next step is to determine the role of safety culture in these agencies. The concept of safety culture has evolved and depends on the level of analysis. The original safety culture concept was developed to account for the impact that a specific organization's culture had on the safety-related behavior of a specific workforce. Therefore, the concept applied directly to the level of an organizational unit which was a well-defined entity and clearly-bounded system. Given that the concept of safety culture was originally developed to describe the influence of factors within a specific organization, the concept should be directly applicable to federal, state and local agencies. (Wiegmann, Thaden, 2007)

Traffic safety culture appears to be an intuitive and powerful concept which can explain the observed differences in international, regional, and demographic crash risk, as well as the tendency of high-risk behaviors. There have been studies that have documented the effectiveness of traffic safety interventions predicated on the effect of culture on behavioral choice. A cultural approach needs to complement a traditional traffic safety approach which includes engineering, enforcement, and education. By treating the origin of risk behaviors, cultural-based interventions can be considered proactive and transformational in their treatment approach. (Ward, Linkenbach, Keller, Otto, 2010)

Several barriers must be overcome to successfully transform a traffic safety culture. Ward, Linkenbach, Keller, and Otto in 2010 identified five barriers that need to be addressed for a successful approach toward safety culture change. These barriers were: isolation, tradition, definition, omission, and direction. The concept of isolation was described as to how traffic safety is perceived and the challenges agencies have to collaborate among themselves. The traditional approach toward traffic safety problems was also identified since it prevents the support for long-term transformation. The concept of safety culture is also not well-defined. Ward, Linkenbach, Keller, and Otto stated that "despite its ubiquitous reference, the current use of the term 'traffic safety culture' is often colloquial, inconsistent, and vague. Such ambiguity

is a barrier to convergent understanding and unification of effort." The lack of research and the absence of a theoretical model prevents the support of any initiative aiming to transform the safety culture. (Ward, Linkenbach, Keller, Otto, 2010)

Safety culture has become an important aspect to consider when addressing road safety in the past decade. This concept has slowly been introduced to transportation agencies through the use of the "4 E's" of road safety: engineering, educational, enforcement, and emergency medical service. Currently, local agencies face challenges such as lack of funding and staff that prevent them from managing their own road network and addressing road safety. The statistical data highlighted earlier have shown that local agencies have an important role in the objective of reducing fatal and injury crashes in the United States. An important step toward improvement is to change the safety culture within local agencies as well as in the community. The training tools that were created as part of this research targets this type of change, and the purpose of these training tools is to inform agencies on the role that they play in safety, the need of improvement, and how specific tools will help them move forward.

Chapter 3: Methodology

3.1 Objectives

In order to identify the road safety challenges local agencies are facing and to share the resources available to local agencies and, in particular, with agencies in the State of Idaho, it was essential to develop a comprehensive understanding of the needs and priorities with regard to safety data management and analysis and safety culture. Furthermore, current and new practitioners needed to be provided with a fundamental set of core skills and knowledge required for safety data management and analysis to support local transportation decision-making. A structured process was developed in order to better understand current practices and needs. The process steps included: a preliminary assessment, survey, survey data analysis, draft presentations, interview, interview data analysis, and final presentations. The purpose of each step is explained as follows:

- A preliminary assessment of past studies was conducted which focused on the basic concepts of road safety and agency involvement; this effort established a baseline understanding road safety.
- A survey was developed and distributed to collect information on local agency practices.
- The survey results were analyzed to identify the challenges of and the resources currently used by local agencies.
- Draft presentations were created with the use of the preliminary assessment and the data collected.
- The draft was sent to practitioners who previously participated in the survey as a pilot study. Interviews were conducted as a data collection method.
- The data was analyzed with the use of a qualitative tool and defined criteria. The draft presentations were modified in accordance with the data collected.

A flow chart documenting this process is illustrated in Figure 1.

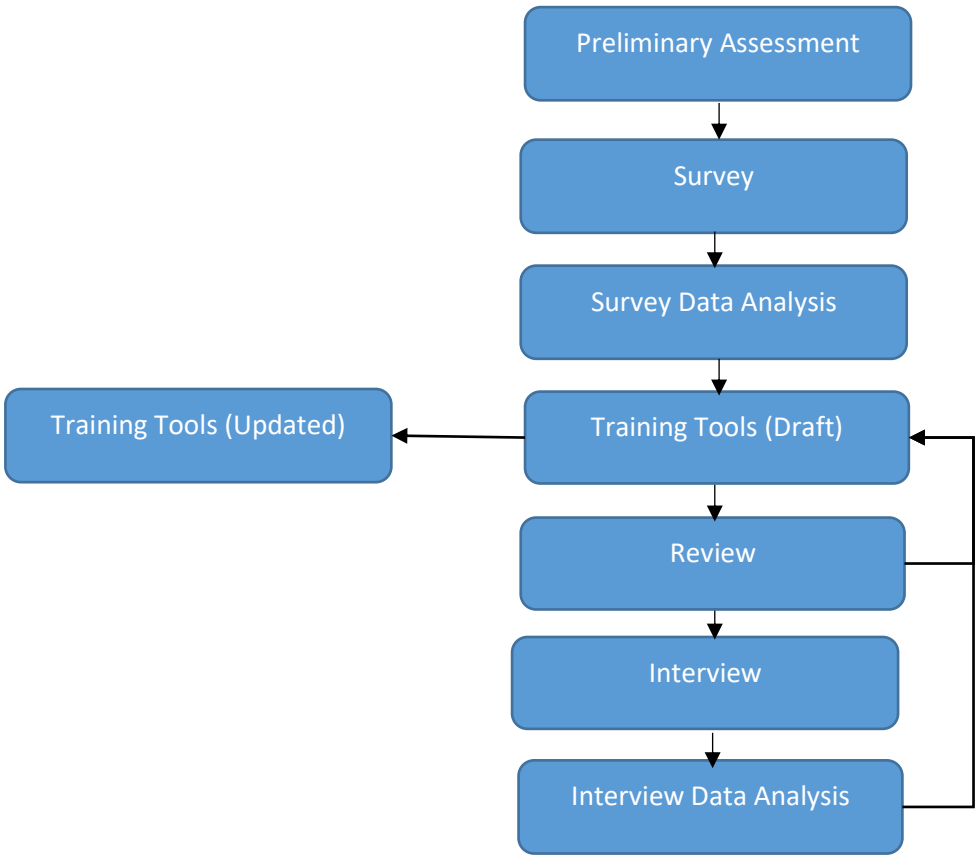

Figure 1. Flow Chart

3.2 Survey

To identify the resources currently available to local agencies in Idaho, several assessment methods were evaluated to determine the ideal approach to take. The use of a survey was selected for this research since this method has a high relevance to the transportation field. This research focused on road safety resources, so it was desirable to ask agencies and their staff about the resources that are used for data collection and analysis. Regardless of the subject matter to be covered, transport surveys do serve several purposes. (Richardson, Ampt, and Meyburg, 1995) The main purpose of this survey was to identify the resources available for data collection and analysis and to identify the challenges associated with securing these resources.

The use of an online survey tool provided many benefits. One of the benefits was that the survey could synthesize the characteristics of a large population to draw conclusions from and make

important decisions. However, even though surveys are considered a great tool to use, many mistakes need to be avoided. Confusing or misleading questions is one of these mistakes. Survey questions must clearly ask a specific and pointed question. When an individual is confused by the question, he or she will typically not answer the question in a way that is useful. Another mistake is having a question that is too long. It is easy to lose the appropriate meaning when questions are long and the respondent feels overwhelmed or loses focus while reading the question. (Penwarden, 2015)

Predicting the level of survey participation is difficult; survey response rates vary widely and a wide variety of factors can impact them. The challenge was to work within the existing constraints of the e-mail system, and the first step was to find a way to encourage e-mail recipients to open and read the e-mail rather than immediately deleting it. (Watt, 1999) The use of an online survey as a method of data collection has been increasing with the rise of the internet but the average response rate appears to be decreasing. Research done by Sheehan in 2001 reviewed 31 studies that used an e-mail survey to collect data and reported a mean response rate of 36.83%. They noted that e-mail surveys administered in 1995 – 1996 had an average response rate of about 46% while e-mail surveys in 1998 – 1999 had an average response rate of about 31%. Another study identified that the average response rate for studies utilizing data collected from organizations is 35.7 percent with a standard deviation of 18.8 percent. (Baruch and Holtom, 2008) Some factors can be considered to overcome the low response rates including personalized e-mail invitations, follow-up reminders, pre-notification of the intent to survey, and simpler formats. (Cook, 2000; Solomon, 2001)

At the preliminary planning stage, several basic issues were addressed prior to proceeding with the design and administration of the survey. A survey target audience was identified and consisted of managers, city engineers, superintendents and directors of public works, street division staff, and traffic division staff from local agencies in the state of Idaho. Their contact information was obtained from various city and county websites or by directly contacting a specific person or agency. Contact information from a total of 269 cities, counties, and highway districts was collected.

The initial survey, administered through SurveyMonkey, featured questions related to road safety, and these questions were reviewed to avoid any wording mistakes. The overall survey was designed to take around five to ten minutes to complete. Some follow-up questions were asked in order to gather more in-depth information from each participant. The questions are shown in the numbered list below and specific options, though omitted from the questions below, are discussed in the subsequent sections.

1. How would you best describe your agency's familiarity level with the following programs?
2. For your local agency, traffic safety data such as traffic volumes and speed are collected by?
3. Does your local agency perform analysis to evaluate sites for safety improvements?
4. What software do you use to analyze traffic safety data?
5. Does your agency regularly use (any of the following) safety documents?
6. In the past 3 years, did your agency receive training (in any of the following topics)?
7. Rank the topic areas of greatest need to your local agency with 1 being the highest need and 6 being the lowest need.
8. If additional resources or funding were made available to address traffic safety, how would you prioritize (the following needs)?
9. The University of Idaho is developing a series of online "training modules" focused on roadway safety for local agencies in the State of Idaho. What are three essential topic areas/subjects that we must include?
10. We believe that these training modules will benefit from your future input. Please provide your contact information if you would kindly allow us to reach out to you in the future. Thank you in advance.

A link to the survey was sent by e-mail to each local agency. While administering the survey, one challenge noted was that some local agencies did not have a practitioner in charge of road safety. In this scenario, the city or county clerk was asked to provide information related to how their organization manages road safety.

3.3 Survey Response Rate

From the 269 agencies contacted, 24 local agencies in the state of Idaho responded to the survey constituting an 8.9 percent response rate. Of the 24 agencies, 41.7 percent represented a city agency (N=10), 29.2 percent represented a county (N=7), 8.3 percent represented a highway district (N=2), 8.3 percent represented a metropolitan planning organization (N=2), and 12.5 percent were from an undefined agency (N=3). (An undefined agency implied that the agency or responder did not provide any contact information). The participants, based on their geographic location within the state, are shown in Figure 2 and were located all across the state of Idaho. The agencies located in the north and central Idaho mainly consisted of counties except the City of Hauser while most of the agencies in the south were cities. There were some parts of the state that were not well-represent such as the cities and counties between Lewis County and the City of Hauser, the central west side, and a small belt between Jerome County and the City of Twin Falls.

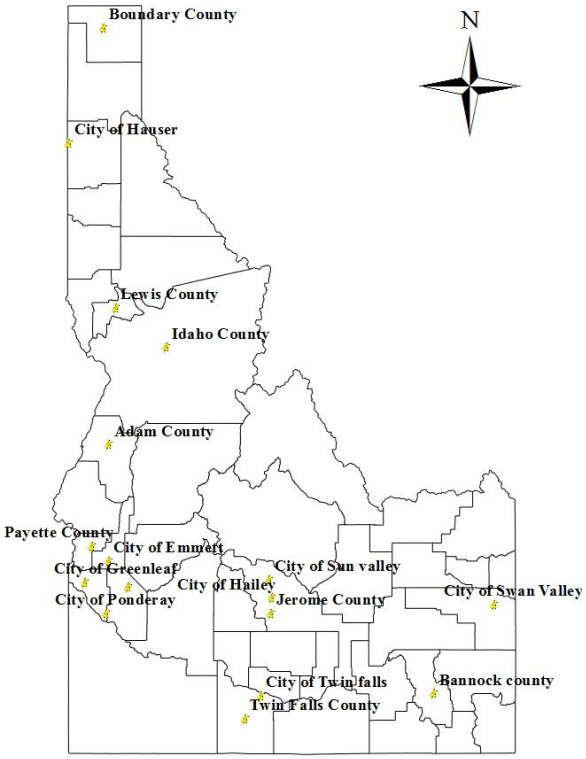

Figure 2. Survey Participants

Many smaller local agencies noted that a separate entity provides services to manage their roads, and this arrangement was more prevalent when an agency did not have a street or traffic division. The most common agency tasked with managing another agency's roads was the local highway district, which represents a state-level agency.

3.4 Survey Responses

Although the overall survey response rate was lower than expected, the distribution and the varying types of agencies that participated represented a broad statewide spectrum. In the following paragraphs, the analysis of the responses is presented.

When asked to describe their agency´s familiarity level with specific road safety programs, respondents were provided with the following options and asked to rank their level of familiarity: Toward Zero Deaths (TZD), Highway Safety Improvement Program (HSIP), Highway Risk Rural Road Program (HRRRP), and the Traffic Enforcement Mobilization Agreement (TEMA). Of the four options, the most familiar program based on the number of agencies that selected the moderately and extremely familiar choices was the Highway Safety Improvement Program (N=12) and the least familiar program based on the selection of not at all familiar was the Traffic Enforcement Mobilization Agreement (N=16). Toward Zero Deaths (N=12) and the Highway Risk Rural Road Program (N=10) were in the midrange of familiarity when considering the agencies that selected the slightly familiar and somewhat familiar choices. (see Figure 3).

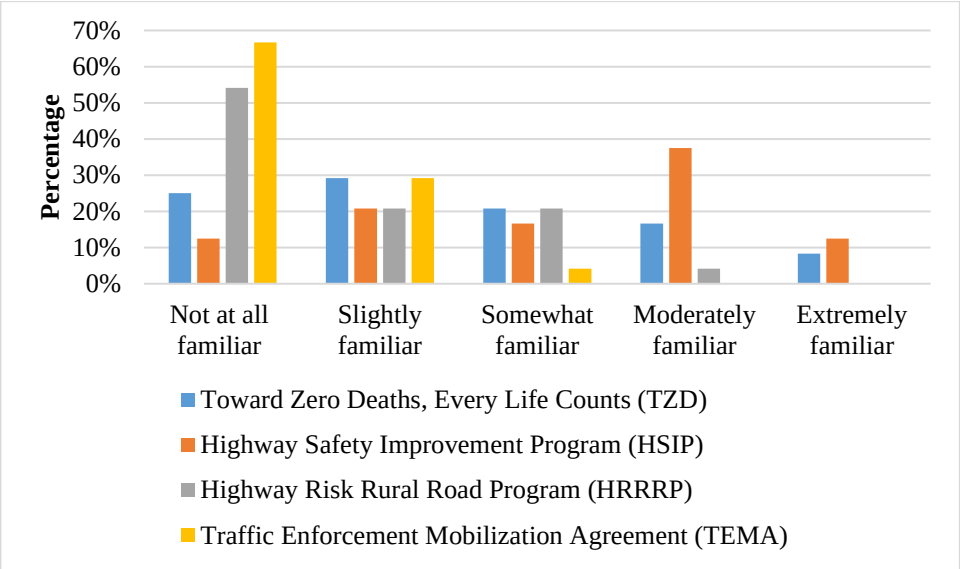

Figure 3. Local Agency Familiarity of Safety Programs

The collection of traffic safety data such as traffic volumes and speeds at their local level varied amongst internal staff, a consulting or data collection agency, the Idaho Transportation Department, or another local agency. Sixteen local agencies responded that their own internal staff collects traffic safety data while fifteen agencies occasionally request and receive technical assistance from the Idaho Transportation Department. Some of the agencies rely on consultants from other local agencies. The agencies that specified "other" agencies stated that they collected data with help from county and highway district staff.

Each local agency was asked if they perform specific types of analysis to evaluate sites for safety improvements. This question evaluated if an agency had conducted an analysis for a traffic stop sign, traffic control signal warrant, pedestrian crossing, or completed a crash analysis. The most common type of analysis used to evaluate sites for safety improvements was a stop sign analysis followed by conducting a traffic control signal warrants. The analysis least frequently conducted was a crash analysis. A pedestrian crossing analysis was in the middle of the range, with some agencies conducting this analysis while others did not have the capability to do so.

Software applications have an increasingly large role when analyzing traffic safety data. Responding agencies had the option of identifying their familiarity with certain software

applications currently in use. Specific options included: Safety Analyst, WebCARS, Interactive Highway Safety Design Model (IHSDM), and Geographic Information System applications. The results show that the software most used by local agencies to analyze traffic safety data is GIS (N=8). Safety Analyst was not identified by any agency. Four agencies noted other options including the Travel Demand Model - QRS II and various Highway Safety Manual spreadsheets.

Each agency was asked how regularly they use or reference specific safety documents or resources. The agencies had the option of selecting between the Highway Safety Manual (HSM), Highway Safety Improvement Program Manual (HSIP), High Risk Rural Road Manual (HRRR), Model Inventory of Roadway Elements (MIRE), Manual on Uniform Traffic Control Devices (MUTCD), ITD Traffic Manual, A Policy on Geometric Design of Highway and Streets, or any other resource. The most commonly referenced resource as identified by the agencies was the MUTCD (N=18) followed by the ITD Traffic Manual (N=12). The HRRR and MIRE were the least used. Based on these results it appears that there is an opportunity to further expose both the HSM and HSIP to local agencies.

Each agency was asked if they had received training in the last three years in any of the following topics: data collection methods, data analysis procedures, countermeasure identification, cost/benefit analysis, Highway Safety Manual usage, road safety problem identification, or pedestrian and bicycle safety or complete streets. Several agencies (N=11) had received training in pedestrian and bicycle safety or complete streets. For the other training topics, some had received training in data collection (N=4), data analysis (N=3), and cost/benefit analysis (N=3). Training with regard to the Highway Safety Manual was comparably lower when compared with the other suggested topics.

Each responder was asked to prioritize and rank a selected topic area of greatest need for their agency. The choices included: data collection methods, data analysis procedures, countermeasure identification, road safety problem identification, project prioritization, and project funding. Specific examples were provided for each category to add clarity for each option. The agencies prioritized these topics in the following order: project funding (sources

and opportunities), project prioritization (methods and procedures), data analysis (methods and procedures), and road safety problem identification.

In the event that additional resources or funding were made available to address traffic safety, the responders were asked to prioritize the following needs: hire additional staff or expertise, increase training or technical assistance opportunities, increase data collection opportunities or frequency, or enhance data analysis capabilities. The agencies prioritized the needs as follows: hire additional staff or expertise, increase training or technical assistance opportunities, and increase data collection opportunities or frequency.

The final question asked responders to identify three essential topic areas or subjects that would serve as an ideal and needed future training topics. The agencies provided many topic alternatives, and the responses were grouped into the following categories: problem identification, countermeasure options, project prioritization, highway and street design, traffic signals and management, road safety audits, transportation planning, and funding management.

Responders were also given the opportunity to provide their contact information and indicate their willingness to participate in future studies.

3.5 Interview

Based on the feedback provided by the practitioners, a set of PowerPoint slides was developed to address user needs. (The content of these slides is described in the next chapter) To further evaluate the applicability and effectiveness of this learning tools; the slides were sent to a subset of practitioners for testing as part of a pilot study. The main purpose was for local agencies to review and comment on the content, images, graphics, text, and general format of the slide deck. The directors, superintendents, or supervisors of each agency were encouraged to share the presentations with newer staff as well as to provide their own feedback. The initial approach was to contact all practitioners who previously participated in the survey. Local agencies from cities and counties in the State of Idaho were selected to perform this task, and from the fourteen

agencies contacted, seven agencies (N=7) agreed to participate in this following evaluation. The presentations were sent in both a .pdf and PowerPoint format to the participant.

A phone interview was conducted two weeks after initial contact with the participants. During this period of time, a twelve-question interview script was developed which focused on specific topics and concerns related to the content and format. The questions were divided into the following categories: initial perception, usefulness, formatting, and recommendations. The questions are shown in the numbered list below:

1. What is your name and what agency do you work for?
2. How long have you been with [this agency]?
3. In your own words, what do you think is the purpose of these presentations?
4. If given the opportunity would you use these presentations yourself?
5. Do you think you would share these presentations within your own agency?
6. Would you recommend these presentations to your transportation colleagues? Yes or No?
7. Would you please comment on the general format of the presentations?
8. Were the presentations easy to follow? Yes or No. Please describe.
9. Were the images and graphics on the slides helpful? Yes or No. Please elaborate.
10. What specific topic or topics did you find most interesting?
11. Was the length of the presentations appropriate?
12. Can you suggest any topics that you would recommend for future presentations?

Each interview was recorded with the permission of the participants and the analysis was conducted based on the participant's observations of the initial slide deck. The average time of each interview was 11 minutes 42 seconds. The interview was administered to six agencies in the state of Idaho and one agency in the state of Oregon. Their working experience, in their respective agencies, ranged between eight and thirty-two years.

3.6 Interview's Responses

The interview responses were reported as qualitative data, and as a strategy to report this type of data, frequencies were used to develop a useful summary based on the important points of the interview. In the qualitative analysis, the data are indexed to develop different analytical categories and theoretical explanations. (Pope, Ziebland, Mays, 2000) A study done by Knafl and Howard recommended the following minimal requirements for reporting qualitative data: "preparation for data collection, length of time spent collecting data, how data were recorded, and the amount of data collected; steps were taken to organize, categorize, or summarize the data prior to final analysis; management of threats to the validity and reliability of the data; and the process by which conclusions were derived from the data." (Knafl and Howard, 1984)

The data was analyzed using two different approaches. The first approach used Dedoose, a cross-platform application that analyzed qualitative data and mixed methods research. The second approach followed the steps recommended in the Knafl and Howard study which was previously described. In the following paragraphs, each method and associated results are explained.

For the Dedoose analysis, the interviews were uploaded and analyzed with audio recorded from each participant. After uploading the audio files, a description of the participants was created in a descriptors tab. The purpose of the descriptor tab is to describe the source of the data such as names, agency, age, gender, and other characteristics that represent the participant. From the information collected, the following fields were created: participant name, years of experience, and agency. After developing the descriptor set, each descriptor was linked to their respective interview file. The analysis consisted of creating codes which represented a specific characteristic or description identified by each participant. For example, a code representing the need to break up the presentations or reduce the number of slides was created and called "Improve Length"; All codes were simple and straight forward and the codes used in the software are listed in Appendix C. Each code was linked to an excerpt which represents a phrase in the interview said by the interviewer or interviewee. This process of linking the code was done for each interview. Dedoose presents several options to report the results but for this

analysis, the results were reported in a frequency chart matching users with the established codes (see Figure 4).

	Easy to follow	Good Format	Good information	Good length	Helpful	Improve Length	No Topics	No Usage/ No Share	Purpose (In Detail)	Purpose (Simple)	Recommendations	Road Safety	Share	Topics	Usage	Totals
Participant 1	1	3	2	2	1		1	1		1			1			13
Participant 2	3	3	3		1	1			1		4	3	1	2	1	23
Participant 3			2		1	3			1		3		1	2	1	14
Participant 4	1	1	1	1	1				1		3		1	1	1	12
Participant 5	1				1	1	1	2		1		1				8
Participant 6	1	3	1		2	3	1		1		4	3	1	2	1	23
Participant 7	1		1	1	1			2		1	1			1		9
Totals	8	10	10	4	8	8	3	5	4	3	15	7	5	8	4	

Figure 4. Code Application per User

As seen in the figure above, the code most frequently occurring was the recommendations code (N=15). This code represents the number of times the participants suggested a modification to the presentations such as breaking up the slides or adding new content. The code occurring the fewest time was Purpose (Simple). (N=3). Four participants mentioned the need to improve the length of the slides and two of them mentioned it three different times during the interview. More than half of the participants felt that the slides were easy to follow (N=6), had good information (N=6), and stated that the images and graphics were helpful (N=7). Four participants were willing to use the slides in the future and five participants desired to share it within their own agencies. The slide deck had a positive reaction with regard to the format and content but a negative reaction with regard to overall. The participant's suggestions were taken into account when modifications were made to the initial set of slides.

In the second approach, interviews notes were recorded and reviewed based on the positive or negative responses provided by the participants. The responses were grouped into the following categories: usefulness, format, topics, and recommendations. A summary of the responses is shown in Appendix D. Participants were asked to describe in their own words the purpose of

the presentations. Overall, most of the responses captured the main purpose of the slide deck; the slides are a tool or a resource that will support practitioners and their agencies to identify their role in the safety system and identified the resources available to them to improve their agency's safety culture and provide insight on how to address road safety. The presentations also allowed new engineers to learn about the field of road safety as they begin a career in this field.

The presentation had a positive reaction when practitioners were asked if would use it themselves and if they would share it with their agencies. More than half of the participants were willing to use the slide decks for their own knowledge (N=4) or share it within their own agency (N=5). The agencies that negatively responded explained that the reason for not using the slides was because their city was considerably smaller or their roads were managed by a highway district or county, while others responded that they use other training resources.

A majority of the participants noted that the presentations had a good format with the different fonts, graphics, and images making the slides interesting and catching the attention of the audience (N=7). The presentations were easy to follow and the variety of images and graphics were helpful to better understand each topic. Two participants were concerned with the amount of information provided in the presentation and explained that so much content presented in one sitting might overwhelm a new engineer or cause a general audience to lose interest at some point during the presentation.

The topics that were most interesting to the participants were the following: road safety programs, local road safety plan, FAST act, the cooperation aspect of road safety, statistical data, the important role of local agencies, and history of road safety. Three participants commented about the importance of allowing the audience to participate and having a place for discussion in between key topics to allow the audience to ask questions, discuss topics, and not lose their interest in the presentations.

The participants were also asked for suggestions on future presentation topics. Some participants were interested in knowing more about funding and the training available to

participate and compete in safety grants. Another topic suggested was how to address human error such as texting and fatigue while driving. With regard to topics already covered in the presentations, breaking them down into more specific and in-depth content was suggested.

The interview allowed the participants to express their recommendations that would make the presentations more effective and allow them to obtain more benefit. Some of the recommendations included adding an index, which would allow users to skip topics and move forward to topics of more interest to them. The inclusion of an abbreviation index at the beginning of the presentation for new practitioners that do not have experiences with safety acronyms was mentioned. Another suggestion was to add a “takeaway” at the end of each presentation. A takeaway would serve as a next step after the lecture and would provide information such as who to contact, first steps toward change, or links to web pages.

Chapter 4: Results

Using the information and insight collected from the survey, a three-part training tool was initially developed for broad dissemination to transportation practitioners. This tool, which could be used as part of a continuing education training program, was designed to be both dynamic and self-sustainable so that there would be value for those teaching this subject matter related to safety data and safety data management. The development of this tool in the form of a set of transferable PowerPoint presentations was implemented due to its ease of use, accessibility, and distribution. The presentations included components including a definition of learning objectives, identification of reading materials, road safety terminology, resources currently available, survey results, local agencies challenges, and recommendations. The three presentations were developed with the intent of being presented as part of a series but could also be delivered as stand-alone presentations.

The presentations themselves were developed in three phases. The first phase consisted of the development of an extensive outline. This helped identified the primary topics for each presentation and selected subtopics that would be included. The subtopics were categorized in terms of relevance and anticipated interest to the audience. The topics were organized in a logical sequence so that material could be shared in an orderly manner. Each slide deck could be independent of one another, so the topics identified for each presentation were selected based on this concept. After these considerations were taken into account, an outline was developed and the main topics are highlighted in Figure 5.

Figure 5. Presentations Organization

The second phase consisted of assembling the content for each presentation. The slide decks were developed with the intent that anyone could serve as a presenter describe possessing minimal familiarity with the material. With this concept in mind, a detailed script was written in the notes section of each individual slide. This script was designed to provide the necessary background for the speaker while simultaneously allowing the presenter to provide additional insight as needed. Another benefit to developing a script is that the speaker would be encouraged to remain on point for each slide. To maintain audience interest, two to three bullet points were typically provided on each slide and additional graphs and images were used to illustrate or highlight particular concepts. All graphics and figures were provided either by the research team or available in a public domain space so as to avoid any potential copyright violations. In Figures 6 and 7, the structure of the slides and an example of the title page and content page is presented.

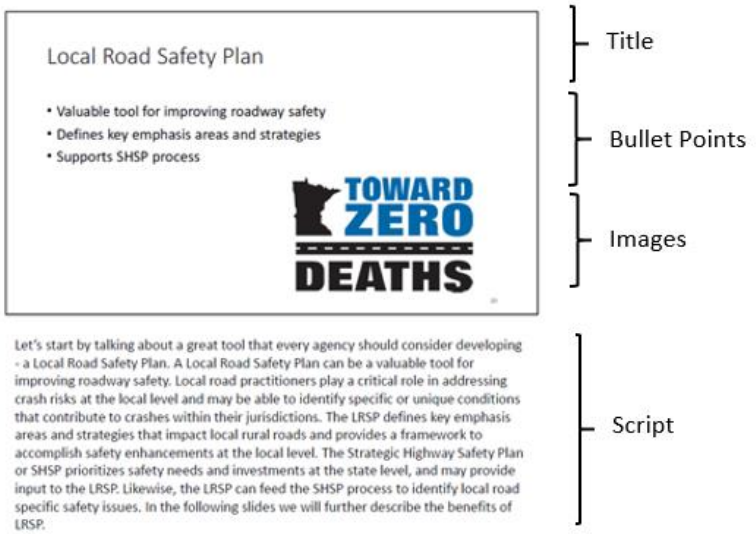

Figure 6. Slides Structure (Example)

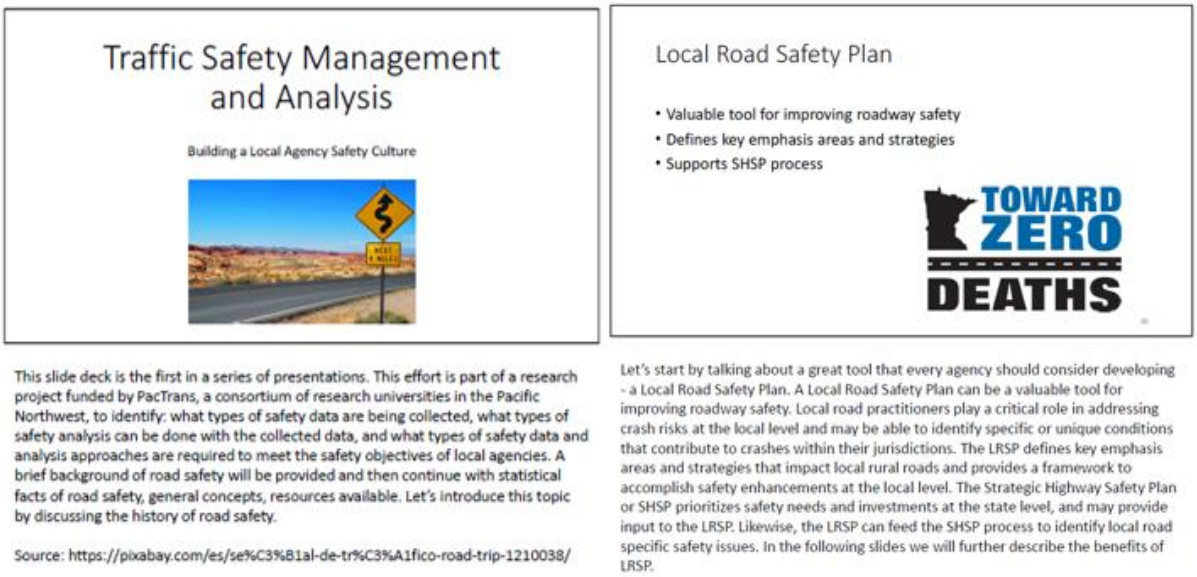

Figure 7. Example of the title page (left) and content page (right)

The third phase consisted of revising and editing the presentations. The primary objective during the revision process was to make certain that the technical content met the needs of the intended audience. The slides were reviewed so that: the information provided was described effectively and succinctly, the content on each slide made sense, the graphics on each slide were suitable, and the key messages and takeaways for each presentation were retained. In the

following three paragraphs, additional details are provided related to the content of each presentation.

The slide deck for the first presentation introduces the training by starting with the history of road safety in the United States from the Interstate Act of 1956 through the 2015 FAST Act. Statistical facts of road safety around the United States are presented and include, but are not limited to, the number of fatalities and crashes, roadway ownership in the Pacific Northwest states, and the economic impact of crashes. The next section describes general concepts of road safety such as defining road safety, describing the road users, and performance measures. Current safety legislation and its importance are then discussed. A significant part of this presentation describes the resources available to local agencies beginning with the governmental agencies that focus on improving road safety and concluding with a discussion on specific manuals, courses, and available software.

The second presentation highlights ongoing research efforts, along with the methodology and analysis of the local practitioner survey and the responses collected. A description of the purpose, objectives, and methodology used for the research is provided. Each step of the methodology is listed and described, and key elements such as preliminary assessment, past studies, and data collection are provided. The target population and survey objectives are described, and each survey question is explained. The survey responses are presented and include information on the response rates and geographic location of each responder. Specific survey results are discussed, with an explanation given identifying the resources that local agencies in Idaho have available and the challenges that agencies face while addressing road safety.

The third and final presentation focuses on the local agencies in the State of Idaho. It identifies the challenges they face and provides recommendations to address these challenges. State-specific road safety statistics from 2010 to 2015 are introduced, along with details as to how the transportation system is organized in the state. The challenges faced with gathering road safety data from local agencies are explained and include causes, consequences, and the importance of addressing them. A discussion follows encouraging the use of the Strategic

Highway Safety Plan for local agencies. The advantages and implementation methods are explained and additional resources are provided so that the practitioner can obtain more information. In the final section of the presentation, noteworthy practices throughout the United States are highlighted to showcase how some states are addressing their challenges. The presentation ends with a short conclusion section that presents the key points of the presentation.

The slide decks were modified in accordance with the comments and suggestion of the seven practitioners who participated in the interview from the state of Idaho and Oregon. Initially, the slide deck consisted of three presentations with fifty-five slides, fifty-nine slides, and thirty-three slides. After taking into account the extensive amount of content in the first and third presentations, each of these slide decks was divided into two presentations. This changed the number of slide decks from three to five. In Figure 8, the new outline is presented and the corresponding topics highlighted. The second and fifth slide decks are presented as the new presentations with thirty-two slides and twenty-six slides, respectively. The first slide deck was reduced to twenty-five slides and the fourth slide deck to thirty slides.

The slide deck for the revised first presentation was broken down into two presentations. The first slide deck starts with the history of road safety in the United States from the Interstate Act of 1956 through the 2015 FAST Act and statistical facts of road safety around the United States presenting data such as the number of fatalities and crashes, roadway ownership in the Pacific Northwest states, and the economic impact of crashes. It continues by describing general concepts of road safety such as defining road safety, describing the road users, and performance measures. Current safety legislation and its importance are then discussed. The second slide deck describes the resources available to local agencies beginning with the federal agencies that focus on improving road safety and concluding with a discussion on specific manuals, courses, and available software.

The second presentation remains with the same content as it was not divided but is now considered the third slide deck. The old third presentation was divided into two presentations. The fourth slide deck focuses on the local agencies in the State of Idaho and identifies the

challenges they face to address road safety. State-specific road safety statistics from 2010 to 2015 are introduced, along with details as to how the transportation system is organized in the state. The challenges faced with gathering road safety data from local agencies are explained and include causes, consequences, and the importance of addressing them. A discussion follows encouraging the use of the Strategic Highway Safety Plan for local agencies. The advantages and implementation methods are explained and additional resources are provided so that the practitioner can obtain more information. The fifth and final slide deck provides recommendations to address the challenges listed in the previous presentation. Noteworthy practices throughout the United States were highlighted to showcase how some states are addressing their challenges. The presentation ends with a summary and key information toward building a safety culture environment.

An index and acronym table were also added to the slide deck, this was requested by the participants to help practitioners better understand the terminology and search specific topics within the slide deck. A slide was included at the end of each presentation providing contact information along with the initial steps needed to improve an agency's safety culture. All these modifications are considered initial changes toward the continual improvement in the content of the presentations. The final draft of the slide decks is shown in Appendix E.

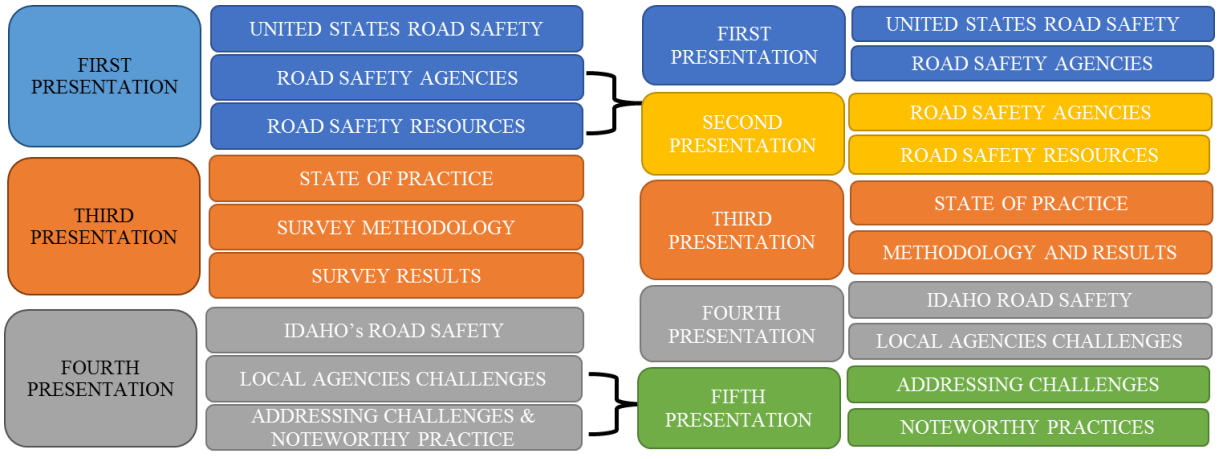

Figure 8. New Slide Structure.

Chapter 5: Conclusions

Safety planning efforts and funding often start at the state level and trickle down to local and regional agencies. Analysis and investment on state highways rather than local roads is often the result of several factors, including: statewide priorities on higher volume and higher speed roadways which typically represent the roadway network of the state DOT itself, data limitations on local roads, the lack of safety planning expertise at local agencies, the lack of a champion in state DOTs for expanding opportunities for local agencies, and other requirements that discourage or restrict participation by local agencies in a highway safety program. In summary, this research sought to examine both the challenges and current resources available to local agencies, specifically to the State of Idaho, and to address road safety.

Based on the responses from a local agency survey, it was identified that local agencies in Idaho are familiar with the Highway Safety Improvement Program and rely on staff from the state DOT to collect traffic data. The most common type of safety analysis used to evaluate sites for safety improvements was the analysis process for stop signs followed by traffic control signal warrants. The results show that the software most commonly used to analyze traffic safety data is the geographic information system (GIS) and the most common manual used is the MUTCD. In the past three years, most of the agencies did receive training in pedestrian and bicycle safety or complete streets. Project funding, project prioritization, and data analysis procedures were the three highest needs identified by local agencies in the state of Idaho. If funding was not an issue, other needs that agencies focused on included hiring additional staff or expertise and increasing training or technical assistance opportunities.

The data collected were also used to determine what challenges local agencies face to address road safety. Some agencies lack the funds needed to implement safety improvements on their road systems and look to the state HSIP or other funding sources for assistance. The increase of competition and the need to do more with less makes choosing the right projects more important than ever. Local agencies often lack the safety data or analytical skills necessary to meet crash data analysis requirements. To stretch limited highway safety funding, local transportation agencies are encouraged to identify and implement the optimal combination of countermeasures to achieve the greatest benefits. However, the lack of local staff requires more

multitasking and results in increased inefficiencies. One common challenge related to training was the lack and uneven commitment to training.

The five presentations created serve the purpose of addressing some of these challenges and providing alternatives to assist local agencies. Local practitioners had the chance to evaluate the initial draft of the presentations and recommend changes that would make the content more effective. The practitioners suggested several changes such as dividing the content into shorter presentations. This change was intended to avoid loss of audience interest and increase engagement and participation. Another recommendation was the inclusion of index and acronym list that would allow users to search for specific topics and learn new terminology. The comments and recommendations improved both the slides and its content. Future evaluation can still be done by interviewing local agencies from cities and counties that manage more complex road systems, metropolitan planning organizations, highway districts, LTAC, and State Departments of Transportation. The use of the slides during future presentations will generate more feedback which can be used to further update and expand the content.

The primary challenge to address safety remains a key responsibility of each local agency who, with limited staff or resources, must be properly engaged and informed in order to best address existing roadway safety needs and continue to improve the safety culture of their agency and community. Future research opportunities exist on the topic of road safety culture as well as local agency participation in road management, the effectiveness of countermeasures, and safety grants participation. All of the topics in the presentations that have been developed can still be expanded based on the interest of the audience. Currently, many courses and training opportunities exist around the country but it is essential to also create tailored educational material (in this case to address issues in the State of Idaho) and this approach and the format created can be applied to other states that are interested in improving their safety culture.

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Appendix A

Safety Data Management and Analysis Survey

The University of Idaho is conducting safety education research to determine what resources are currently and readily available for local practitioners in the States of Idaho. Using this information, we hope to fill missing gaps and develop resources that will help practitioners to effectively understand, manage, and analyze safety data. This short survey will take less than ten minutes of your time.

If you have any questions, please contact Mr. Edinson Bautista at [baut3586@vandals.uidaho.edu].

1. How would you best describe your agency´s familiarity level with the following programs?

	Not at all familiar	Slightly familiar	Somewhat familiar	Moderately familiar	Extremely familiar
Toward Zero Deaths, Every Life Counts (TZD)	○	○	○	○	○
Highway Safety Improvement Program (HSIP)	○	○	○	○	○
Highway Risk Rural Road Program (HRRRP)	○	○	○	○	○
Traffic Enforcement Mobilization Agreement (TEMA)	○	○	○	○	○

2. For your local agency, traffic safety data such as traffic volumes and speeds are collected by: (check all that apply)

- ☐ Internal Staff
- ☐ Consultant / Data collection agency
- ☐ Idaho Transportation Department
- ☐ Other local agency
- ☐ Other (please specify)

3. Does your local agency perform the following analysis to evaluate sites for safety improvements?

	Always	Usually	Sometimes	Rarely	Never
Traffic stop sign	○	○	○	○	○
Traffic control signal warrants	○	○	○	○	○
Pedestrian crossing	○	○	○	○	○
Crash analysis	○	○	○	○	○

4. What software do you use to analyze traffic safety data? (check all that apply)

- ☐ Safetyanalyst
- ☐ WebCars
- ☐ Interactive Highway Safety Design Model (IHSDM)
- ☐ Geographic Information System (GIS)
- ☐ Other

5. Does your agency regularly use any of the following safety documents? (Check all that apply)

- ☐ Highway Safety Manual (HSM)
- ☐ Highway Safety Improvement Program (HSIP)
- ☐ High Risk Rural Road (HRRR)
- ☐ Model Inventory of Roadway Elements (MIRE)
- ☐ Manual on Uniform Traffic Control Devices (MUTCD)
- ☐ ITD Traffic Manual
- ☐ A Policy on Geometric Design of Highway and Streets (The Green Book)

Other

6. In the past 3 years, did your agency receive training in any of the following topics? (Check all that apply)

- [ ] Data collection methods
- [ ] Data analysis procedures
- [ ] Countermeasure Identification
- [ ] Cost/Benefit Analysis
- [ ] Highway Safety Manual usage
- [ ] Road safety problem identification (per HSM and HSIP)
- [ ] Pedestrian and Bicycle safety / Complete Streets
- [ ] Other

7. Rank the topic areas of greatest need to your local agency with 1 being the highest need and 6 being the lowest need.

- Data Collection methods (i.e. electronic crash reports, roadway inventory database, Highway Performance Monitoring System (HPMS))
- Data analysis procedures (i.e. descriptive statistics, FARS data, WebCars, GIS mapping)
- Countermeasure Identification (i.e. identify crash severity, roadway characteristics, identify potential countermeasures, countermeasure effectiveness)
- Road Safety Problem Identification (per HSM and HSIP) (i.e. identify safety issues to address, average crash frequency, crash rates, relative severity index, critical crash rates)
- Project Prioritization (i.e. benefit / cost analysis, countermeasure evaluation)
- Project Funding (i.e. sources and frequency)

8. If additional resources or funding were made available to address traffic safety, how would you prioritize the following needs? (1 being the most critical and 4 being the least critical)

- Hire additional staff or expertise
- Increase training or technical assistance opportunities
- Increase data collection opportunities / frequency
- Enhance data analysis capabilities

9. The University of Idaho is developing a series of online "training modules" focused on roadway safety for local agencies in the State of Idaho. What are three essential topic areas / subjects that we must include?

A.

B.

C.

10. We believe that these training modules will benefit from your future input. Please provide your contact information if you would kindly allow us to reach out to you in the future. Thank you in advance.

Name:

E-mail address:

Job title:

Appendix B

Hello, I'm _____ and I'm calling on behalf of the University of Idaho.

We're conducting this phone interview as a follow-up to the three traffic safety education presentations that were sent to you.

Is this a convenient time for you?
1 – Yes, if yes continue.
2 – No, if no schedule another time _____.

The information from this interview will help us to improve and enhance the content, as we want this resource to benefit local agencies.

A. Would it be okay if we record this interview? [Yes or No]

Thank you. This interview will have a total of thirteen questions. Let's begin.

1. What is your name and what agency do you work for?
2. How long have you been with [this agency]?
3. In your own word, what do you think is the purpose of these presentations?
4. If given the opportunity would you use these presentations yourself?
5. Do you think you would share these presentations within your own agency?
6. Would you recommend these presentations to your transportation colleagues? Yes or No.
7. Would you please comment on the general format of the presentations?
8. Were the presentations easy to follow? Yes or No. Please describe.
9. Were the images and graphics on the slides helpful? Yes or No. Please elaborate.
10. What specific topic or topics did you find most interesting?
11. Was the length of the presentations appropriate?
12. Can you suggest any topics that you would recommend for future presentations?
13. Are there any changes that you would recommend to make the presentations more effective?

This concludes our interview. Do you have any questions for us?

Thank you.

Appendix C

Codes	Description
Easy to follow	The participants consider the slide deck was easy to follow.
Good Format	The participants consider the slide deck has a good format.
Good Information	The participants consider the slide deck has a good content.
Good length	The participants consider the slide deck has an appropriate length.
Helpful	The images and graphics were considered helpful.
Improve Length	Suggest the need of dividing the presentation.
No Topics	There were no interesting topics for the participants.
No Usage/ No Share	The participants were not willing to use or share the slide decks.
Purpose (In Detail)	The purpose of the presentation was explained in a detailed way.
Purpose (Simple)	The purpose of the presentation was explained in a simple way
Recommendations	The participant recommends changes to the slides or the addition of new content.
Road Safety	The participants mention ways to address road safety.
Share	The participants were willing to use or share the slide decks.
Topics	There were interesting topics for the participants.
Usage	The participants were willing to share the slide decks.

Appendix D

Numbers	Questions	Participant 1	Participant 2	Participant 3
1	What is your name and what agency do you work for?	City of Emmett, Idaho	Lewis County, Idaho	Swan Valley, Idaho
2	How long have you been with [this agency]?	32 years	8 years	10 years
3	In your own word, what do you think is the purpose of these presentations?	I think it is ways to look at or improve road safety and the requirements of the federal highway and the state of Idaho to address safety.	How different agencies can work together to address rural road safety and address the local agencies limited resources.	Not completely sure but to address transportation issues.
4	If given the opportunity would you use these presentations yourself?	Possibly. The major concern is a lot of information which need to be broken down.	Yes	No sure, the city is too small and it considers that bigger agencies would benefit more from the presentations.
5	Do you think you would share these presentations within your own agency?	Yes, he would.	Yes, she likes the first slide deck. It was easier to read and follow. Appendix at the beginning of the presentation for any new engineers starting in road safety.	
6	Would you recommend these presentations to your transportation colleagues? Yes or No.	Yes, he would.		
7	Would you please comment on the general format of the presentations?	The different fonts and images makes the presentation interesting. The statistical information was interested, it catches the attention. ave a full-time grant writer which makes it harder to compete with counties which have staff focus in this task which gives them an edge when competing with the small cities.	Find the slides easy to read. Go through the grammar and readability or spelling errors. The slides are informative.	
8	Were the presentations easy to follow? Yes or No. Please describe.	Yes, the slides are good and depends on how much time do you focus in each slide. Slide 26 have three bullet points and the script paragraph looks quite extensive.		They were easy to follow.
9	Were the images and graphics on the slides helpful? Yes or No. Please elaborate.	Yes, good images.	Yes, it catches your attention. Makes you stop and think.	Yes it was helpful
10	What specific topic or topics did you find most interesting?	FAST act and the funding information. Include controlled open discussion or question between key topics which allows the audience discuss different topics and experiences.	Rural road programs and LRSP oriented to highway districts. Agencies with limited resources can still make an impact.	
11	Was the length of the presentations appropriate?	There was an initial misunderstanding of the actual length of the presentations but after setting that the slides are divided in 3 parts he considers that the presentation had an appropriate length.		Maybe the presentations are a little bit long but a lot of information is being covering so it might be alright.
12	Can you suggest any topics that you would recommend for future presentations? Suggest any changes.	Training in the safety grants. Local agencies must hire engineering firms for competing in grants. Funding. How to successfully participate for grants.	Addressing human error, more education and state educational programs. Specific content related to the topics already covered. Create a type of index that people can go to specific content.	No recommendation in the moment.

Numbers	Questions	Participant 4	Participant 5	Participant 6
1	What is your name and what agency do you work for?	City of Garden City, Idaho	City of Hailey, Idaho	Jerome County, Idaho
2	How long have you been with [this agency]?	9 years	25 years	24 years
3	In your own word, what do you think is the purpose of these presentations?	To help agencies to address road safety	Help different agencies understand their involvement in the process and how safety and planning is a big plan on it.	Collect information in road safety.
4	If given the opportunity would you use these presentations yourself?	Probably not. They use other training sources.	Yes, I would but it is a little bit long because of the amount of information it has. Someone that is beginning it would be hard to determine where to start.	Probably not unless it's a specific information they need. Highway district tells or dictates what they can do or not.
5	Do you think you would share these presentations within your own agency?	Yes, probably show it their safety meeting but actually the city doesn't do a whole lot of road safety which is done by Ada county.	Yes.	Yes
6	Would you recommend these presentations to your transportation colleagues? Yes or No.		Yes	Yes
7	Would you please comment on the general format of the presentations?	Clear and concise, well directed, was put together very well.	It would be nice to have a skip ahead certain chapters.	Yes
8	Were the presentations easy to follow? Yes or No. Please describe.		It is easy to follow but it would have been nice to have a way to skip forward toward safety aspects or funding.	Yes it was easy to follow
9	Were the images and graphics on the slides helpful? Yes or No. Please elaborate.	The images and graphics were helpful. Well put together.	Images and graphics were helpful but wish he could like to click in the link. Recommend to contact LTAC.	The images and graphics were helpful.
10	What specific topic or topics did you find most interesting?	I cannot really say.	Federal funding and how it works. Road safety aspects. Combine efforts to improve road safety including enforcement, education, engineering and EMS.	
11	Was the length of the presentations appropriate?	Yes, he think so		It has an appropriate length
12	Can you suggest any topics that you would recommend for future presentations? Suggest any changes.	They came clear and concise and use a good amount of time.	More chapters related to safety and funding. If we broke the presentations, there is some great specific topics that can go more in depth.	I wouldn't change anything because he considers himself an amateur and he is more focus into planning.

Numbers	Questions	Participant 7
1	What is your name and what agency do you work for?	Clackamas County, Oregon
2	How long have you been with [this agency]?	25 years
3	In your own word, what do you think is the purpose of these presentations?	History of roads safety and making agencies think about how they can see into their own system and improve, notion that local agencies have an important role in safety and the tools available for them .
4	If given the opportunity would you use these presentations yourself?	Yes, have a good background, question to the agencies and allow discussion.
5	Do you think you would share these presentations within your own agency?	Yes
6	Would you recommend these presentations to your transportation colleagues? Yes or No.	Yes
7	Would you please comment on the general format of the presentations?	Format looks good. Layout really good.
8	Were the presentations easy to follow? Yes or No. Please describe.	Yes
9	Were the images and graphics on the slides helpful? Yes or No. Please elaborate.	It has a good mix of graphics and text.
10	What specific topic or topics did you find most interesting?	History of road safety, how we lay the framework and how safety has been looked at in the transportation system and it is a important piece. Why are we doing what we do.
11	Was the length of the presentations appropriate?	Yes, the length should be fine.
12	Can you suggest any topics that you would recommend for future presentations? Suggest any changes.	Countermeasures and how to use them more efficiently, easy guidance. After the conclusions, add a take away or something that encourage them to do something about road safety.

Appendix E

Content

- Building a Local Agency Safety Culture
  - Road Safety History
  - Roadway Statistics
  - Road Users and Performance Measures
  - Current Legislation
- Transportation Agencies and Resources Available
  - Partner Agencies
  - Manuals
  - Courses
  - Software

Content

- Highway Safety in Practice
  - Introduction and Objectives
  - Preliminary Assessment
  - Survey (Methodology)
  - Survey (Results)
- Road Safety for Local Agencies in Idaho
  - State of Idaho
  - Idaho Statistics
  - Challenges
  - Local Road Safety Plan

Content

- Addressing the Challenges and Noteworthy Practices
  - Data Collection
  - Data Analysis
  - Road Safety Audits
  - Project Prioritization
  - Noteworthy Practice

Abbreviation Index

- 4 E's of Safety: Engineering, Enforcement, Education, and Emergency Medical Service
- AASHTO: American Association of State Highway and Transportation Officials
- B/C: Benefit Cost
- BIKESAFE: Bicycle Countermeasure Selection System
- CMF: Crash Modification Factors
- DOT: Department of Transportation
- EMS: Emergency Medical Service
- FAST: Fixing America's Surface Transportation
- FDE : Fundamental Data Elements
- FHWA: Federal Highway Administration
- HRRR: High Risk Rural Roads
- HSIP: Highway Safety Improvement Program
- HSM: Highway Safety Manual
- HSIS: Highway Safety Information System
- GIS: Geographic Information System
- GHSA: Governors Highway Safety Association
- GPS: Global Positioning System
- IHSDM: Interactive Highway Safety Design Model
- ITD: Idaho Transportation Department
- ISAT: Intersection/Interchange Safety Analysis Tools
- KABCO: a standardized way of coding injury severity
- LHTAC: Local Highway Technical Assistances Council
- LRSP: Local Road Safety Plan
- LTAP: Local Technical Assistance Program
- NHI: National Highway Institute
- NHTSA: National Highway Traffic Safety Administration
- NPV: Net Present Value
- NPW: Net Present Worth
- MIRE: Model Inventory of Roadway Elements
- MPO: Metropolitan Planning Organizations
- MUTCD: Manual on Uniform Traffic Control Devices
- PEDSAFE: Pedestrian Safety Guide and Countermeasure Selection System
- PBCAT : Pedestrian and Bicycle Crash Analysis Tool
- QRS: Quick Response System
- RDIP: Roadway Data Improvement Program
- RSA: Road Safety Audits
- SDOT: State Department of Transportation
- SHSP: Strategic Highway Safety Plan
- SSAM: Surrogate Safety Assessment Module
- TEMA: Traffic Enforcement Mobilization Agreement
- TZD: Toward Zero Deaths

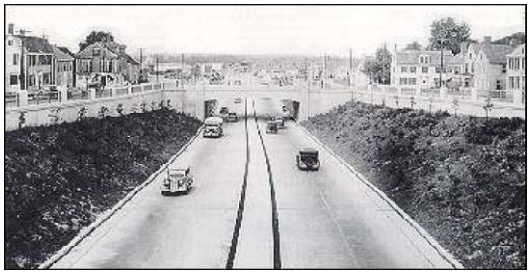
¯raffic Safety Management and Analysis

Building a Local Agency Safety Culture

This slide deck is the first in a series of presentations. This effort is part of a research project funded by PacTrans, a consortium of research universities in the Pacific Northwest, to identify: what types of safety data are being collected, what types of safety analysis can be done with the collected data, and what types of safety data and analysis approaches are required to meet the safety objectives of local agencies. A brief background of road safety will be pro¯ided and then continue with statistical facts of road safety, general concepts, resources available. Let's introduce this topic by discussing the history of road safety.

Source: https://pixabay.com/es/se%C3%B1al-de-tr%C3%A1fico-road-trip-1210038/

Road Safety (The Early Years)

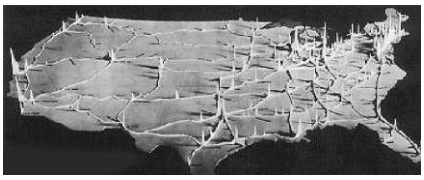


2

Road safety has been an integral part of transportation project development, and its role and significance in transportation policy has evolved over time. Since the introduction of the motor vehicle, roads have been designed and enhanced to improve user mobility and safety. The government has implemented many different measures to improve safety; the end of World War II created the opportunity to introduce a new type of project to United States, namely the introduction of a better and more reliable road network.

Source: https://www.fhwa.dot.gov/publications/publicroads/96summer/p96su10.cfm

Road Safety (¯he Early Years)



3

In 1956, the Federal-Aid Highway Act, popularly known as the National Interstate and Defense Highway Act, was enacted by President Eisenhower who signed the bill into law. The total investment in the project was $128.9 billion with a federal share of $114.3 billion. This covered the 42,795 miles built under the Interstate Construction Program and was the largest public works project in American history to date. In the same year, 49,000 Americans died in motor vehicle crashes and experts projected future increases. Despite efforts made by previous federal and state laws, most states lacked sufficient safety rules, driver education, and enforcement programs.

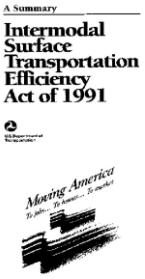
In 1966, the Highway Safety Act or the National Traffic and Motor Vehicle Safety Act, was one of the first major efforts at the federal level to reduce the number and severity of highway-related crashes. This act required states to develop and maintain a highway safety program. The act established the first mandatory federal safety standards for motor vehicles. Many changes in both vehicle and highway design followed this mandate. Vehicles were built ¯ith new safety features and roads were impro¯ed by better delineation of curves, use of breaka¯ay sign and utility poles, improved illumination, and the addition of barriers and guardrails to separate oncoming traffic lanes.

3

In 1973, a new Highway Safety Act was established. This act provided funding for existing interstate highways and new urban and rural primary and secondary roads in the United States. It also funded a highway safety improvement program, and permitted states for the first time in history to use Highway Trust Fund money for mass transit. The law also established the first national speed limit (of 55 miles per hour).

Source:
https://www.fhwa.dot.gov/publications/publicroads/96summer/p96su10.cfm,
https://en.wikipedia.org/wiki/Federal-Aid_Highway_Act_of_1973

Road Safety (1990s)



4

The evolution of highway safety continued with the passage of the Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991. ISTEA presented an overall intermodal approach to highway and transit funding with collaborative planning requirements, giving significant additional powers to metropolitan planning organizations. Highway safety was further enhanced by a new program to encourage the use of safety belts and motorcycle helmets. ISTEA required states to develop and implement a series of management systems, including a safety management system (SMS). A comprehensive crash database was to serve as the basis for these decisions, and safety performance measures were to be defined and used to monitor safety progress over time. SMS resulted in the improvement and quality of crash databases in many states.
In 1998, the *Transportation Equity Act for the 21st Century* (TEA-21) provided more focus by including "safety and security" as a transportation planning priority. TEA-21 also provided guidance on a wide range of planning, policy and safety issues affecting bicycling and walking.

Sources: http://ntl.bts.gov/DOCS/ste.html, https://www.fhwa.dot.gov/tea21/, http://www.pinellascounty.org/media/MPO/, https://en.wikipedia.org/wiki/Intermodal_Surface_Transportation_Efficiency_Act

Road Safety (2000s to present)

5

In 2005, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFE¯EA-LU) was established. With guaranteed funding for highways, highway safety, and public transportation, SAFETEA-LU addressed the many challenges facing our transportation system today – challenges such as improving safety, reducing traffic congestion, improving efficiency in freight movement, increasing intermodal connecti¯ity, and protecting the environment. It established the High¯ay Safety Improvement Program (HSIP) as a core federal-aid program. The specific purpose of the HSIP was to achieve a significant reduction in traffic fatalities and serious injuries on public roads. This was accomplished through the development and implementation of Strategic Highway Safety Plans (SHSP).

Sources: https://www.fhwa.dot.gov/safetealu/, https://www.fmcsa.dot.gov/mission/policy/map-21-moving-ahead-progress-21st-century-act, http://www.taminc.org/news/ArticleID/1069/Fixing-Americas-Surface-Transportation-FAST-Act-o¯er¯iew

Road Safety (2000s to present)

In 2012, Moving Ahead for Progress in the 21st Century (MAP 21) was signed into law by President Obama. MAP-21 created a streamlined, performance-based, and multimodal program to address the many challenges facing the U.S. transportation system. These challenges included improving safety, maintaining infrastructure condition, reducing traffic congestion, improving efficiency of the system and freight mo ement, protecting the environment, and reducing delays in project deli ery.

In December 2015, President Obama signed the Fixing America´s Surface Transportation Act (FAST Act). The FAST Act maintains our focus on safety, keeps intact the established structure of the various highway-related programs, continues efforts to streamline project delivery, and provides a dedicated source of federal dollars for freight projects.

Sources: https://www.fhwa.dot.gov/safetealu/, https://w w.fmcsa.dot.gov/mission/policy/map-21-moving-ahead-progress-21st-century-act, http:// w.taminc.org/news/ArticleID/1069/Fixing-Americas-Surface-Transportation-FAST-Act-overview

Many agencies are in charge of road safety from the federal to the local level. All of these agencies have their own unique vision and mission but all pursue improvements in road safety. The main institution in charge of transportation is the Department of Transportation. The DOT's mission is to "serve the United States by ensuring a fast, safe, efficient, accessible and convenient transportation system that meets our vital national interests and enhances the quality of life of the American people, today and into the future." This department is di¯ided into several organizations that focus on one of many aspects of transportation. The Federal Highway Administration focuses its attention to highways. Their mission is to "improve mobility on our nation's highways and highway system performance—particularly its safety, reliability, effectiveness, and sustainability." As the FHWA's Strategic Highway Safety Plan (SHSP) describes, "our nation's transportation community is entering an unprecedented era of change."

Agency Self-Assessment

Does your agency have a safety mission?

If so, what is it?

Cooperation

- Cooperation equals success in road safety
- Road safety has to involve all transportation aspects

9

Unity and cooperation by those working in the road safety domain is essential. It is not unusual for there to be differences of interest between federal, state and local agencies and this type of issue ends up affecting the individual goals of each agency. Agencies have to understand that they will need the support of the partner agencies. For example, if a reduce speed limit is desired the cooperation of the police department to make this change effective is important. Road safety has to involve every aspect of transportation from planning to operations.

Source: https://pixabay.com/es/apret%C3%B3n-de-manos-respecto-cooperar-1830760/

Local Roadways

- Experience the highest o erall crash rates
- Local agencies must take the lead

10

The local roadway network varies from a few city blocks to thousands of miles of paved, dirt, or gravel roads. Unfortunately, the data indicate that the local roadway network experiences the highest overall crash rates. Local agencies are responsible for these roadways and often face challenges such as limited resources, staffing, and other restrictions. To achieve the stated U.S. goal of zero deaths, local agencies must take the lead; helping these local agencies to achieve success is the purpose of this presentation.

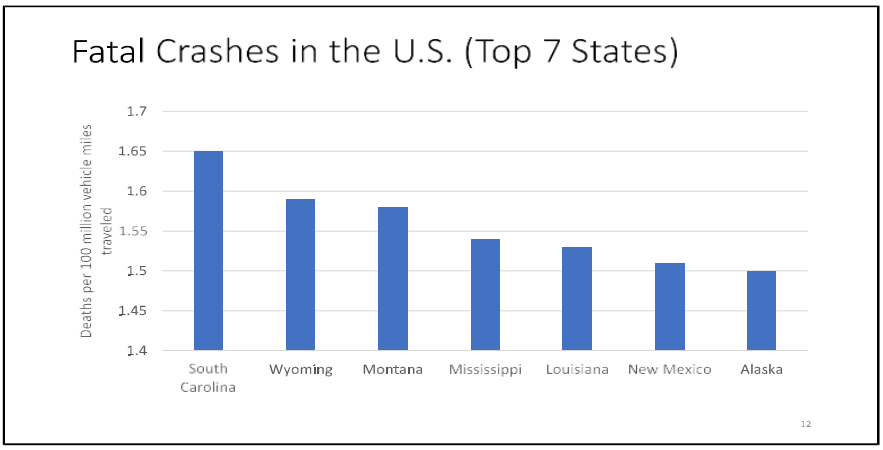
Source: http://itd.idaho.gov/projects/D4/Idaho75TimmermanToKetchum/index.html

Roadway StatIstics

11

Statistical facts can be used to provide perceptive. This discussion identifies the number of roadway fatalities, the individual states with the highest number of crashes, urban and rural road ownership, and the economic impact of crashes.

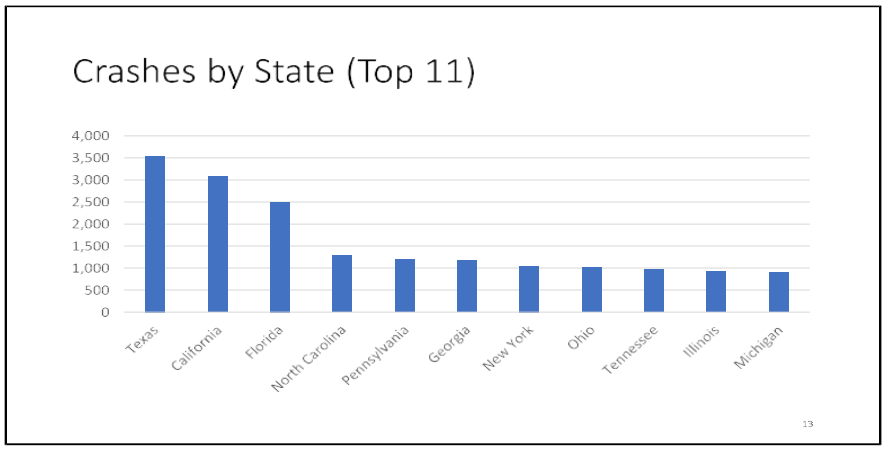
Image source: https://pixabay.com/es/contabilidad-estad%C3%ADsticas-excel-1928237/
https://pixabay.com/es/gr%C3%A1fico-progreso-tabla-1714230/



Over the past decade there has been a downward trend in traffic fatalities. In 2006, there were nearly 43,000 people killed in traffic crashes. Various safety programs were developed to increase seat belt use and reduce impaired driving. Vehicle improvements including technologies such as air bags and electronic stability control have also contributed to reduce traffic deaths.

The number and types of motor vehicle crash deaths differ widely among the fifty states. A state's population has an obvious effect on the number of fatal crashes. Fatality rates per capita and per vehicle miles traveled provide a way of examining vehicle deaths relative to the population and amount of driving. However, many factors affect these rates, including vehicle type, travel speeds, rates of licensure, state traffic laws, emergency care capabilities, weather, and topography. In 2014, there were around 30,000 fatal motor vehicle crashes in the United States in which nearly 33,000 deaths occurred. This translated into 10.2 deaths per 100,000 people and 1.1 deaths per 100 million vehicle miles traveled. The fatality rate per 100 million vehicle miles traveled ranged from 1.65 in South Carolina to 0.57 in Massachusetts.

(By comparison, Idaho had 1.15 fatalities per 100 million vehicle miles traveled.)



The National Institute of Statistics and Economic Studies defines a road crash as any crash involving at least one road vehicle, occurring on a roadway facility open to public circulation, and in which at least one person was injured or killed. In 2015, the United States lost 35,092 people in crashes. The estimated number of people injured on the nation's roads increased in 2015, rising from 2.34 to 2.44 million injured people. The estimated number of police-reported crashes increased from 6.0 to 6.3 million.

The graph in this slide presents the total number of crashes by state, 56 percent of motor vehicle crash deaths occurred in single-vehicle crashes.

Texas led the ranking with 3,538 crashes followed by California with 3,074 crashes. (By comparison, the state of Idaho registered a total of 186 total crashes.)

Urban Road Ownership (2014)

	URBAN					
STATE	STATE HIGHWAY AGENCY	COUNTY	TOWN, TOWNSHIP, MUNICIPAL (1)	OTHER JURIS-DICTIONS (2)	FEDERAL AGENCY (3)	TOTAL
Alaska	696	1,538	327	7	72	2,640
Idaho	362	134	4,463	698	2	5,658
Montana	512	-	3,651	-	-	4,164
Oregon	1,229	3,927	9,719	101	22	14,998
Washington	1,544	6,423	16,455	90	433	24,944
U.S. Total	168,060	243,477	775,851	6,651	7,641	1,201,680

14

The overwhelming majority of urban roads in the United States are owned and maintained by state and local governments. The Interstate Highway System is partly funded by the federal government but owned and maintained by state governments. Local private roads generally serve remote or insular residences. Three million miles of local roads are maintained and operated by state highway agencies, counties, township managers and other jurisdictions. In total, there are more than 38,000 counties, cities, villages, towns, and tribal governments across the United States. One common issue to all local agencies is traffic safety. The number of miles owned for the states of Alaska, Idaho, Montana, Oregon, and Washington is presented here.

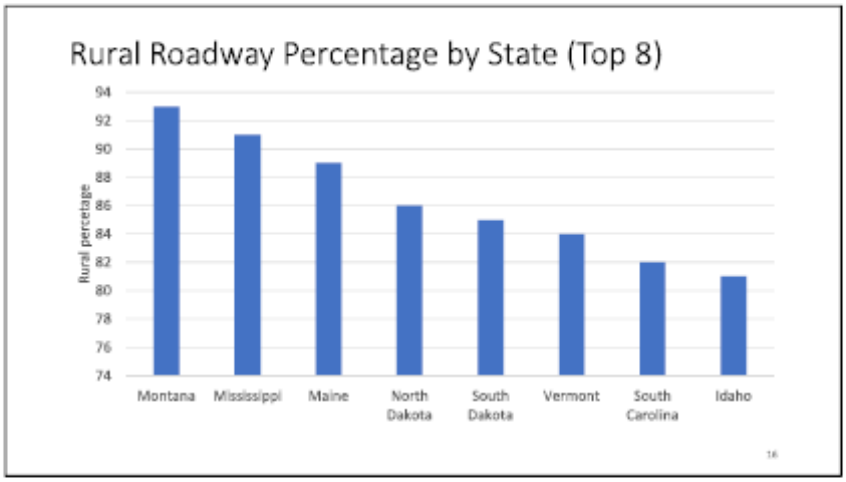
Rural Road Ownership (2014)

	RURAL					
STATE	STATE HIGHWAY AGENCY	COUNTY	TOWN, TOWNSHIP, MUNICIPAL (1)	OTHER JURIS-DICTIONS (2)	FEDERAL AGENCY (3)	TOTAL
Alaska	4,897	2,114	1,456	2,303	2,319	13,089
Idaho	4,623	15,526	1,830	13,061	8,202	43,243
Montana	10,492	42,594	1,175	4,235	12,322	70,819
Oregon	6,430	29,173	1,247	1,379	20,252	58,481
Washington	5,511	32,745	1,629	8,370	8,217	56,473
U.S. Total	614,743	1,597,119	559,289	50,705	153,490	2,975,347

Units: miles

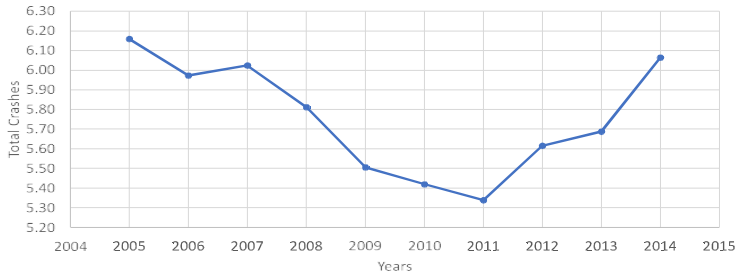
15

By comparison, the number of rural roadway miles owned by agencies are presented here. Fifty-four percent of the miles are owned by counties. The state highway agency and towns own 20 percent and 19 percent, respectively. When comparing the total of urban and rural miles, it is noted that many of the fatal and injury crashes occur in rural areas. Road safety cannot focus only on urban travel; we must consider that a great percentage of drivers are injured or fatally hurt on rural roads. Many local roads are maintained by local agencies with limited resources and staff, making it particularly challenging to address safety issues. Many local agencies rely on state DOTs to provide funding, training, and technical assistance to advance local road safety initiatives and these road safety programs are organized and administered differently from state to state.



This table presents the percentage of rural roadway for selected states. The percentage of rural roads was 93 percent in Montana, 91 percent in Mississippi, and 89 percent in Maine compared with 14 percent in New Jersey, 12 percent in Rhode Island, and 10 percent in Massachusetts. For the state of Idaho 81 percent of the roads are part of the rural roadway. Nationwide, 51 percent of motor vehicle deaths in 2014 occurred in rural areas.

Economic Impact of Crashes



17

(The total number of crashes is. Source: U.S. Department of Transportation, National Highway Traffic Safety Administration.)

There is an inherent cost associated with these crashes, and the economic cost of crashes, defined by the USDOT as the sum of fatal, injury and property damage crashes, is significant. In 2010 the total economic cost of motor vehicle crashes in the United States was $242 billion. When quality-of-life aluations are considered, the total value of societal harm from motor vehicle crashes increases to $836 billion. In every state the value of a crash varies but as a nation the economic costs alone are nearly $800 for each person. The economic cost of motor vehicle crashes in the U.S. is equivalent to 1.6 percent of the Gross Domestic Product (GDP) (2010 data). The economic and societal costs of crashes are increasing, and no amount of money can replace the life of a loved one, or stem the suffering caused by motor vehicle crashes.

Agency Self-Assessment

What are your agency's key statistics?

Which statistics would you highlight?

Roadway Users

- Motor-Vehicle Drivers
  - Cars
  - Trucks
  - Motorcycles
  - Buses
- Bicyclists
- Pedestrlans

19

Let's now define some general road safety concepts. Wikipedia describes road traffic safety as the methods and measures used to prevent road users from being killed or seriously injured. Typical road users include: motorists, vehicle passengers, passengers of on-road public transport, cyclists, and pedestrians. The Highway Safety Improvement Program Manual defines road safety in terms of the injuries and fatalities that occur on the roadway system. The science of safety has evolved o er the years and is focusing more on data and analysis, rather than solely adhering to standards.

Source: http://www.pixabay.com

Road Safety Performance Measures

- Fatalities
- Fatalities and Serious Injuries
- Fatalities and All Injuries
- Crashes

20

What is a road safety performance measure? As described by Kane Tony who authored Performance Measures to Improve Transportation Systems, the ultimate purpose of measuring performance is to improve transportation service for customers. The use of performance measurement is considered useful not only for reporting to the public but also for communicating with the public. The Federal Highway Administration views performance measures as a tool that can help educate the public as well as decision makers and legislators regarding the importance of transportation and the merits of making appropriate system investments.

Road safety is usually measured in terms of fatalities and injuries involving motor vehicles and roadway users such as pedestrians and bicycles. Fatalities and injuries are comprehensive measures but is difficult to track, since minor injuries are not always recorded by law enforcement. Crashes on the other hand, can be tracked so long as they are reported, including those where no injury or fatality occurred such as property damage-only crashes. However, crashes where no injury or fatality occurred may not be reported.

Source: https://www.isp.idaho.gov/isp/crashreports.html
https://pixabay.com/es/crash-test-colisi%C3%B3n-60-kilometros-h-1620591/

20

Current Legislation

- Fixing America's Surface Transportation (FAST) Act
- Impro es nation's surface transportation infrastructure

21

Why is keeping up to date with legislation important? Local agencies need to be aware of changes that take place with new legislation. The current legislation is the Fixing America's Surface Transportation (FAST) Act, a five-year program to improve the nation's surface transportation infrastructure including roads, bridges, transit systems, and passenger rail network. In relation to road safety, some of FHWA's priorities for FAST Act implementation include:

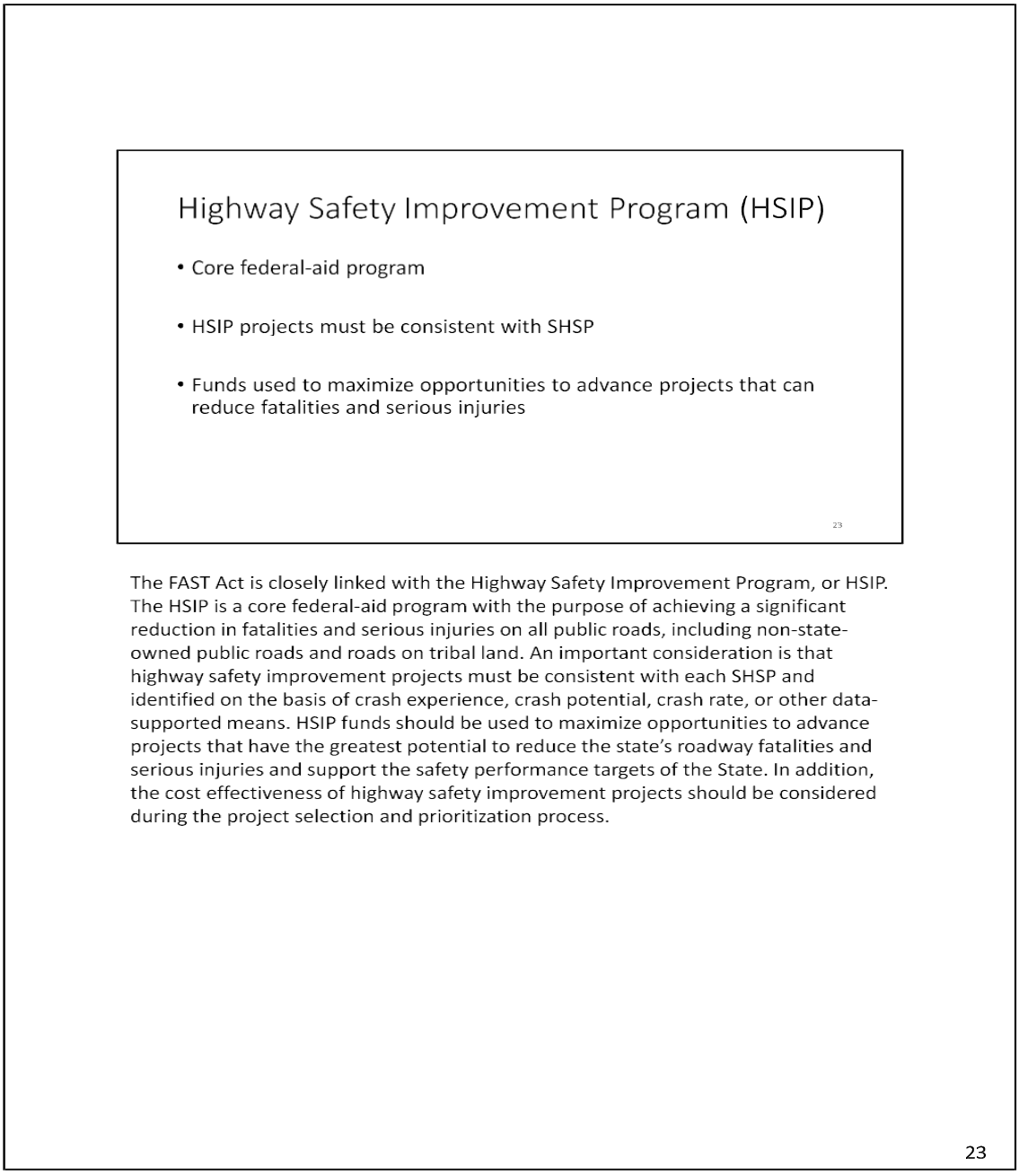
- De eloping summary materials (including fact sheets and presentations) to ensure the public and highway stakeholders have key information on the FAST Act's highway provisions;
- Getting funding in the hands of states, locals, Metropolitan Planning Organizations (MPOs), tribes, and others who can put it to use throughout the country;
- Issuing guidance to fill in the details of the new law and answer stakeholder questions; and
- Making progress on regulations related to the FAST Act.

FAST Act

- Funding:
  http://www.fhwa.dot.gov/fastact/funding.cfm
- Guidance and Regulation:
  http://www.fhwa.dot.gov/fastact/guidance.cfm

22

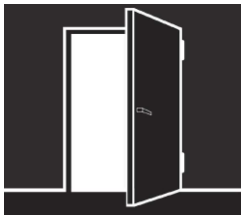
Several links are provided here that relate to important information on the FAST Act and road safety. Funding is a important issue for every local agency and having knowledge regarding the priorities of the FAST Act many provide an important edge when competing for funding.



The FAST Act is closely linked with the Highway Safety Improvement Program, or HSIP. The HSIP is a core federal-aid program with the purpose of achieving a significant reduction in fatalities and serious injuries on all public roads, including non-state-owned public roads and roads on tribal land. An important consideration is that highway safety improvement projects must be consistent with each SHSP and identified on the basis of crash experience, crash potential, crash rate, or other data-supported means. HSIP funds should be used to maximize opportunities to advance projects that have the greatest potential to reduce the state's roadway fatalities and serious injuries and support the safety performance targets of the State. In addition, the cost effectiveness of highway safety improvement projects should be considered during the project selection and prioritization process.

Traffic Safety Management

- Combined efforts at impro¯ing safety would collectively exceed the efforts of agency working independently?



24

Let's pause to consider a case study. Imagine several people moving a large heavy sofa from one room to another. If one person lifts, one person pushes, and another person holds a door open, is this a reasonable approach? However, what if those who are pushing and lifting are going in different directions, and the third person opening the door does so arbitrarily?
Now imagine several different agencies from the same jurisdiction, each with the responsibility of improving high¯ay safety. How can there be some sort of management system so that the agencies' combined efforts at improving safety are greater than each agency working independently?

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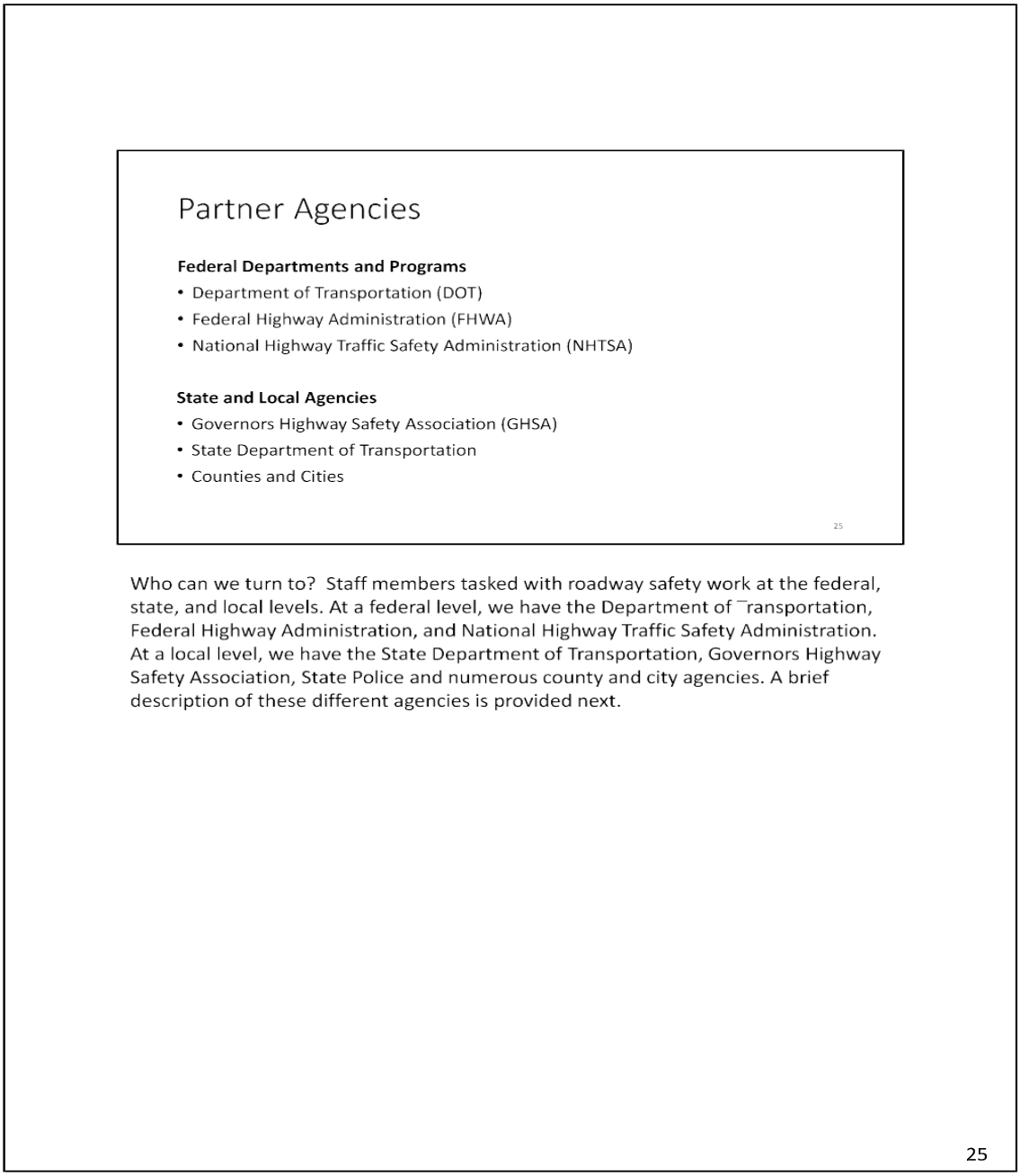

Who can we turn to? Staff members tasked with roadway safety work at the federal, state, and local levels. At a federal level, we have the Department of Transportation, Federal Highway Administration, and National Highway Traffic Safety Administration. At a local level, we have the State Department of Transportation, Governors Highway Safety Association, State Police and numerous county and city agencies. A brief description of these different agencies is provided next.

Summary

- A brief background of road safety in United States
- Describe the importance of road safety
- Introduce road safety's main concepts
- Agencies involve in road safety improvements.

26

Road safety can be define in multiple ways, mainly depending on the performance measure used. In the present, the common performance measure used are fatalities and injuries on the roadway system. The analysis of the concept road safety have evolved over the years and is now focusing more on data and analysis, rather than solely to standards. In the past decade there has been a general downward trend in traffic fatalities and injuries. Various safety programs developed countermeasures that have worked to substantially lower the number of traffic fatalities over the years but there is a need to continue the improvement of the roadway safety system due to the high number of fatalities and injuries. For agencies that seek for road safety improvements, it is necessary to participate with the agencies that are currently responsible of the roadway system and learn what current legislation is active. The current legislation is the Fixing America's Surface Transportation (FAST) Act, which seeks the improvement of the nation's surface transportation infrastructure. The FAST Act is closely linked with the Highway Safety Improvement Program, or HSIP. The HSIP is a core federal-aid program with the purpose of achieving a significant reduction in fatalities and serious injuries on all public roads. This type of information benefits agencies that constantly work for the improvement of their roads. For targeting road safety, agencies divide their priorities depending on the roadway classification. Our main focus will target the agencies responsible of the local roadway system.

Traffic Safety Management and Analysis

Transportation Agencies and Resources Available

This slide deck is the second in a series of presentations. This effort is part of a research project funded by PacTrans, a consortium of research universities in the Pacific Northwest, to identify: what types of safety data are being collected, what types of safety analysis can be done with the collected data, and what types of safety data and analysis approaches are required to meet the safety objectives of local agencies. In this slide deck, its discuss the current transportation agencies in charge of road management and the resources available for addressing road safety.

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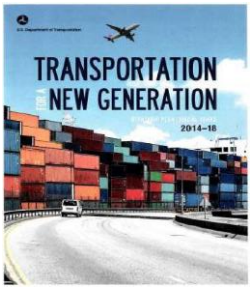
1

Department of ¯ransportatIon

- Safe and secure public travel
- Increase personal mobility
- Contribute to nation's economic growth



2

The Department of Transportation was established by an act of Congress on October 15, 1966. The Department's first official day of operation was April 1, 1967. ¯he top priorities at DOT are to keep the traveling public safe and secure, increase their mobility, and have our transportation system contribute to the nation's economic growth. The United States Department of Transportation's (DOT's) Strategic Plan for fiscal years 2014–2018 re-imagines America's transportation system as the means by ¯hich ¯e connect with one another, grow our economy, and protect the environment. President Lyndon Johnson once said: "A day will come in America when people and freight will move through this land of ours speedily, efficiently, safety, dependably, and cheaply, and that will be a good day and a great day in America". Since the DOT is a institution that does not only focus on safety but every aspect of transportation, the strategic plan describes many different elements with regard to safety, including the goal of improving public health and safety by reducing transportation–related fatalities, injuries, crashes and injuries.

https://w¯w.transportation.gov/dot-strategic-plan

Federal HIghway AdmInIstratIon (FHWA)

- Supports state and local agencies in the design, construction, and maintenance
- Impro⁻e mobility and highway system performance

3

The Federal Highway Administration (FHWA) is an agency within the U.S. Department of Transportation that supports state and local governments in the design, construction, and maintenance of the nation's highway system (Federal Aid Highway Program) and federal and tribal owned lands (Federal Lands Highway Program). Through financial and technical assistance to state and local governments, the Federal Highway Administration is responsible for ensuring that America's roads and highways continue to be among the safest and most technologically sound in the world. The Federal Highway Administration (FHWA) was created on October 15, 1966. The core of FHWA's mission is to improve mobility on our nation's highways, and a primary focus of the strategic plan framework is improving highway system performance—particularly its safety, reliability, effectiveness, and sustainability. The FHWA also has a Strategic Highway Safety Plan Champion's Guidebook which is intended to provide an overview of the fundamental elements of the SHSP process. It serves as a resource for states that are updating their Strategic Highway Safety Plans (SHSP) or assessing their SHSP development process, and is a reference for professionals new to safety and planning.

http://www.fhwa.dot.gov/policy/fhplan.cfm

3

Federal HIghway AdmInIstratIon (FHWA)

U.S. Department of Transportation
Federal Highway Administration

http://safety.fhwa.dot.gov/hsip/

- General (HSIP) Information
- Strategic Highway Safety Plan (SHSP)
- Data and Analysis Tools
- High Risk Rural Roads (HRRR)
- Railway-Highways Crossing (Section 130) Program
- Transportation Performance Management (TPM)
- HSIP Rulemaking
- HSIP Resources
- Highway Safety Improvement Program Reports

4

The FHWA manages many different programs and provides different tools for highway improvement. For safety, existing programs or tools include the Strategic Highway Safety Plan, data and analysis tools, high risk rural roads, and the HSIP manual and resources.

National Highway Traffic Safety Administration (NHTSA)

- Responsible for reducing deaths, injuries and economic losses
- Investigates safety defects in vehicles
- Promotes the use of safety belts, child safety seats, and air bags

5

The National Highway Traffic Safety Administration (NHTSA), under the U.S. Department of Transportation, was established by the Highway Safety Act of 1970 as the successor to the National Highway Safety Bureau to carry out safety programs under the National Traffic and Motor Vehicle Safety Act of 1966 and the Highway Safety Act of 1966. NHTSA is responsible for reducing deaths, injuries and economic losses resulting from motor vehicle crashes. This is accomplished by setting and enforcing safety performance standards for motor vehicles and motor vehicle equipment, and through grants to state and local governments to enable them to conduct effective local highway safety programs. NHTSA investigates safety defects in vehicles, sets and enforces fuel economy standards, helps states and local communities reduce the threat of drunk drivers, promotes the use of safety belts, child safety seats and air bags, investigates odometer fraud, establishes and enforces vehicle anti-theft regulations and provides consumer information on motor vehicle safety topics. NHTSA also conducts research on driver behavior and traffic safety to develop the most efficient and effective means of bringing about safety improvements.

http://www.nhtsa.gov/

Governors Highway Safety Association (GHSA)

- Represents state and territorial highway safety offices
- Pro ides leadership
- Supports states and local agencies to improve traffic safety

6

The Governors Highway Safety Association (GHSA) represents the state and territorial highway safety offices that implement programs to address behavioral highway safety issues including: occupant protection, impaired driving, and speeding. GHSA provides leadership and advocacy for the states and territories to improve traffic safety, influence national policy, enhance program management, and promote best practices. GHSA's goals are to promote traffic safety as a national priority, expand and deliver member support services, develop new and strengthen existing partnerships, and ensure sufficient resources to support association services and priorities.
The Highway Safety Act of 1966 established the State and Community Highway Safety Grant Program, commonly known as the "402" program, creating a unique partnership among federal, state and local governments. This legislation also set the foundation for the creation of State Highway Safety Offices, which were funded primarily through 402 funds. In each state and territory, governors select a Highway Safety Representative (Governor's Representative) to administer the program. In 1967, several Go ernor's Representatives, realizing the need to share information and collectively work for national safety goals, decided to organize. The organization was incorporated in 1974 and in the ensuing years, its membership, expertise and influence grew. In 2002, the name was changed to the Governors Highway Safety Association.

Department of Transportation – State Level

- Own mission and vision
- Backbone of economy

7

Every state department of transportation has a mission and vision while operating the roads in their state. For example, the Idaho Department of Transportation's mission is "Your Safety. Your Mobility. Your Economic Opportunity." Why is transportation important? The state's transportation system is inextricably woven into the fabric of daily life. The state's citizens use its transportation system to get to work and school, visit friends, and seek recreation opportunities. The roads, bridges, airports, railroads and ports are the backbone of a state's economy. The cost of doing business is affected by how well goods and people can be moved across town, across the country and around the world. Thus, economic performance is tied to the quality of a state's transportation system.

Countles and Cities

- Manage a safe, high-quality local public street system
- Operations and maintenance practices vary by jurisdiction

The local counties and cities are responsible for a specific part of the road system in each state. County and city roads and highways operated and maintained by the local highway department vary greatly in design standards, funding and regularity of maintenance. Some cities manage their own roads while others are managed by the county or a local district.

Toward Zero Deaths

- Brings stakeholders together
- Defines the common vision
- One person dies every 16 minutes in a traffic crash

9

There are currently many diverse initiatives and programs to increase safety on the nation's roadways. Many stakeholders have their own strategic plans that guide their individual activities, and many of these organizations involve their highway safety partners as they develop coordinated safety plans to put them into action. Federal transportation laws require each state to develop a SHSP and requires all safety partners to focus on the highest priority traffic safety needs. What is missing, ho—ever, is a specific single vision that brings together all of the various stakeholders nationwide with a role in highway safety. The Toward Zero Deaths (TZD) National Strategy on Highway Safety, brings these stakeholders together and defines the common vision that will drive their individual and collaborative efforts. Sadly, one person dies every 16 minutes in a traffic crash in the United States.

Road users need to make safety-driven decisions, as do transportation professionals, and a crucial tenet of the TZD National Strategy is to encourage change in the nation's highway safety culture. This involves exploring how and why road users often make unsafe decisions, and why and how these influences have such an impact. Positively changing the safety culture among road users where decisions are to made with safety in mind would lead them to understand the potential results of their actions or inactions. Many challenges remain the size of the nation's roadway network, the

number of road users, the variety of road user types, and the complexity of the driving task combine to present significant challenges for eliminating traffic fatalities and serious injuries.

Learn more: http://www.towardzerodeaths.org/

State Police

- Patrol, investigations
- Commercial vehicle safety
- Alcohol beverage control

10

An important agency partner is the Idaho State Police (ISP). The ISP has provided law enforcement services to the citizens since 1919. Today, the Idaho State Police consists of Patrol, Investigations, Commercial Vehicle Safety, Alcohol Beverage Control, Regional Communications Centers, Forensic Services, Brand Inspector, Bureau of Criminal Identification including the Idaho State Sex Offender Repository, and the Peace Officer Standards and Training (POST). In relation to safety, the state police works to enforce safety regulations as well as educate drivers and industry about commercial vehicle safety.

Countles and Cities

11

As mentioned earlier, local counties and cities are responsible for a specific part of the road system in each state.

A city's police department is an important element for road safety and it's mission is to address multi-model issues using educational, environmental, engineering, and enforcement systems. For example, the City of Moscow's police department provides traffic safety services to their local residents, to the University of Idaho campus colleagues, regional commuters, and a multitude of seasonal visitors. Traffic officers are tasked with identifying areas in Moscow with traffic issues and working with the City of Moscow Street and Engineering Department to solve issues. They also work in conjunction with Idaho Transportation Department (ITD) traffic enforcement programs, such as DUI, Seat Belt and Aggressive Driving enforcement. These enforcement programs are a great benefit to the community.

11

Local Agency Case Study

12

The Streets Division of the Public Works Department of Moscow strives to provide a safe, high quality public street system for the citizens of Moscow. The division promotes short and long range planning, maintenance, and capital improvement goals for maintaining and improving the public street system and its associated appurtenances. The street department works in conjunction with the city police and provides the highest quality of safety available. Local cities face many road safety challenges. Limited funding for project or staff can cause a city to focus their efforts in other important issues.

How do we decide which operating conditions pose the greatest safety risk? To answer this question we need to look at the resources or materials that we have available. There are many manuals that provide information and guidelines about road safety. Some of these manuals are the results from years of research that are synthesized in one document. Other resources that are available are courses, conferences, and research papers. Let's begin by describing some of the important manuals that are currently available including the High—ay Safety Manual, Geometric Design of Highway and Streets (Green Book), Highway Safety Improvement Program Manual, Roadway Safety Data Program, Safety Improvement on High Risk Rural Road, and Manual on Uniform Traffic Control Device. We'll briefly describe each of these documents.

HIghway Safety Manual (HSM)

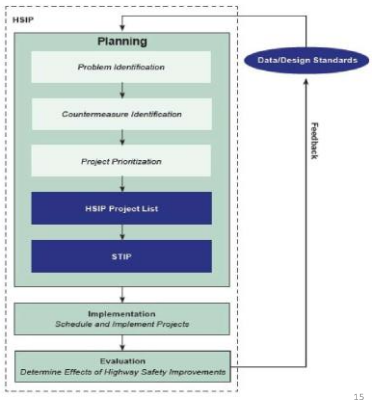
- Introduction, Human Factors and Fundamentals
- Roadway Safety Management Process
- Predictive Method
- Crash Modification Factors

14

The Highway Safety Manual (or HSM) focuses on quantifying the safety effect of decisions in planning, design, operations, and maintenance through the use of analytical methods. The HSM is organized into four parts: introduction, human factors and fundamentals; roadway safety management process; predictive method; and crash modification factors.

HSM supports engineering analysis and decision making to reduce crash frequency or severity, or both, on a roadway network. In general, crash reduction may also be achieved by considering enforcement, education for road users, improving incident response and EMS, and improving vehicle safety performance. HSM can by applied in many situations such as identifying sites with the most potential for crash frequency or severity reduction, identifying factors contributing to crashes and associated potential countermeasures to address these issues, conducting economic appraisals of improvement and prioritization of projects, evaluating the crash reduction benefits of implemented treatments, calculating the effect of ¯arious design alternati¯es on crash frequency and severity, and estimating potential crash frequency and severity on highway networks.

HIghway Safety Improvement Program Manual (HSIP)



The purpose of the Highway Safety Improvement Program Manual or HSIP Manual is to provide an overview of the HSIP and provide state and local agencies with the tools and resources required to implement the HSIP. The manual provides information related to planning, implementation, and evaluation of state and local HSIPs and projects. The goal of the program is to achieve a significant reduction in traffic fatalities and serious injuries on all public roads, including non-State-owned public roads and roads on tribal lands. The HSIP requires a data-driven, strategic approach to improving highway safety on all public roads that focuses on performance. The manual provides a foundation for understanding the HSIP and include topics such as basic concepts in road safety; the history of the HSIP and current legislation and guidelines; addressing road safety within all phases of the project development process; setting safety goals, objectives, and performance measures; and identifying available resources and technologies that support the HSIP process.

Roadway Data Improvement Program

- Improve safety data
- Expand capabilities for analysis and evaluation
- Support safety initiatives

RDIP
Roadway Data Improvement Program

16

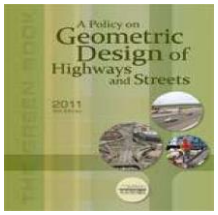
The Roadway Data Improvement Program focuses on the Safety Strategic Plan goal to improve safety data and expand capabilities for analysis and evaluation. The effectiveness of safety programs is directly linked to the availability of sound data analysis for informed decisions. Increasingly, states and other safety partners are in need of reliable data, including crash and roadway data. For that and many other reasons, impro ing safety data is important for federal, state, local, and other partners who must overcome challenges such as lack of resources and inconsistent data systems across agencies. The purpose of the Roadway Data Improvement Program (RDIP) is to help transportation agencies improve the quality of their roadway data to support their safety initiatives. These improvements may be in terms of the data elements collected, data collection practices, geo-spatial data referencing, data storage, data maintenance, and linking roadway-related data with other safety data. RDIP provides roadway database managers and other traffic safety professionals with a tool to assist them in identifying, defining, measuring, and ultimately improving, the quality of the data within their roadway databases. The quality of the data can be characterized by the timeliness, accuracy, completeness, consistency, integration, and accessibility of the roadway data.

More information: http://safety.fhwa.dot.gov/rsdp/

16

Geometric Design of Highway and Streets (Green Book)

- Research and practices for highway and street geometric design
- Reference manual to assist with administrative, planning, and educational efforts



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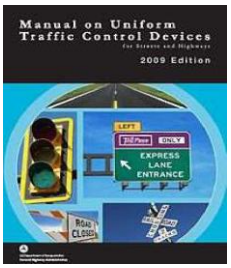
AASHTO's Geometric Design of Highways and Streets, also known as the "Green Book," contains the current design research and practices for highway and street geometric design. The document provides guidance to highway engineers and designers who strive to make unique design solutions that meet the needs of highway users while maintaining the integrity of the environment. It is also intended as a comprehensive reference manual to assist in administrative, planning, and educational efforts pertaining to design formulation. Design guidelines are included for freeways, arterials, collectors, and local roads in both urban and rural locations, paralleling the functional classification used in highway planning. The book is similarly organized into functional chapters to stress the relationship between highway design and function and include highway functions, design controls and criteria, elements of design, cross-section elements, local roads and streets, collector roads and streets, rural and urban arterials, freeways, intersections, and grade separations and interchanges.

Manual on Uniform Traffic Control Devices

- Promote highway safety and efficiency.
- Road users of regulations.
- Minimize the occurrences of crashes.



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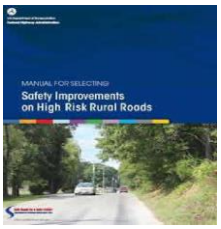
The purpose of traffic control devices is to promote highway safety and efficiency by providing for the orderly movement of all road users on streets, highways, bikeways, and private roads open to public travel throughout the nation. Traffic control devices notify road users of regulations and provide warning and guidance needed for the uniform and efficient operation of all elements of the traffic stream in a manner intended to minimize the occurrences of crashes. This Manual on Uniform Traffic Control Devices contains the basic principles that govern the design and use of traffic control devices for all streets, highways, bikeways, and private roads open to public travel.

Safety Improvement on High Risk Rural Roads

- Costs and benefits of safety treatments on high risk rural roads
- Safety treatments
- Initial and reoccurring maintenance costs



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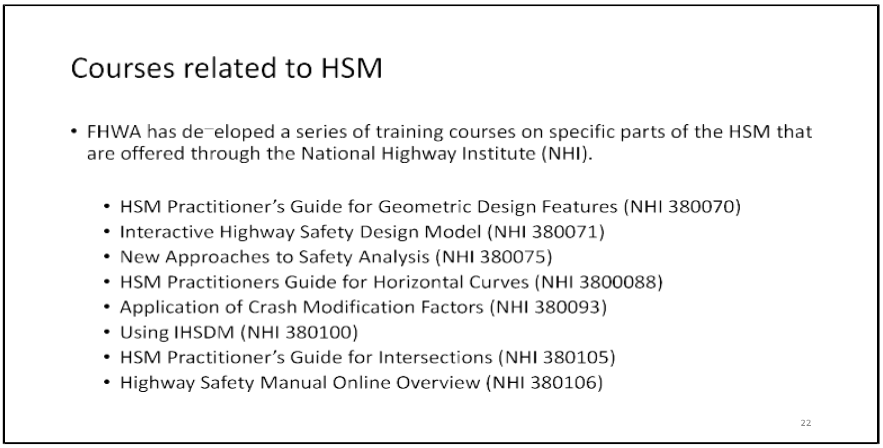
This manual provides information on the costs and benefits of safety treatments on high risk rural roads (HRRR). Agencies can use this manual to determine specific information related to safety treatments: safety benefits; cost-effectiveness comparison of safety treatments; applicability of treatment deployment with respect to identified need; initial and reoccurring maintenance costs associated with countermeasure installation. in addition, this manual provides information on the decision-making process necessary to identify treatments. With limited HRRR data, it can be challenging for agencies to effectively use limited funds for treatments on HRRR. The purpose of this manual is to provide a comparison between the cost-effectiveness of safety treatments on HRRR, identify where the treatments may be more effectively used, and present initial and ongoing costs associated with installation. The objective is to assist agencies in finding effective ways to efficiently allocate safety improvement funds on HRRR to achieve a greater reduction in the number and severity of rural roadway crashes.

How do we decide which operating condition poses the greatest safety risks? We talked about important manuals that provide assistance to improve road safety. Another resource that is available to improve our knowledge of the road system. Throughout the United States, many agencies provide this service including states dots, county highway departments, universities, and some local agencies. On the subject of providing training in relation to highway safety, there are two agencies —ho specialities in this field National High—ay Institute and Local Highway Technical Assistance Council. The LHTAC is specific for Idaho. The State Police also provide training oriented to enforcement. In the next series of slides, we are going to talk more about these opportunities.

Courses National Highway Institute

The National Highway Institute is the training and education arm of FHWA. Established by Congress in 1970, NHI has been providing quality service to the transportation community for over forty years. When NHI first opened its doors in 1970, it was just a small operation with a handful of employees who completed every course registration, scheduling arrangement, and certificate by hand. Understandably, the menu of courses was fairly narrow, covering only a handful of basic transportation subjects. The National Highway Institute's mission is improving the conditions and safety of our nation's roads, highways, and bridges to do so, continuously building on the skills of highway professionals and enhancing job performance across the country is needed. NHI's broad reach allows them to train personnel from state departments of transportation, local public agencies, industry, academia, FHWA, other federal agencies, and professionals in other countries. In the image we can see the amount of courses or training that are available in relation to highway safety. I motivate the audience to go and check out the courses.



The National Highway Institute offers several courses related to the Highway Safety Manual including the IHSDM which is the software of the HSM. Later on this presentation this software will be describe. In this offering, you can find topics related to geometric design features, safety analysis, horizontal curves, crash modification factors, and HSM application in intersections. You will find the codes in this slide if any of these courses are of interested to you.

Local Highway Technical Assistance Council

- **Road Scholar Classes**
  - ATSSA Flagger Certification
  - Basic Math
  - Communication Skills
- **Road Master Classes**
  - ATSSA Traffic Control Technician
  - Environmental BMPs
  - Pavement Maintenance II

lhtac2 Serving Idaho Since 1994

23

Local Highway Technical Assistance Council or LHTAC connects local highway jurisdictions in Idaho with available resources for maintenance and construction of Idaho's Local Highway System in the most efficient and effective manner possible. LHTAC's mission is to advocate, support and train. They work hard to represent the local highway jurisdiction's best interest, and provide information and educational courses. The courses are divided in to two parts road scholar classes and road master classes. Road scholar classes including: Flagger Certification, Basic Math, Communication Skills, CPR, First Aid, Pavement Maintenance I, and Roadway Material. Road master classes are more advanced and include Traffic Control technician, Environmental Best Management Practices, pavement maintenance, roadway drainage, speed limits and speed zones.

This list showcase more courses provided by the LHTAC. Topic include road safety audits, road safety 365, Manual on Uniform Traffic Control Devices, winter maintenance, local systemic safety, data analysis and solutions. Every course has importance in the field of transportation and if you want learn more about this course please contact LHTAC.

Software

- WebCars
- Interactive Highway Safety Design Model
- Geographic Information System
- LH¯AC crash data
- Travel Demand Model - QRS II
- AASHTO Pavement
- AASHTO Safety

25

The use of software is a tool that provides the opportunity to develop faster and easier collection and analysis of data. Software application are continuously being updated and improved to collect and analyze data and for that reason it is important for agencies to keep up to date with these advances. Some of the most commonly used software in the State of Idaho include: WebCars, Interactive Highway Safety Design Models, Geographic Information System, LHTAC crash data, QRS II, AASHTO pavement and AASHTO Safety. In the following slides, ¯e are going to talk more of each of the software applications and the benefits they provide.

WebCars

- WebCars is a crash analysis reporting system used in the State of Idaho.
- IMPACT 2K is a software designed to complete crash reports electronically.
- IMPACT 2K software electronically transmits crash data to WebCARS

26

WebCars is a Crash Analysis Reporting System used in the State of Idaho that allows local and state agencies analyze crash data, this web based analysis software was developed by the Office of Highway Safety. The Idaho Mobile Program for Accident CollecTion (IMPACT 2K), a software designed to complete crash reports electronically, works in conjunction with the WebCARS which was designed to replace the previous analysis system CARS. IMPACT 2K allows officers to easily record data at the scene of a crash in half the time as by hand. WebCARS has a comprehensive application that effectively detects high crash locations, performs intersection analysis, sorts crashes by location, time of day and severity and includes other programs for monthly and yearly summaries.
IMPACT 2K software electronically transmits crash data to WebCARS, creating an advanced, timely crash data collection and analysis system available 24 hours after the information is uploaded. Nearly forty agencies use WebCARS to analyze crash data in Idaho. Eighty-seven percent of the state's law enforcement agencies are using IMPACT 2K.

http://apps.itd.idaho.gov/apps/webcars/

Interactive Highway Safety Design Model

- Software analysis tools evaluates safety and operational effects of geometric design.
- Makes it significantly easier and faster to evaluate design decisions

27

Interactive Highway Safety Design Model (IHSDM) is a suite of software analysis tools used for evaluating safety and operational effects of geometric design decisions on two lane rural highways. IHSDM is intended for use throughout the highway design process from preliminary planning and engineering through detailed design to final review. It may be used for projects to improve existing roadways as well as for new roadway construction projects. What are the advantages of IHSDM for highway design? IHSDM makes it significantly easier and faster to evaluate design decisions. Each module focuses on a specific area of analysis. The policy review module automates the current process of checking a design against applicable, quantitative design guidelines. The crash prediction module provides quantitative safety performance measures, including expected crash frequency and severity. The remaining modules diagnose factors contributing to safety performance of a proposed design.

Geographic Information Systems

- Enables people see, analyze, and understand patterns and relationships.
- Data in many different forms can be entered into GIS.

28

A geographic information system (GIS) is a computer system for capturing, storing, checking, and displaying data related to positions on earth's surface. GIS can show many different kinds of data on one map. This enables people to more easily see, analyze, and understand patterns and relationships. GIS can use any information that includes location. The location can be expressed in many different ways, such as latitude and longitude, address, or ZIP code. Data in many different forms can be entered into GIS. Data that are already in map form can be included in GIS. This includes as the location of rivers and roads, hills, and valleys. Digital or computerized data can also be entered into GIS. An example of this kind of information is data collected by satellites that show land use—the location of farms, towns, or forests. GIS can also include data in table form, such as population information. GIS technology allows all these different types of information, no matter their source or original format, to be overlaid on top of one another on a single map. GIS can help you plan, monitor, and manage strategic infrastructure more effectively by using the location power of data to determine capacity enhancements, improve operations, and identify the most strategic investments for maintaining transportation infrastructure.

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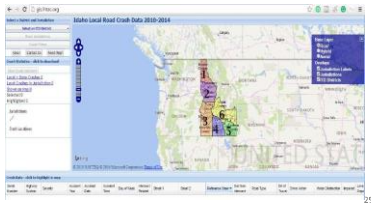
LHTAC crash data

- Designed to help meet the requirement of the HSIP
- Crash data is acquired annually from the ITD Office of Highway Safety
- Displayed crash locations indicate the approximate vicinity of a crash



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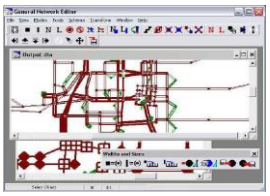
As we learned before the nationwide Highway Safety Improvement Program (HSIP) was established under the SAFTEA-LU Federal Transportation Act. Local highway jurisdictions are allocated a portion of those funds (local HSIP). Proposed LHSIP projects must directly address specific safety issues, based on data analysis. A web application provided by the Local Highway Technical Assistance Council (LHTAC) is available and designed to help meet those requirements by making statewide crash data from ITD's Office of Highway Safety easily accessible to all local jurisdictions. Crash data is acquired annually from the ITD Office of Highway Safety. Displayed crash locations indicate the approximate vicinity of a crash, based on reported descriptions. The application is not perfect but as a free website it's a great tool for those agencies that have a hard time analyzing data because of the price of other software application.

Travel Demand Model - QRS II

- Quick Response System II is the strategic travel forecasting package
- Four-step planning process for highway and transit forecasting



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Quick Response System II is a strategic travel forecasting package. It runs the four-step planning process – trip generation, trip distribution, mode split, traffic/transit assignment – for highway and transit forecasting. Networks and data are entered and edited graphically. QRS II has benefited from extensive research on travel forecasting methodologies. QRS II is a state-of-the-art planning package. It can provide traditional region-wide forecasting, as ―ell as site impact analysis and corridor analysis. Recent innovations within QRS II has positioned it as the premier platform for project-level and travel forecasting.

AASHTO Pavement

- Pavement ME Design is a pavement design software.
- Efficiency in the calculation process
- Tools to allo— easy comparison between pavement designs

31

AASHTOWare Pavement ME Design is a pavement design software, which builds upon the National Cooperative Highway Research Program is mechanistic-empirical pavement design guide. The procedures incorporated in the software reflect years of research and development involving both AASHTO members and the National Cooperative Highway Research Program (NCHRP). Pavement ME Design has a user-friendly interface and generates optimal pa—ement design based on gi—en requirements. It pro—ides: efficiency in the calculation process, interactive guidance, a database to track and archive pavement designs and design parameters, tools to allow easy comparison between pavement designs, support for both SI and US Customary units, tools to optimize designs, enhanced report generation tools to better document and communicate pavement design findings, ability to evaluate and fine-tune trial designs, a full range of distress and performance analyses, and pavement response calculations and combines them with traffic, climate, and materials parameters.

All this description is provided from the AASHTO WEBPAGE
http://www.aashtoware.org/Pavement/Pages/ME%20Design.aspx?PID=1

AASHTO Safety Analyst

- Safety Analyst is a set of soft—are tools used for highway safety management.
- Implements the six main steps of the highway safety management process.
- Facilitates cost-effective, site-specific highway safety improvements

32

Safety Analyst is a set of software tools used by state and local highway agencies for highway safety management. Safety Analyst implements analytical procedures for use in the decision-making process to identify and manage a system-wide program of site-specific improvements to enhance highway safety by cost-effective means. The software automates procedures to assist highway agencies in implementing the six main steps of the highway safety management process, including: network screening, diagnosis, countermeasure selection, economic appraisal, priority ranking, and countermeasure evaluation. Safety Analyst was developed as a cooperative effort by FHWA and participating state and local agencies.

AASHTOWare Safety Analyst facilitates cost-effective, site-specific highway safety improvements. The software integrates the analytic approaches recommended in the Highway Safety Manual (HSM) into a single package, providing a program to guide the decision-making process, prioritize improvements and help your agency get the greatest possible safety benefit from each dollar it spends. The software relies on information readily a—ailable to most highway agencies including: crash data, traffic data, and either roadway segment, intersection or ramp data. Safety Analyst can be used to proactively determine which sites have the highest potential for safety improvement, as opposed to reactive safety assessments done conventionally. Proactive procedures optimize crash reduction for every dollar invested in safety.

Summary

- Agencies responsible of road safety.

Federal Agencies

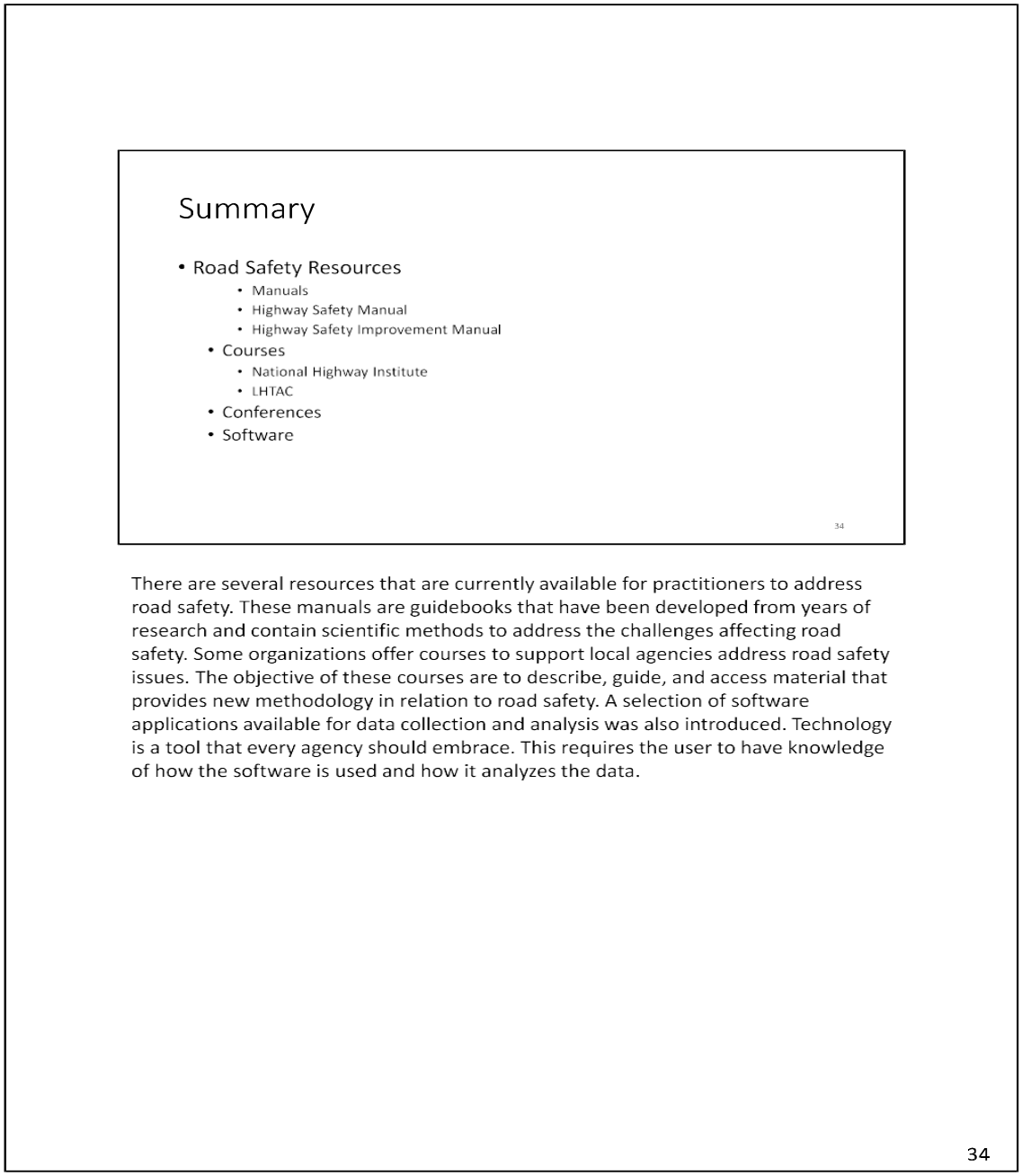
- Department of Transportation (DOT)
- Federal Highway Administration (FHWA)
- National Highway Traffic Safety Administration (NHTSA)

State and Local Agencies

- Governors Highway Safety Association (GHSA)
- State Department of Transportation
- Counties and Cities

33

Who can we turn to? Staff members tasked with roadway safety work at the federal, state, and local levels. At a federal level, we have the Department of Transportation, Federal Highway Administration, and National Highway Traffic Safety Administration. At a local level, we have the State Department of Transportation, Governors Highway Safety Association, State Police and numerous county and city agencies. A brief description of these different agencies is provided next.



There are several resources that are currently available for practitioners to address road safety. These manuals are guidebooks that have been developed from years of research and contain scientific methods to address the challenges affecting road safety. Some organizations offer courses to support local agencies address road safety issues. The objective of these courses are to describe, guide, and access material that provides new methodology in relation to road safety. A selection of software applications available for data collection and analysis was also introduced. Technology is a tool that every agency should embrace. This requires the user to have knowledge of how the software is used and how it analyzes the data.

Traffic Safety Management and Analysis

Highway Safety in Practice

We have learned that there have been decreasing numbers of fatal and injury crashes in recent years but the numbers remain uncomfortably high. There are opportunities for improvement and learning the advances and technologies in the field are important but before taking that step forward it is important to learn what resources are currently being used to improve road safety and help local agencies and people like you.

"Big Data"

- Recent advancements in data collection capabilities have allowed transportation-related agencies to collect mountains of safety data.

2

With the continuing advancement of technology, more and more data is available to transportation professionals. There is a need to determine the types of safety data that are being collected by local agencies, types of safety analysis that can be done with the collected data, and other types of safety data and analysis approaches required to meet local agency safety objectives. Many agencies conduct extensive collection efforts with regard to roadway, traffic, licensing, and vehicle data. With the increased complexity of safety data management and analysis activities and with most transportation agencies faced with limited staff and financial resources, there is a growing opportunity to provide transportation agencies with the resources and guidance to effectively understand, manage, and analyze safety data.

Source: Idaho Department of Transportation.

Key Objective (1 of 3)

- De elop a comprehensive understanding of needs and priorities.

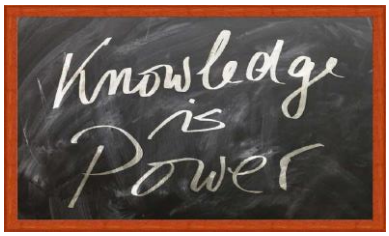
3

We have divided the needs and priorities into three main objectives. The first objective is to develop a comprehensive understanding your local agency needs and priorities. It's important to determine why agencies have these specific needs or priorities and research alternatives to provide you with resources that can assist you. This is not a trivial task because the needs and priorities change from agency to agency but data were collected and the most common needs were identified.

Source: http://svlg.org/policy-areas/health-policy/policy-priorities

Key Objectives (2 of 3)

- De elop a set of core skills and kno—ledge.



4

The second objective was develop a set of core skills and knowledge in relation to highway safety. —e identified the basic skills and knowledge a traffic engineer or professional who works in the field of transportation needs to have to effectively collect data and analyze traffic safety. A skilled traffic engineer will be ready to assume the responsibilities of a new job, more adept at learning and acquiring new skills, and work with more efficiency and effectiveness of their product. Several manuals and software that provide the practitioners —ith effective tools to collect data and conduct analysis for project prioritization and decision making will be introduced to address this objective.

Source:
https://vcuautismcenter.org/news/archivedEnewsletters/enewsletter.cfm?id=72

Key Objective (3 of 3)

- Pro ide safety data resources that can easily be accessed for use and distribution.

5

The third objective is to provide safety data resources that can be accessed for use and distribution. Some of the resources are publicly accessible while other must be purchased. It's important not to disregard the paid resources since they often provide more detail and information in the topics of road safety. Agencies should consider investing in this type of resource as it will provide long term benefits.

Source: https://pixabay.com/es/mano-dedo-mantener-acceso-bola-237143/

Methodology

- Preliminary Assessment
- Sur¯ey
- Analysis of the Survey Data
- Training Tools
- Final Reporting

6

A structured methodology was developed in order to better understand how local agencies collect and use roadway safety data and how agencies staff are trained. The first step was to conduct a preliminary assessment on the basic concepts of road safety, agency involvement, and past studies. This effort established a baseline understanding road safety. After the preliminary assessment, a survey was created to collect information on current agency practices. These data ¯ere analyzed to identify the challenges and the resources currently used by the local agencies.

Source: https://pixabay.com/es/escaleras-de-distancia-poco-a-poco-1458533/

Preliminary Assessment

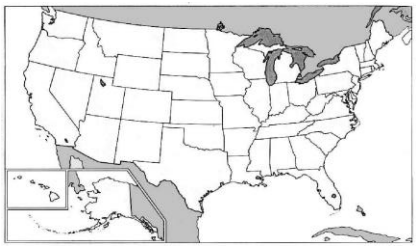
- What data is available out in the field?
- Which agencies responsible of road safety?
- What does this institution provide to improve road safety?
- What manuals, courses, and conferences are currently available?

7

As described in the previous slide, the purpose of the preliminary assessment was to identify basic concepts of road safety, agency involvement, and past studies. We sought answers to the following questions: What data is available out in the field? Which agencies responsable of road safety? What does this agency provide to improve road safety? And what manuals, courses, and conferences are currently available?

Source: https://pixabay.com/es/pregunta-mark-signo-de-interrogaci%C3%B3n-423604/

Previous Studies



As part of the preliminary assessment, a literature review was conducted to determine previous research completed, and the conclusions, and recommendations from that research. Although many studies were identified, four are highlighted as part of this presentation.

Source: https://ww¯.image-maps.com/maps/united_states/

Assessment of Local Road Safety, Funding, Training, and Technical Activities

- Safety programs reduce fatalities and serious injuries on local roads
- Knowledge of various funding mechanisms, access to safety data, and traffic engineering is essential

9

The Assessment of Local Road Safety Funding, Training, and Technical Assistance describes that local roads provide critical connections which allow people and goods to move about communities, neighborhoods, and towns. Local road safety programs save lives by reducing fatalities and serious injuries. States are focused on improving safety on a system-wide level and consider local roadways another opportunity to achieve the goals and objectives identified in SHSPs. Addressing local road safety issues requires knowledge of various funding mechanisms, access to essential traffic safety data, traffic engineering and safety expertise, and partnerships among and between a wide array of local elected officials, planners, engineers, and other decision-makers. Realizing the complexities of local road safety, many State DOTs offer support in the form of information, training, technical assistance, and project implementation to agencies to assist with the local road safety projects. This assessment revealed a variety of efforts State DOTs have implemented to improve local road safety.

Source: Gaines, Waldheim, and Herbel (2013). "Assessment of Local Road Safety Funding, Training, and Technical Assistance"

9

The objective of NCHRP Synthesis 321 "Roadway Safety Tools for Local Agencies" was to provide a summary of practical safety tools for local agencies. However, these tools cannot reduce crashes if they are not applied. Meeting the safety needs of local agencies is a considerable challenge, given that these agencies operate in an environment of limited resources. The synthesis concluded that safety practices should be tailored to the problems and resources of an agency as there is no one-size-fits-all safety solution. Large financial commitments and complex analysis are not always necessary to implement a successful local safety program. A documented local roadway safety program is a proven safety tool, and recognizing the need to implement even a rudimentary safety program is a necessary first step.

State Practices for Local Road Safety

- Document state programs and practices that address road safety
- Identify agencies that works together to successfully deliver projects
- Local agencies may lack resources to plan and implement programs and practices

11

The objective of NCHRP Synthesis 486 State Practices for Local Road Safety was to document state programs and practices that address local road safety. These programs and practices use data-driven approaches to addressing local road safety. The project gathered information from states and a sample of local agencies involved in finding new or innovative ways to address local road safety. The purpose of these —as to identify local and state agencies that have a track record of working together to successfully deliver projects, and reveal programs and practices that benefit both state DOTs and local agencies.

This synthesis concludes that states are using a variety of approaches to engage local government agencies. State DOTs are coordinating with their Local Technical Assistance Program (LTAP) centers to address issues with agencies on local road safety. Local agencies frequently lack the resources to plan and implement road safety projects and programs many states have developed low-cost treatment options that improve safety on local roads. Local agencies also rely on crash databases to determine safety improvement focus areas.

State DO¯ AdmInistration of Local Road Safety AId

- Understand how states DOTs engage local agencies in the safety process
- Organizational characteristics influence how well they accomplish their goals

12

The State DOT Administration of Local Road Safety Aid study provided an opportunity to understand how state DOTs engage local agencies in the safety process, as well as determine what organizational characteristics appear to influence how well they accomplish this goal. An interview of representative states revealed that the following characteristics were present:

- All or most of the states indicated they have designated staff working as liaisons to local agencies with outreach programs that provided technical assistance, training, assistance with federal paperwork, and/or crash records.
- All indicated they had established partnerships with MPOs, LTAPs, and various coalitions of local agencies.
- All indicated that their HSIPs were centrally managed.
- All indicated that at least 40 percent of their safety funds that address driver-behavior related crashes result in projects that benefit the local road systems.
- All but one of the states indicated that there ¯as DOT leadership support for engaging local agencies in statewide safety planning efforts.
- All but two states indicated their safety program includes a systemic safety program, with the remaining two states indicating they are actively working to develop a systemic safety component.

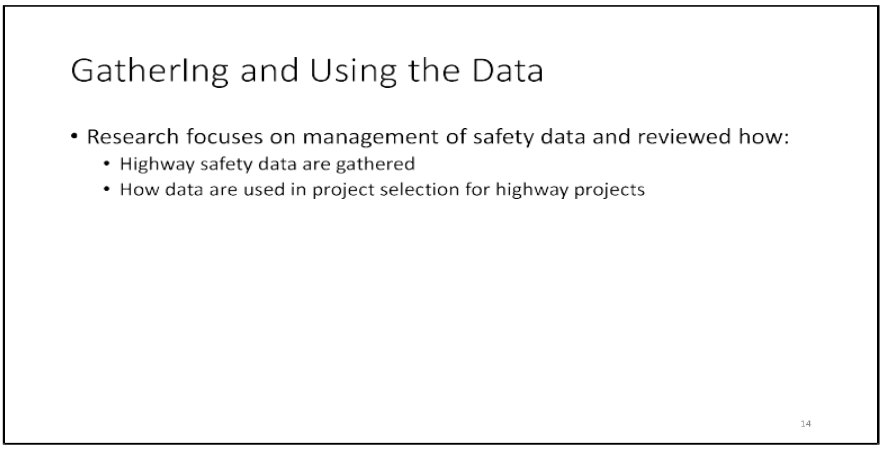
GatherIng and Using the Data

- How are road—ay crash data acquired, stored, and utilized regarding highway projects?

13

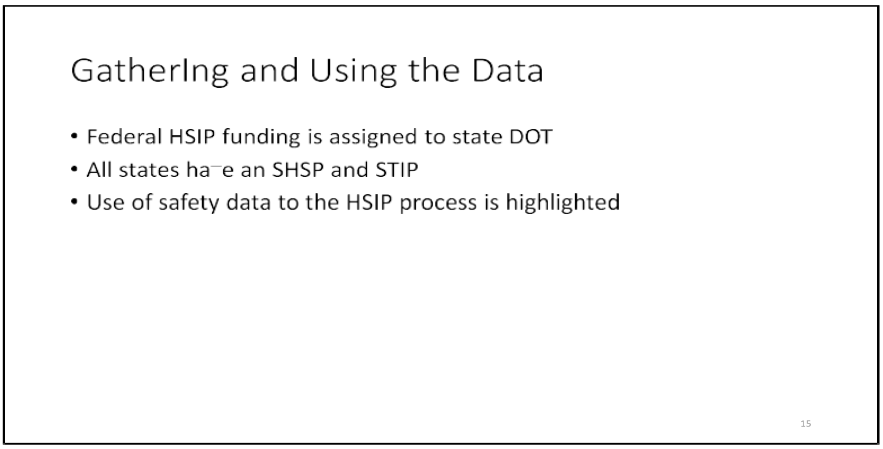
As part of the overall effort, we sought to specifically determine how roadway crash data are acquired, stored, and utilized in engineering and management decisions regarding highway projects? Engineers and professionals involved with safety data management from six states were interviewed. Since most safety projects are funded by the federal FHWA, through the HSIP, the general flow of safety data is similar in the states interviewed. But there are many differences in the details, especially the computer hard—are and software used. The methods of data progression and transfer between the responder and the DOT often involve an intermediate agency.

The program to extract these data for each DOT varies. The transfer of HSIP funding to local agencies, and the use of historical crash data in the SPFs also deviate from state to state. The older method of looking at crash data from location in question is not uncommon, but the modern method of using data from similar locations using an empirical bayes analysis is becoming more common and is the currently recommended method.

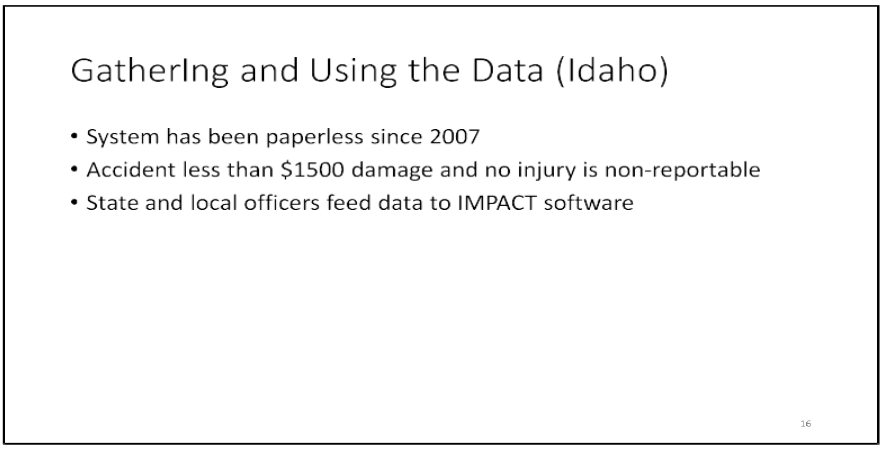


Although details vary from state to state, most states have a similar process of converting a crash report that is initiated by a responder or citizen into a database entry. This database is controlled by a non-DOT agency such as the DMV (Department of Motor Vehicles). Quality Control (QC) may be preformed by a single or multiple agencies. The selection of safety improvement projects may be summarized into t—o fundamental processes: identification of roadway sections and intersections for safety ranking and candidate safety project selection.

Starting with the crash data from a database managed by the Data Office, these data are parsed with an extraction program that converts the raw data to compiled reports. This may involve an ETL (Extract Translate Load) program or be done manually. These reports can be summarized for the entities that might need them, such as a county or region. The output from the ETL program provides the basis for ranking candidate locations. However, the rankings depend on the queries and algorithms used. The output of the extraction program can express the severity of the safety problem at a location.



After the processing and QC, the reviewed data are accessible to respective state DOTs and are loaded in varying processing programs. Federal HSIP funding is assigned to the state DOT, who distributes to local agencies. In many states this leads to two different project selection and evaluation processes, depending on the agency that will administer the project. All states have a Strategic Highway Safety Plan (SHSP) and a State Transportation Improvement Program (STIP); however, there are differences between states in ho¯ prescriptive the safety plan is. In any case, the ranking must correspond to the plan. All projects must be listed in the STIP for public review. Usually local agencies, cities and counties, as well as Municipal Planning Organizations (MPO), are queried regarding projects that affect them. Since most funding is related to the HSIP process, we highlight the use of safety data to the HSIP process here.



Let's highlight the process in the state of Idaho, and how the Gem State gathers user data. The system has been paperless since 2007. An accident less than $1500 damage and no injury is non-reportable but a uniform crash report is required by law. All officers report through the use of "IMPACT". Within the DOT, the IMPACT data are downloaded daily to "CIRCA" at the district level. Quality control, or QC, is performed on location, weather, and causal data. If questions arise, the officer is asked to clarify.

The general process is outlined as follows:

- Engineers at the district level use the data from CIRCA to determine where improvements are needed.
- Engineers use WebCars is used to query CIRCA.
- Engineers at the district level conduct an initial B/C using TREDIS.
- Results from districts are combined statewide, where an overall B/C priority listing is developed.
- A committee at headquarters uses the B/C analysis to decide funding then funding is portioned out to districts.

In terms of training, the Highway Safety Manager trains officers on the use of IMPACT. There are three levels of training, Initial, Supervisors, and Refresher. Headquarters

GatherIng and Using the Data

- Acquisition, storage, and use of data are different bet—een states
- Limitations associated with data acquisition
- Most common reported difficulty associated with crash location attributes

17

While the basic notion of acquisition, flow, storage, and use of data is similar in all the states queried, many details are quite different between states. In some cases, details are different between the data used for state highway projects and data used for local projects within that same state. For traffic, safety, and design engineers, the most commonly reported difficulty with the data involves attributes about the crash location. This includes milepost, or ownership of the road such as state route vs. local road. Those using the data should also be aware that se¯eral agencies may have been involved in the data's gathering and compilation. Inter-agency cooperation and coordination are an important part of assuring accuracy and usability of the data.

A key use of crash data would be the adjustment of the SPF, Safety Performance Functions, and CMF, Crash Modification Factors, for the state or local agency. Typically, engineers use SPFs and CMFs from the HSM or from an on-line service of the FHWA, the CMF Clearing house. An important management issue might be the selection of crash data. The old method for project selection —as to e¯aluate the number of crashes at particular segments/locations and compare with the SPF and base the benefit estimation on these numbers. However, the more modern method is to use an EB analysis that takes into account the crash data from other, similar, locations. Several of the computer programs used by DOTs use do this automatically.

Survey: Population Target

- Local practitioners from Idaho
- Local agencies
- Local consultant

18

To further understand the resources currently available to local agencies in Idaho, an online survey was developed and administered to local agency staff throughout Idaho. The main purpose for this survey was to identify the resources used for data collection and analysis, and to identify any challenges. Prior to proceeding with the design and administration of the survey, a survey target audience was identified. This survey targeted local agencies including cities, counties, Metropolitan Planning Organizations, and high—ay districts. Practitioners from Idaho including city engineers, public works directors, and street superintendent were asked to participate, as well as local consultants.

Source: Idaho DOT

Survey ObjectIves

- Identify what local agencies do to address their challenges
- Identify what material they use to address road safety issues
- Determine the biggest challenge for local agencies

19

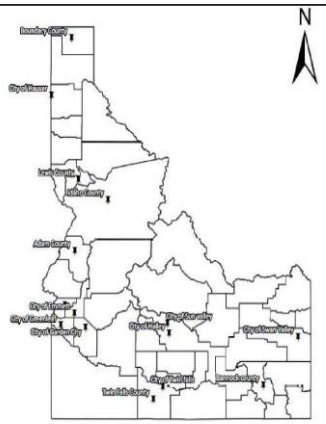
The survey sought to determine what and how resources are being used in practice. Specific objectives of the survey included: filling missing gaps and developing resources to help practitioners effectively understand, manage, and analyze safety data, identifying what local agencies do to address their challenges, identifying what material is used to address road safety issues, determining what are the overall biggest challenge for local agencies, and what they ⁻ish to learn more about road safety. All of these objectives seek to better understand how our local agencies address road safety.

Survey Format

- Ten questions
- Multiple choice, ranking, and short answers

Based on the survey objectives, an online survey was created. Directors, superintendents or city engineers were asked to participate in the survey so that specific information could be obtained as to the resources currently used. In addition to the multiple choice and ranking questions, respondents were encouraged to provide feedback so that additional in-depth information could be gathered. We determined based on initial contact with local agencies that many cities were not responsible for the maintenance of the cities or county roads. In the next couple of slides, each question and each question's objective are further explained.

Counties and Citles



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This map shows the broad range of cities and counties that participated in this survey. Many cities and counties did not explicitly respond but noted that a different agency such as the Idaho Transportation Department was in charge of their road management and day-to-day operations.

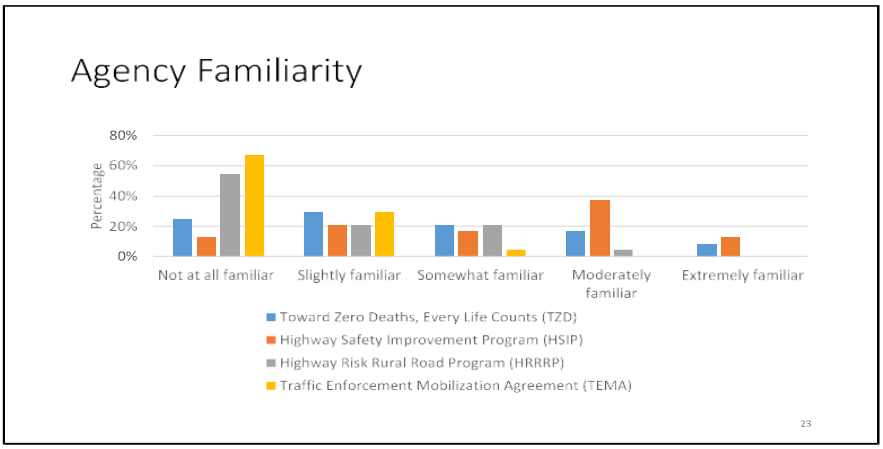
Survey (Responses)

ALL SURVEYS

TITLE	MODIFIED	RESPONSES	DESIGN	COLLECT	ANALYZE	SHARE	MORE
Safety Education 2 Created 05/20/2016	08/29/2016	24					

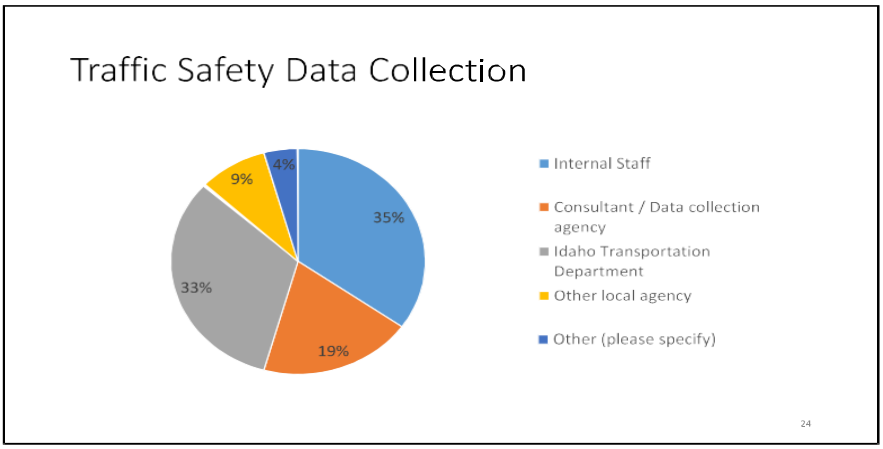
22

The survey was administered from July to August of 2016. An initial invitation was sent to an e-mail distribution list representing the engineering leadership at regional and local agencies throughout the state. A total of 250 agencies were contacted and 24 agencies responded for a rate of approximately ten percent.

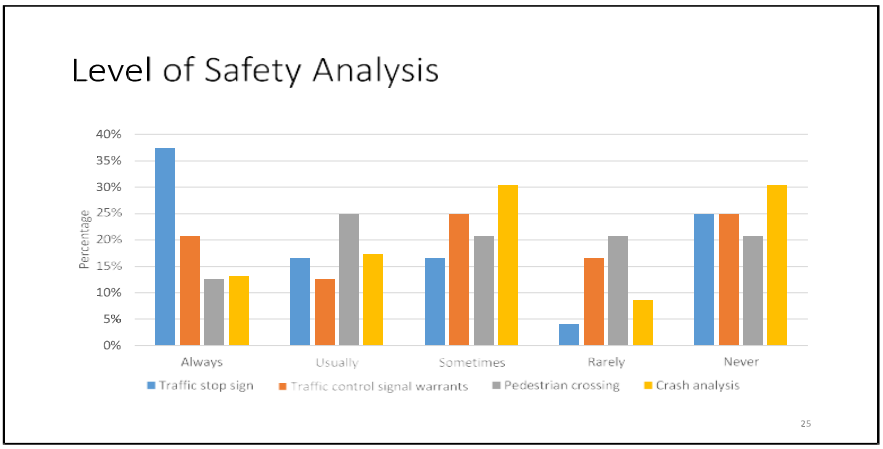


The first question was, "How would you best describe your agency´s familiarity level with the following programs?" The objective of this question was to identify the familiarity of the local agency to different highway safety programs in the State of Idaho.

The programs that survey responders were asked to rank included: Toward Zero Deaths (TZD), Highway Safety Improvement Program (HSIP), Highway Risk Rural Road Program (HRRRP), and the Traffic Enforcement Mobilization Agreement (TEMA). The most familiar was the Highway Safety Improvement Program while the least familiar program the Traffic Enforcement Mobilization Agreement. The Toward Zero Deaths and Highway Risk Rural Road Program were in the midrange of familiarity for the agencies.

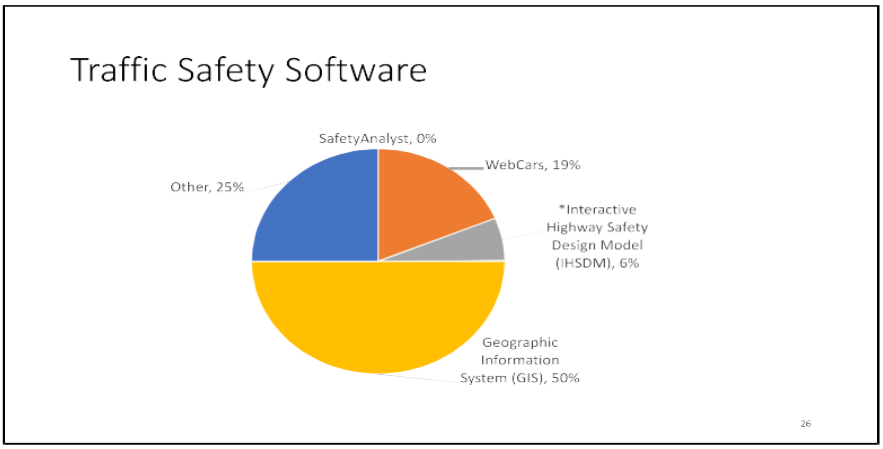


"For your local agency, traffic safety data such as traffic volumes and speeds are collected by whom?" The objective of this question was to identify if the cities, counties or MPOs collect their own transportation data. Possible responses included: internal staff, consulting or data collection agencies, Idaho Transportation Department or another local agency. Most local agencies responded that their own internal staff collects traffic safety data and occasionally requests technical assistance from the Idaho Transportation Department. Some of the agencies rely on consultants from other local agencies. Those specifying "other" agencies stated that they collected data with help from county and highway district staff.



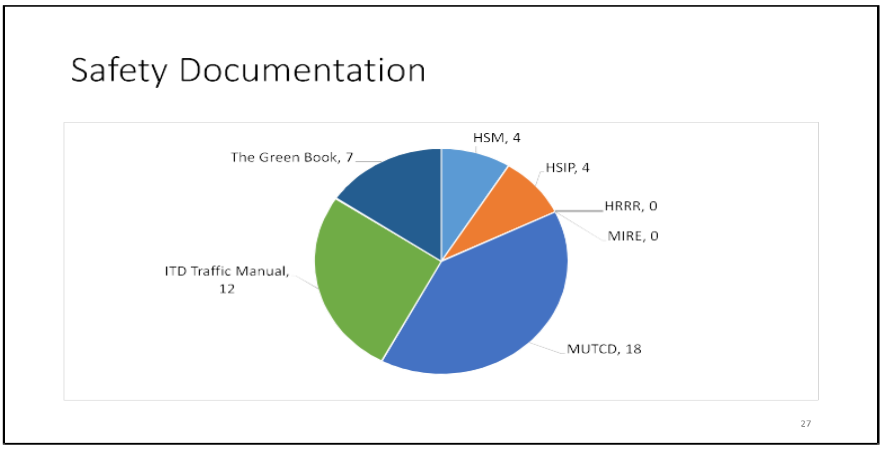
"Does your local agency perform specific types of analysis to evaluate sites for safety improvements?" The objective of this question was to determine what type of analysis if any, they perform. This question assessed if agencies have done or how often they conduct analysis for a: traffic stop sign, traffic control signal warrant, pedestrian crossing, and crash analysis. The most common type of analysis used to evaluate sites for safety improvements was the stop sign analysis followed by traffic control signal warrants. The least frequent type of analysis was crash analysis. Pedestrian crossing analysis is in the middle of the range, with some agencies taking it into account and others not doing so or not having the capability to do so.

25

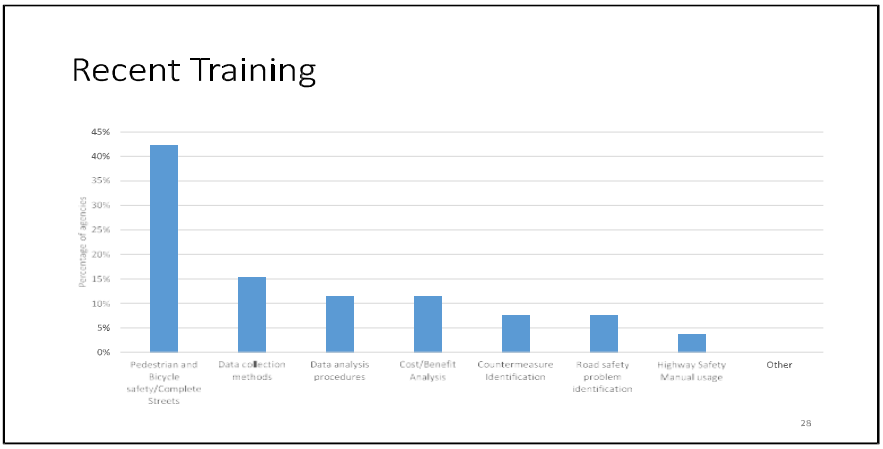


"What software do you use to analyze traffic safety data?" Technology is a great resource for engineers. We have to be updated as to what is being used. Learning the data collection process and using analysis software can results in a better product. Responding agencies had the option of selecting different software or applications including: SafetyAnalyst, WebCars, Interactive Highway Safety Design Model (IHSDM), geographic information system, or some other application. The results show that the software most used by local agencies to analyze traffic safety data is GIS ¯ith 8 agencies. No agencies used SafetyAnalyst. Four agencies selected and noted the option "Other" and specified the software they used included the Travel Demand Model - QRS II and Highway Safety Manual spreadsheets.

- The IHSDM, which supports the Data-Driven Safety Analysis initiative that is part of Federal Highway Administration's (FHWA's) Every Day Counts 3 efforts, includes six evaluation modules (Crash Prediction, Design Consistency, Intersection Review, Policy Re¯iew, Traffic Analysis, and Driver/Vehicle).
- Participants: 14



"Does your agency regularly use any of the following safety documents?" This question identified resources being used and their knowledge of other material or resources. It would be a necessary follow-up activity to provide additional information if certain useful material was not currently being used. The agencies had the option of selecting the Highway Safety Manual, Highway Safety Improvement Program, High Risk Rural Road, Model In¬entory of Roadway Elements, Manual on Uniform Traffic Control Devices, ITD Traffic Manual, A Policy on Geometric Design of Highway and Streets or another resource. The most common manual used by the agencies was the MUTCD selected by 18 agencies followed by the ITD Traffic Manual with 12 agencies. The HRRR and the MIRE were the least used. Based on these results it appears that there is an opportunity to further expose both the HSM and HSIP to local agencies.



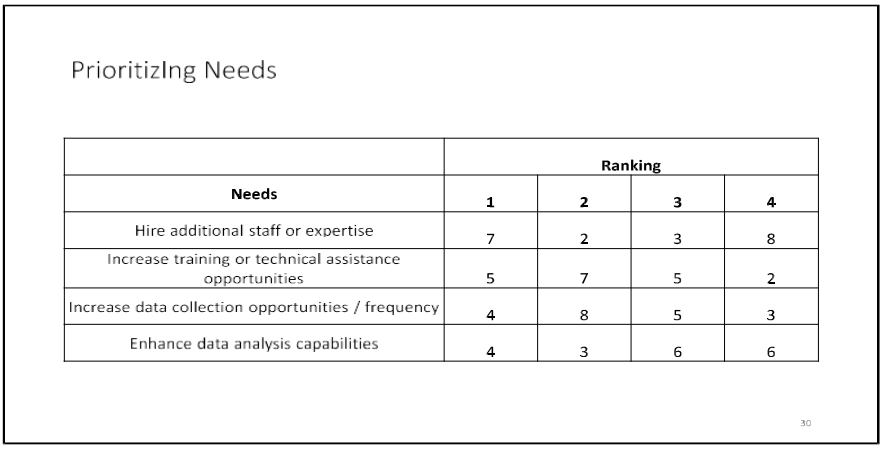
"In the past 3 years, did your agency receive training in any of the following topics?" We sought to identify what challenges they had to address, and what material we could provide to address the topics not selected. The topics included: data collection methods, data analysis procedures, countermeasure identification, cost/benefit analysis, highway safety manual usage, road safety problem identification, and pedestrian and bicycle safety/ complete streets. The agencies also had the option of selecting "other" and specifying a different topic. Most of the agencies received training in pedestrian and bicycle safety or complete streets. For the other training topics, some had received training in data collection, data analysis and cost/benefit analysis. Highway Safety Manual training was comparably lower to the other training topics.

Agency Needs

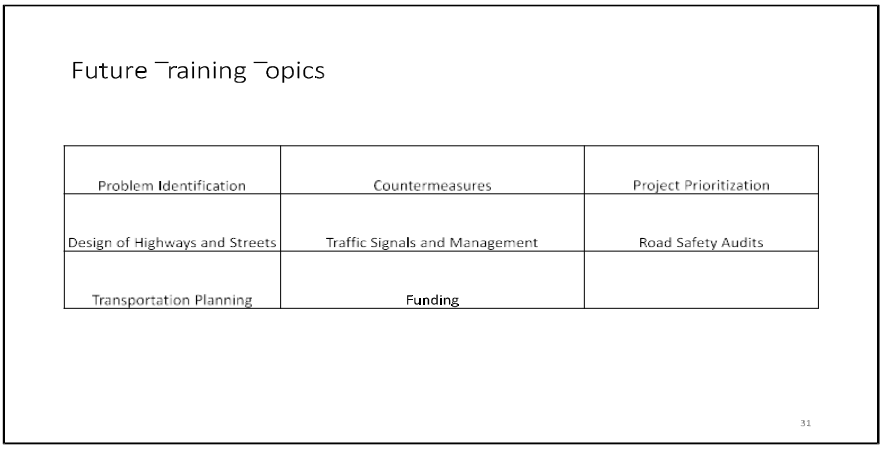
	Ranking					
Priority	**1**	**2**	**3**	**4**	**5**	**6**
Data Collection Methods	2	2	1	1	4	7
Data Analysis Procedures	1	5	4	2	4	2
Countermeasure Identification	1	0	4	5	6	2
Road Safety Problem Identification (per HSM & HSIP)	2	2	7	5	2	1
Project Prioritization	5	5	3	3	1	3
Project Funding	8	5	1	2	2	3

29

Rank the topic areas of greatest need to your local agency with 1 being the highest need and 6 being the lowest need. The objective of the question was to identify specific needs that local agencies have. The choices included: data collection methods, data analysis procedures, countermeasure identification, road safety problem identification, project prioritization, and project funding. Specific examples were provided with each category to provide additional clarification. The agencies prioritized the topics in the following order: project funding followed by project prioritization, data analysis procedures, and road safety problem identification.



If additional resources or funding were made available to address traffic safety, how would you prioritize the following needs? The objective of the question was to prioritize local agency needs if funding was available. The agencies were asked to choose between: hire additional staff or expertise, increase training or technical assistance opportunities, increase data collection opportunities/frequency, and enhance data analysis capabilities. The agencies prioritized the topics as follows: hire additional staff or expertise, increase training or technical assistance opportunities, and increase data collection opportunities or frequency.



Based on our research effort we explained that the University of Idaho hopes to develop a series of online training modules focused on roadway safety for local agencies in the State of Idaho. What are three essential topic areas / subjects that we must include? Agencies were asked to share potential training topics. The responses were grouped into the following categories: problem identification, countermeasures, project prioritization, design of highways and streets, traffic signals and management, road safety audits, transportation planning, and funding.

Summary

- Description of the survey's objectives and procedures
- Determine what resources are a¯ailable to address road safety
- Identify the local agencies challenges to address road safety

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An online survey was developed and administered to identify the resources currently used by the local agency staff throughout Idaho to target road safety. The survey sought to fill missing gaps and developing resources to help practitioners effectively understand, manage, and analyze safety data, identifying what local agencies do to address their challenges, identifying what material is used to address road safety issues, determining what are the overall biggest challenge for local agencies, and ¯hat they wish to learn more about road safety. Many responses were collected and the following conclusions were drawn: local agencies in State of Idaho are familiar with the Highway Safety Improvement Program, they rely on their staff and the State DOT to collect traffic data, GIS is the most common type of software used to analyze traffic safety data, and the most common manual used by local agencies is the MUTCD. In the past 3 years, most of the agencies received training in pedestrian and bicycle safety or complete streets. Project funding opportunities, project prioritization methods, and data analysis procedures were the three highest training needs for local agencies surveyed. Other common concerns amongst local agencies ¯ere the focus on hiring additional staff and increasing training or technical assistance opportunities. All the collected data helped identify the major challenges that local agencies are facing to address road safety and the resources they have available to address these challenges.

Next Steps

- De elop a comprehensive understanding of needs and priorities
- De elop a set of core skills and kno ledge
- Pro ide safety data resources that can be easily accessed for use and distribution

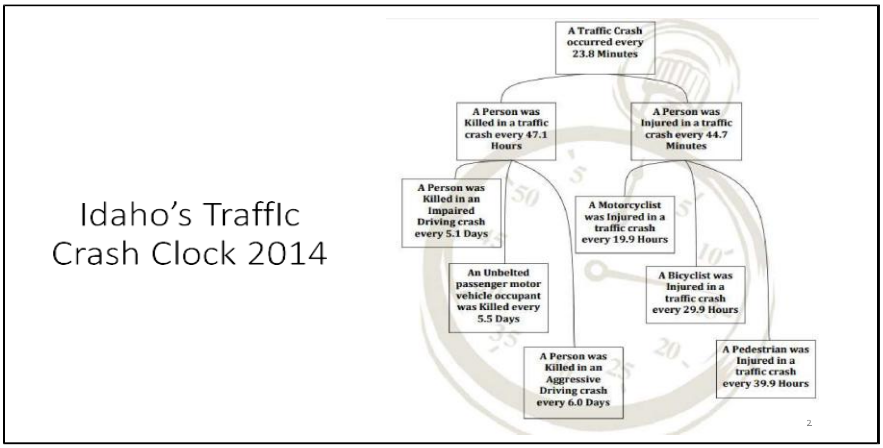
33

We sought to develop a comprehensive understanding of needs and priorities, developing a set of core skills and knowledge, and providing a safety data resource that can easily be accessed for use and distribution. Several steps were considered to provide better understanding the scope and the end product of this assessment. To determine what gap were needed to be covered, previous studies were identified. A rich amount of information was obtained but only the most pertinent studies ere highlighted on the presentation. To collect information of the resources currently available to local agencies, alternative methods were evaluated to determine the ideal approach to take. The use of a survey was selected to be the best alternative as the use of a survey has high relevance to transportation in several specific areas.

Traffic Safety Management and Analysis

Road Safety for Local Agencies in Idaho

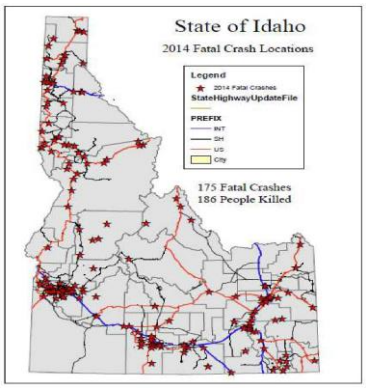
This slide deck is the fourth presentation in a series of lectures about traffic safety for local agencies. This presentation is tailored specific to transportation practitioner in the state of Idaho but local and regional personnel from other states will also benefit. Some of the major topics that will be discuss include Idaho crash data, local agency challenges, and addressing new challenges. At the end of the presentation, several example of different methods used by local agencies to successfully address safety challenges will be shared.



According to the World Health Organization, a road traffic injury is a fatal or non-fatal injury incurred as a result of a collision on a public road involving at least one moving vehicle. Children, pedestrians, cyclists, and the elderly are among the most vulnerable road users. The image on this slide represents the Idaho's Traffic Crash Clock, a graphic depicted in the Idaho Department of Transportation's Strategic Plan. It presents the Idaho's Traffic Crash Clock. Let's read through it. The text boxes shows that a traffic crash occurred every 23.8 minutes, a person was injured in a traffic crash every 44.7 minutes, a motorcyclist was injured in a traffic crash every 19.9 hours, a bicyclist was injured in a traffic crash every 29.9 hours, a pedestrian was injured in a traffic crash every 39.9 hours, a person was killed in a traffic crash every 47.1 hours, a person was killed in an impaired driving crash every 5.1 days, an unbelted passenger motor vehicle occupant was killed every 5.5 days, and a person was killed in an aggressive driving crash every 6.0 days.

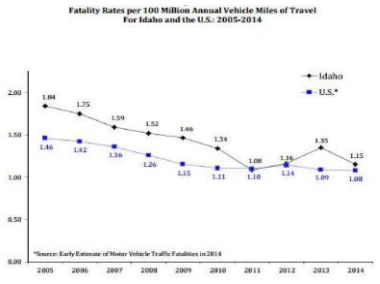
http://www.who.int/topics/injuries_traffic/en/

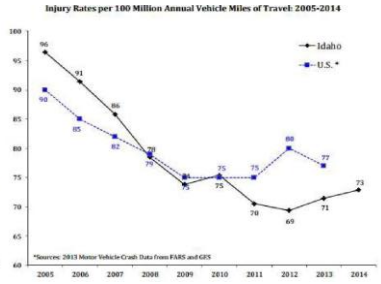
State of Idaho



The State of Idaho is bordered by the Canadian province of British Columbia to the north and the U.S. states of Montana and Wyoming to the east, Utah and Nevada to the south, and Oregon and Washington to the west. Idaho is twice as large as the six New England states combined. Idaho's transportation system is comprised of a statewide network of more than 60,000 miles of road, about 4,000 bridges, 1,900 miles of rail lines, 125 public airports, and the Port of Lewiston. Of these facilities, the transportation department has jurisdictional responsibility for almost 5,000 miles of highway (or 12,000 lane miles), more than 1,700 bridges, and 30 recreational and emergency airstrips. The State Highway System also includes 30 rest areas and 10 fixed ports of entry. The transportation department oversees federal grants to 12 rural and urban public transportation systems, provides state rail planning and rail-project development, and supports bicycle and pedestrian planning and projects.

Idaho Injurles and Fatalitles





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According to Idaho's Strategic Safety Plan, fatality and injury rates in Idaho have varied over the past decade but have generally decreased. In this slide, two graphs are presented: fatality rates per 100 million annual vehicle miles of travel and injury rates per 100 million annual vehicle miles of travel. Factors such as vehicle safety features, limited access highways, engineering improvements, occupant restraint usage, demographic changes and a reduction in driving under the influence tend to reduce fatalities and injuries. Increases in average vehicle miles traveled, licensed drivers, registered vehicles, changes in reporting, and higher average speeds tend to increase the number of fatalities and injuries.

Idaho Crash Severity

Table 3
Injury Severity of Persons Involved in Traffic Crashes: 2010-2014

	2010	2011	2012	2013	2014	Change 2013-2014	Avg. Change 2010-2013
Fatalities	209	167	184	214	186	-13.1%	2.1%
Serious Injuries	1,396	1,293	1,287	1,262	1,273	0.9%	-3.3%
Visible Injuries	3,565	3,354	3,428	3,549	3,689	3.9%	-0.1%
Possible Injuries	6,764	6,219	6,273	6,533	6,806	4.2%	-1.0%
No Injuries	44,239	40,920	42,620	44,051	42,993	-2.4%	0.0%
Unknown / Missing	818	706	333	344	392	14.0%	-21.1%
Total Persons in Crashes	56,991	53,899	54,125	55,952	55,339	-1.1%	-0.5%

This table presents the injury distribution of people involved in crashes from 2010 through 2014. The number of fatalities decreased from 214 to 186 in 2014, but there were 7 serious injuries for every person killed in a motor vehicle crash. On average, four people were killed or seriously injured every day in 2014, which represents the last full year of available data.

Idaho Economic Cost of Crashes

Table 4
Economic Cost of Idaho Crashes: 2014 Estimates

Incident Description	Total Occurrences	Cost Per Occurrence	Cost Per Category
Fatalities	186	$6,493,502	$1,207,791,342
Serious Injuries	1,273	$323,382	$411,665,088
Visible Injuries	3,689	$90,577	$334,140,238
Possible Injuries	6,806	$60,040	$408,633,680
Property Damage Only	13,742	$6,951	$95,520,433
Total Estimate of Economic Cost			**$2,457,750,780**

This table shows the estimated economic cost for motor vehicle crashes in Idaho. The cost of each injury type was established by determining a percentage value in relation to the cost of a fatality. The cost estimate for preventing a fatality was revised by the Federal Highway Administration (FHWA) in February 2008. This was a substantial increase over the previous cost estimate, and the 2014 costs have been adjusted for inflation using the Gross Domestic Product Implicit Price Deflator. The estimated total cost of Idaho crashes in 2014 —as nearly $2.5 billion, and this amounts to an average cost of $1,504 for every person in Idaho.

Urban and Rural Crashes

Table 9
Comparison of Crashes by Roadway Classification: 2010-2014

	2010	2011	2012	2013	2014	Change 2013-2014	Avg. Change 2010-2013
Fatal Crashes	199	185	152	200	175	-12.5%	2.2%
Urban	44	42	30	41	40	-2.4%	1.2%
Rural	155	143	122	159	135	-15.1%	2.6%
Injury Crashes:	7,861	7,939	7,492	7,850	8,217	4.7%	0.0%
Urban	4,838	4,919	4,762	4,963	5,399	8.8%	0.9%
Rural	3,023	3,020	2,730	2,667	2,818	5.7%	-4.0%
Total Crashes:	22,992	22,555	20,833	22,348	22,134	-1.0%	-0.8%
Urban	14,215	13,780	12,993	13,705	14,670	7.0%	-1.1%
Rural	8,777	8,775	7,840	7,697	7,464	-3.0%	-4.2%

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This table compares the number of fatal, injury, and total crashes by urban and rural roadway classification. Urban roadways are defined as those within the limits of cities with 5,000 people or more. Urban roadways tend to carry higher volumes of traffic at lower speeds, while rural roads carry lower traffic volumes at higher speeds. In 2014, 34% of all crashes occurred on rural roads but accounted for all 77% of fatal crashes. In Idaho, 88% of the total road mileage was classified as rural road—ay. Since rural roads tend to have higher speed limits, crashes at higher impact speeds have a greater probability of resulting in a fatality.

Idaho Local Agencies

- Many local roads are maintained by local agencies
- With limited resources and staff, making it particularly challenging to address safety issues.

Safety issues are identified on local roadways through a wide range of approaches. Although no single approach works best for all local agencies, some are far more effective at improving long-term roadway safety. Many agencies, often larger ones, have staff whose full-time jobs are dedicated to roadway safety which allows them to focus on safety initiatives, be trained in the latest safety research, and have access to safety analysis data, tools and procedures. At the same time, smaller agencies lack the financial ability to dedicate staff resources to analyze safety issues and staff may have limited access to roadway safety training, safety expertise, and the latest safety analysis tools and procedures. Many local agencies rely on State DOTs to provide funding, training, and technical assistance to advance local road safety initiatives.

Source: http://www.cdc.gov/healthyYouth/partners/index.htm

Countles and Cities

- Manage a safe, high-quality local public street system
- Operations and maintenance practices vary by jurisdiction

9

The local counties and cities are responsible for a specific part of the road system in each state. County and city roads and highways operated and maintained by the local highway department vary greatly in design standards, funding and regularity of maintenance. Some cities manage their own roads while others are managed by the county or a local district.

An important agency partner is the Idaho State Police (ISP). The ISP has provided law enforcement services to the citizens since 1919. Today, the Idaho State Police consists of Patrol, Investigations, Commercial Vehicle Safety, Alcohol Beverage Control, Regional Communications Centers, Forensic Services, Brand Inspector, Bureau of Criminal Identification including the Idaho State Sex Offender Repository, and the Peace Officer Standards and Training (POST). In relation to safety, the state police —orks to enforce safety regulations as well as educate drivers and industry about commercial vehicle safety.

Challenges

11

Using the information which was obtained from the survey described in our second presentation, several challenges facing agencies were identified. In the following slides, these challenges will be described.

Challenge: Project Funding

- Local agencies may lack funds to implement safety improvements
- Local agencies struggle with competing priorities and issues

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One of the most common barriers to improving local road safety is the lack of funding available to these local agencies. Many simply lack the funds to implement safety improvements on their road systems and look to the State HSIP or other funding sources for assistance. State agencies usually require local agencies to provide up-front funds for federal-aid projects. Many local governments, especially those in rural areas, cannot provide these resources. Furthermore, many local agencies do not have adequate resources to support the administration of Federal-aid projects. Local agencies also struggle with competing priorities and issues. Some small local agencies may not be willing to participate in federal-aid programs because they cannot afford even a meager match for a project. Securing matching funds requires support from local elected officials and gaining consensus among decision-makers can be difficult if other priorities are on the table.

Source: https://pixabay.com/es/dollar-moneda-dinero-telara%C3%B1a-red-592511/

Challenge: Project Prioritization

- Multiple methods for prioritizing safety projects exist
- Many considerations enter into project selection beyond safety

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When limited funds are available, determining the project or projects to move forward can be challenging. After contributing crash factors and potential countermeasures have been identified, the next step is to prioritize these countermeasures and projects for implementation. Increasing competition and the need to do more with less make choosing the right projects critically important. Given the significant number of potential projects, the wrong choice can be made. Some of the prioritization challenges faced by organizations include: insufficient understanding of the costs, risks, and benefits of proposed projects, or biased estimates from project proponents.

Sources: http://safety.fhwa.dot.gov/hsip/resources/fhwasa09029/sec4.cfm

Challenge: Data System Integration

- Proper data collection, access, and analysis will:
  - Improve data quality, timeliness, completeness, and uniformity
  - Improve data sharing
  - Improve access to real-time information
  - Enhance access

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Data system integration is a key component of an effective road safety program. Proper safety data, collection, access, and analysis help to achieve a number of goals: improve data collection quality, timeliness, completeness, and uniformity; improve data sharing among state, federal, and local agencies and stakeholders; improve access to real-time information for roadway users; enhance access to traffic safety data; and improve data-related to trip characteristics of all roadway users, level of service, injuries, and fatalities on roadways. A careful examination of crash data can reveal contributing factors and patterns at sites and segments. The review of individual crash reports should result in a list of type of crashes and categorization by crash type, a list of contributing crash factors, crash pattern descriptions, and collision diagrams. However, local government staff may lack the safety data or analytical skills necessary to conduct the appropriate crash data analysis.

Source: https://www.udemy.com/learning-python-for-data-analysis-and-visualization/

Challenge: Countermeasure Identification

- CMFs
- Funding constraints

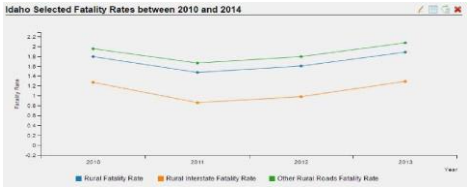
15

Once crash locations and issues have been identified, the next step for safety practitioners is to select a set of improvement alternatives which will reduce the likelihood of future crashes. Such safety improvements are referred to as countermeasures and most countermeasures have corresponding Crash Modification Factors (CMFs). When CMFs are applied correctly they can help agencies identify the expected safety impacts of implementing a particular countermeasure to reduce crashes. The main challenge in countermeasure identification is funding capability, which limits the countermeasure type and extent of implementation. Insufficient funding also limits the staffing and training that an agency can provide to prepare for this type of analysis.

In an effort to stretch highway safety funding, local transportation agencies are encouraged to identify and implement the optimal combination of countermeasures to achieve the greatest benefits. Combined with crash cost data and project cost information, Crash Modification Factors can help safety practitioners compare the benefit-cost ratio of multiple countermeasures and then choose the most appropriate application for their proposed safety improvement projects. It is important to note that there are many safety issues and corresponding countermeasures can be more "maintenance-oriented" in nature.

Challenge: Data CollectIon

- Safety
- Equipment Failures
- Communication Issues



16

Data collection in rural areas are typically carried our over vast roadway networks. Many challenges exist with regard to data collection such as: the safety of the traffic data collection crew in installing equipment on high-volume routes, equipment failures, travel time considerations, and communication problems.

Source: FHWA

Challenge: Lack of staff or expertise

- Small local agencies may lack the resources needed to apply for the safety funds
- States provide training or assistance to offset this challenge

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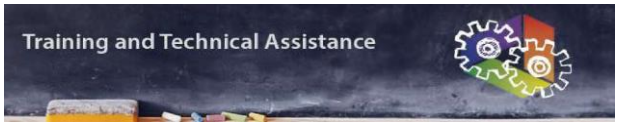
Local agencies may lack the staff needed to apply for the safety funds. Since participation in the Federal-aid process is optional for local agencies, they do not receive funds if they fail to submit an application. Many states do provide training or assistance with the application process to offset this challenge. However, the ongoing demand to train local agency staff in needed areas or skills is often difficult to sustain o¨er the long time periods required. This is exacerbated by high staff turnover rates at local agencies and creates continuing challenges for DOTs and Local Technical Assistance Programs or LTAPs who provide training.

Source: http://brooklynbrief.com/pacific-street-library-handicapped-lack-funding/

Challenge: Training or technical assistance opportunities

- Lack of local staff creates more multitasking and less efficiency
- Lack and uneven commitment to training
- Technical assistance programs vary widely



18

Many agencies spend only a small percentage of annual payroll on training. While some managers view training as an investment, others see it as an expense with little evidence of return. For this reason, a common challenge is the lack for or uneven commitment to training.

Technical assistance programs vary widely. They differ according to the framework under which they are provided, the type of assistance, and the type of provider. Despite all of the different combinations of framework or assistance, type of assistance, and assistance providers, little has been done to systematically examine what kinds of assistance work best under a particular circumstance.

Source: http://www.apa.org/pi/lgbt/programs/safe-supportive/training/default.aspx

Addressing Challenges

- Every situation and e ery agency is unique

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Identifying the challenges a local agency faces is the first step to addressing the agency's limitations. Increased funding is often considered the solution to ongoing challenges, but some challenges may be addressed with a different approach. Not all approaches are suitable for every agency, so the local agency needs to determine what solution is best for their given situation. The purpose of this next section is to gi e recommendations to solve the most common challenges that local agencies are facing.

Source: https://kasina.com/blog/2014/07/product-execs-discuss-outcome-oriented-products.html

Local Road Safety Plan

- Valuable tool for impro ing roadway safety
- Defines key emphasis areas and strategies
- Supports SHSP process

Let's start by talking about a great tool that every agency should consider developing - a Local Road Safety Plan. A Local Road Safety Plan can be a valuable tool for improving roadway safety. Local road practitioners play a critical role in addressing crash risks at the local level and may be able to identify specific or unique conditions that contribute to crashes within their jurisdictions. The LRSP defines key emphasis areas and strategies that impact local rural roads and provides a frame ork to accomplish safety enhancements at the local le el. The Strategic Highway Safety Plan or SHSP prioritizes safety needs and investments at the state level, and may provide input to the LRSP. Likewise, the LRSP can feed the SHSP process to identify local road specific safety issues. In the following slides we will further describe the benefits of LRSP.

Benefit: Proactive Approach

- Routine safety analyses of the roadway network
- Agencies utilize both systemic and spot location improvements

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The first benefit is its proactive approach. An LRSP can demonstrate to the public and policy makers that a systematic approach is being taken to reduce severe crashes and build trust with local government officials, key stakeholders, and the general public. An agency can use a proactive approach to roadway safety by identifying safety improvements and analyzing the safety of their entire roadway network, either: one-time by conducting network-wide safety analysis of their road—ays driven by new sources of funding or routinely with regular safety analyses of the road—ay network.

Agencies with a proactive approach utilize both systemic and spot location improvements. Applying improvements systemically across an entire corridor or network allows an agency to proactively address locations that have not had crash concentrations in the past but have similar features as those currently experiencing high levels of crashes. In addition, even though a spot location improvement may be based on "past" crashes, agencies making improvements based on countermeasures —ith proven crash reduction factors at the highest crash locations often have the best chance of reducing future crashes.

Source: https://pixabay.com/es/tablero-tiza-formaci%C3%B3n-habilidades-953157/

Benefit: Develop Partnerships

- Impro e relationships with the public, stakeholders, and governmental agencies
- Improving road safety is a benefit for everyone involved
- Differing philosophies, competing priorities, and varying business cultures will be present

22

The second benefit of developing an LRSP is the formation of agency and project partnerships. An LRSP provides local agencies with an opportunity to improve relationships with the public, stakeholders, and across governmental agencies by working through a collaborative process. Each safety partner and organization brings a unique and valuable perspective to bear on transportation safety. However, differing philosophies, competing priorities, and arying business cultures may make collaboration a challenge. Creating a basic foundation for effective collaboration and establishing a process to support collaborative efforts overcomes these barriers.

Source: http://www.gsa.gov/portal/content/114395

Benefit: Multidisciplinary Cooperation

- De elop effecti e solutions
- Leverage resources
- Engineering, enforcement, education, and EMS
- Ability to influence strategic priorities

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The third benefit of developing a local road safety plan is the need for multidisciplinary cooperation. Agencies are able to develop more effective solutions and leverage resources by considering and coordinating engineering, enforcement, education, and emergency service strategies. These 4 E's of safety have typically been used either as measures to correct existing road safety issues or as crash prevention strategies. Reducing highway fatalities and serious injuries is contingent upon a multiagency collaborative effort., and the benefits of participation include the ability to influence strategic priorities and resource allocation.

Source: https://pixabay.com/es/conectar-conexi%C3%B3n-cooperaci%C3%B3n-manos-20333/

Benefit: Safer Roadways

- Comprehensive approach
- More safety awareness
- Partner "experience" factor

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The fourth benefit is the design of safer roads for the future. An LRSP facilitates a comprehensive approach to addressing road safety that can lead to the design and implementation of specific projects that reduce severe crashes. By creating their own plans, agencies became more aware of safety issues, create an experience through the LRSP process, benefit from more training and technical assistance when it is provided, develop a clear vision and mission, and allocate appropriate resources.

Source: https://pixabay.com/es/se%C3%B1al-de-tr%C3%A1fico-road-trip-1210038/

Benefit: Safety Funding

- Justify funding requests
- Linkage to SHSP

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The fifth benefit is funding. An LRSP with a prioritized list of improvements can help agencies justify funding requests by documenting specific needs, particularly if they are consistent with emphasis areas and strategies identified in the state's SHSP. An LRSP also shows that an agency has done its due diligence and can help an agency compete more effectively for limited funds.

Source: https://pixabay.com/es/dollar-moneda-finanzas-660223/

Benefit: Managlng Llability

- Proacti e approach
- Demonstrates agency responsiveness
- Reduce crash potential and improve overall safety performance

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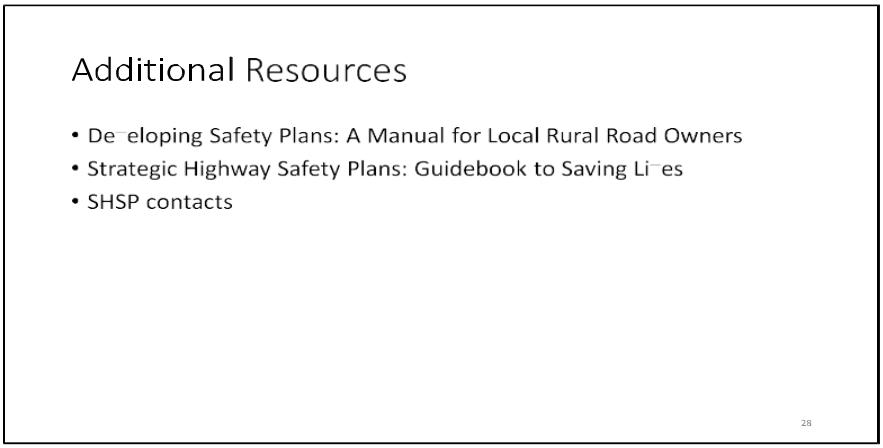
The sixth benefit of developing a local road safety plan is managing liability. An LRSP is one of several risk management techniques that demonstrate an agency's responsiveness to the safety needs of the public. Implementing LRSP to reduce crash potential and improve overall safety performance is considered a proactive approach to safety that should be used in defense of agency liability.

Source: https://pixabay.com/static/uploads/photo/2015/11/03/08/53/environment-1019749_960_720.jpg

The success of an LRSP is dependent of five critical components. If one of these components is not initially available, the plan should still move forward, as other components may be added or expanded as the plan is refined. Practitioners who are interested in developing and implementing an LRSP should also be fully aware of the other strategic goals within their organization and how the proposed LRSP will complement those goals. The five components include:

- Have a champion. A champion advocates for the LRSP and gathers the political support to assist in its implementation.
- Develop a clear vision and mission. A strategic vision and mission unites all stakeholders with a common goal.
- Assemble collaborative partners. Partners must work together to implement the plan.
- Allocate appropriate resources. Manpower and management are essential for ensuring a plan's success.
- Establish open communication. The LRSP owners should foster open and frequent communication with stakeholders, community partners, and citizens as they develop and implement the plan.



We encourage our audience to learn more about how to implement a local road safety plan in your agency. ¯here are a couple of guidebooks that explain how the LRSP works and the first steps to take. The FHWA also encourages this practice to improve road safety and provides resources related to this subject. Every state is required to create a strategic highway safety plan and more questions can be directed to your state department of transportation staff.

Summary

- Importance of road safety in the State of Idaho
- Identify the challenges that local agencies face to address road safety
- Identify the importance of implementing a Local Road Safety Plan

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Crash fatality and injuries in Idaho have varied over the past decade and different approaches have been taken to address these issues which have allowed a general decreased in the numbers. Using the information collected with our survey, several operational challenges were identified that affects an agency to address road safety. These challenges were the following: the lack the funds to implement safety impro¯ements, the lack of traffic data or the analytical skills necessary to complete crash data analysis requirements, the lack of available staff which forces individuals to multitasking and be inefficiency and the lack of or uneven commitment to training. A valuable tool for improving roadway safety and addressing these challenges is the Local Road Safety Plan or LRSP. The LRSP offers a foundation for consensus and focus and defines key emphasis areas and strategies that impact local rural roads and provides a framework to accomplish safety enhancements at the local level. ¯he LRSP provides a proactive approach, develops partnerships, encourages multidisciplinary cooperation, safer roadways, and opens up opportunities for funding. The success of an LRSP is dependent on five critical components: ha¯ing a champion, developing a clear vision and mission, assembling collaborative partners, allocating appropriate resources, and establishing open communication. The identification of these challenges allows us to search for effective countermeasures used to address them. The tools recommended were identified as effective tools to address road safety.

¯raffic Safety Management and Analysis

Addressing the Challenges and Noteworthy Practices.

This slide deck is the fifth and final presentation in a series of lectures about traffic safety for local agencies. ¯his presentation is tailored specific to transportation practitioner in the state of Idaho but local and regional personnel from other states will also benefit. Some of the major topics that will be discuss include addressing new challenges and noteworthy practices. At the end of the presentation, several example of different methods used by local agencies to successfully address safety challenges ¯ill be shared.

Source: https://pixabay.com/en/checklist-clipboard-questionnaire-1622517/ and https://pixabay.com/en/question-stairs-solution-decision-1713304/

Data Collection

- First step in the transportation safety planning process
- Needed to establish goals, performance measures and identify projects
- Tasks include collecting, storing, and sharing
- Datasets include crash data, roadway characteristics, traffic volumes, driver and passenger information

2

Data collection is one of the first steps in the transportation safety planning process. Data are needed to establish reasonable goals, objectives, performance measures and targets, or identify programs and projects. The data collection process is continually improving, as technology advances and organizational capacity improves, but still needs to be carefully planned and implemented. Although seemingly straightforward, the tasks of collecting, storing, and sharing data across agencies can be challenging due to data standards, business rules, communications protocols, agency missions, legal and privacy concerns, and other factors. It is important for those who have a stake in transportation safety to work together to improve the quality and usage of safety data. There are several datasets that are part of the overall traffic records coordination process including crash data, roadway characteristics, traffic volume, driver and passenger information, vehicles, injury control, citation and adjudication.

Data Collection

- K – fatality
- A – serious injury
- B – non-incapacitating injury
- C – possible injury
- O – no injury

3

One of the most important data fields in the crash report is the injury level of each person involved in the crash. The KABCO system is a standardized way of coding injury severity and uses the following injury codes: K—fatality; A—serious injury; B—non-incapacitating injury; C—possible injury; and O—no injury.

Source: pixabay

Technology Usage

- Roadway Photolog
- Automating The Roadway Inventory
- Global Positioning System
- Traffic Counters

No single technology allows for the collection and maintenance of all the varied data required for safety analysis. Technology implementation and maintenance can be capital-intensive, requiring significant funding and programmatic support. Therefore, the benefits and costs clearly must be evident across all affected agencies. Technologies are constantly evolving, so agencies should seek to employ technologies that allow for flexibility.

The typical method of collecting roadway data until the 1970s was through 'windshield surveys' and manual data collection. These roadway photolog efforts were very time intensive and the resulting information was generally poorly distributed, incomplete, and lacking continuity. Agencies used the resulting film images to determine general surface conditions and locations of signs, signals, driveways, and other roadside items or hazards. The storage and indexing of the film reels was cumbersome and time consuming, and usually limited to one agency office.

As technology evolved, the automation of roadway in entory became more sophisticated. Devices such as differential GPS, accelerometers, laser measurement, inertia detection, and other sensors collecte data such as sign type, location, and distance to the edge of the road; sign nighttime reflectivity; roadside barriers and

other roadside hardware; pavement roughness, rutting, texture, faulting or cracking, reflectivity; road geometry; lane width and shoulder ¯idth; and physical location.

A Global Positioning System or GPS is a satellite-based radio-beacon navigation system developed, owned, and operated by the U.S. Government. Each transportation department's use of GPS is based on its own particular needs; however, there is a common thread among transportation applications. ¯his technology is used to improve public and personnel safety as well as efficiency.

Collecting traffic information using traffic counters is vital to the daily operations of many groups within a DOT, and safety is no exception. Traffic volumes can be used for many purposes in safety analysis. Agencies can use this information to rank roadways and intersections by priority for receiving safety funding. Traffic counters are classified into two basic groups: (1) intrusive and (2) non-intrusive. Intrusive detectors are the most common and are embedded into the road surface or lay exposed on the surface. These include the loop detector, the pneumatic road tubes, bending plates, and piezoelectric sensors. Current methods for automatically collecting pedestrian volumes can be expensive and inaccurate. Non-intrusive detectors usually do not include road surface installation. The use of non-intrusive technologies for traffic detection has become a widespread alternative to con¯entional roadway-based detection methods. Many sensors are new to the market or represent a substantial change from earlier versions of the product. Examples include: passive infrared, active infrared, magnetic passive and active, microwave including doppler, radar, and passive millimeter, ultrasonic including pulse and doppler, and video. Some of these detectors have function issues at intersections and accuracy may be compromised by weather and road conditions as they depend on detected heat, sound, or radio ¯aves. The video image camera detectors offer the capability of collecting additional traffic data beyond standard counts.

Source: https://www.dot.ny.gov/divisions/engineering/technical-services/highway-data-services/photolog-unit

Data Collection

- Automated, semi-automated, and manual systems
- Some roadway data collected manually

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Agencies collect traffic volume data with a combination of automated, semi-automated, and manual systems. The most advanced systems use permanent detectors tied to software that aggregates data for determining hourly and daily traffic counts as well as speeds and vehicle classifications. Agencies still widely use older technology such as temporary installations of road tubes with digital or even pneumatic counters, especially at locations where the counts are collected for a short duration on an annual or even longer-term schedule. Some road—ay data is collected manually. Agencies may perform these efforts using paper-and-pencil forms or using a variety of field data collection devices including software implemented on a personal digital assistant, tablet, handheld data collection device, or a field data collection computer. The software products used in capturing these data, either remotely or by transcribing manual data into a system, share some common features.

With roadway data collection technology comes the opportunity, in comparison to older methods, to collect more data at substantially lower costs, usually in a more timely manner and often with improved precision and accuracy. It is true, howe¯er, that while these methods offer savings over options that would collect the same data manually, the choice facing most departments is not between two alternative methods of obtaining the data but rather whether or not to collect the data at all. It is

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usually much easier to document the cost of data than it is to prove its benefit. The FHWA Office of Safety conducted a study to develop guidance on methodologies that State and local DOTs could implement to make the case for investing in data collection, data systems and processes. A Guidebook was developed to assist States in justifying the decision to invest in additional data collection efforts related to safety. If a State is uncertain of the value of data collection, or if a State is having difficulty justifying the allocation of resources to data collection projects, the Guidebook provides instruction in how States may assess the potential impact of investment in safety data improvement.

http://safety.fhwa.dot.gov/rsdp/downloads/guidebook.pdf.

State Strategy

- State DOTs uses a variety of strategies to mitigate the issues local agencies face

State DOTs use a variety of strategies to mitigate the issues local agencies face during the data collection and analysis process. These strategies include: Developing software or web-based tools to give local agencies the capability to access and analyze crash data, provide GIS coverage on local roads; and developing annual summary crash reports for local agencies. Beyond providing improved traffic records database systems, agencies provide crash data analysis training or technical assistance. Once local agencies have a means to collect and analyze crash data they are able to identify the projects most needed to improve safety.

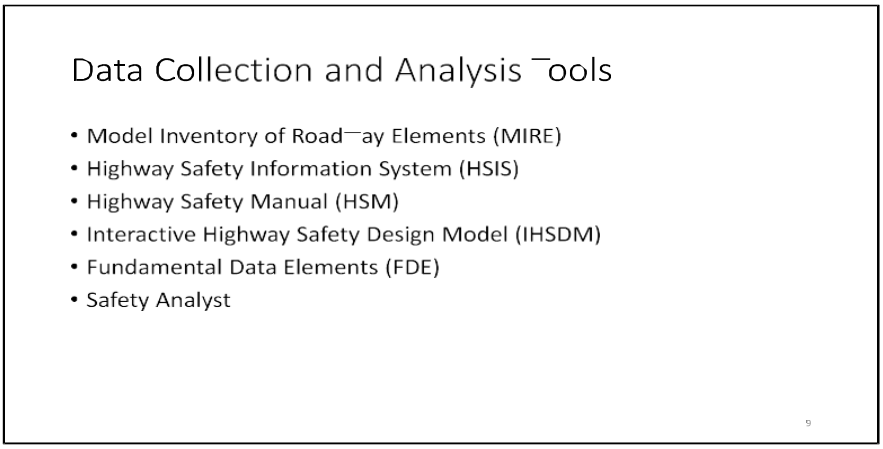
The biggest barrier to integrating quantitative safety analysis into the planning process is staff time and expertise. While this can be a significant barrier, agencies can begin to address safety with a minimal level of effort. First and foremost, planners should coordinate with data managers in their state to learn about data availability, analyses already complete, or options for analytical support. Another way to o¨ercome these barriers is to start with the basics. Many of the analyses using descriptive statistics can be conducted using common spreadsheet tools. Summarizing the who, what, when, where, and why of crashes will provide an excellent starting point to understanding safety conditions in the community. This information can also serve as talking points to elected officials and local partners and raise the importance of safety in the community.

Table Source: Applying Safety Data and Analysis to Performance Based Transportation Planning

Data Analysis: FHWA

- FHWA provides and supports a wide range of data and safety analysis tools

FHWA provides and supports a wide range of data and safety analysis tools for state and local practitioners. ¯hese tools have been designed to assist practitioners in understanding safety problems on their roadways, link crashes to their roadway environments, and select and apply appropriate countermeasures. The capabilities of these tools range from simple to complex. Some tools provide general information, ¯hile others allo¯ complex analysis of crashes under specific conditions or with specific roadway features. Let's discuss some of the data collection and analysis tools currently available.



Some of the data collection and management tools that are currently available include the Model Inventory of Roadway Elements which was discussed in the previous presentation and the Highway Safety Information System. The HSIS is a multi-state database that contains crash, roadway inventory, and traffic volume data for a select group of states. The participating states were selected based on the quality of their roadway, traffic and crash data a¯ailable and their ability to merge data from these ¯arious files. The HSIS is used to analyze a large number of safety problems, ranging from basic "problem identification" issues to modeling efforts that attempt to predict future accidents from roadway characteristics and traffic factors.

Some of the safety data analysis tools that are currently available are the Highway Safety Manual (HSM), Interactive Highway Safety Design Model (IHSDM), and Safety Analyst. These three tools were previously discussed. The Fundamental Data Elements tool is guidance that is identified within a subset of MIRE. The guidance recommends that states should collect the FDEs on all public roads as soon as practicable in order to benefit from improved analyses as soon as possible. When integrated with crash data, FDE enables States to conduct a sufficient safety analysis to identify safety problems and make more effective investment decisions.

Pedestrian and Bicycle Safety Tools

- Pedestrian and Bicycle Crash Analysis Tool (PBCAT)
- Pedestrian Safety Guide and Countermeasure Selection System (PEDSAFE)
- Bicycle Countermeasure Selection System (BIKESAFE)

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NHTSA conducted the National Survey of Bicyclist and Pedestrian Attitudes and Behaviors in 2002 and again in 2012 to understand attitudes and self-reported behavior of bicyclists and pedestrians. By 2012, there was a 14 percent increase among respondents who said they had walked in the past 30 days, and who had walked more often than they had a year earlier. Bicycle and pedestrian crashes are a problem in many places, as they can occur anywhere that people choose to walk or bike. The majority of pedestrian and bicyclist fatalities occur in urban areas. Improving this data on bicycling and walking rates is essential to understanding the safety problem. There are tools that address pedestrian and bicycle safety such as: the Pedestrian and Bicycle Crash Analysis Tool (PBCAT), a software application designed to assist State and local pedestrian and bicycle coordinators, planners, and engineers address pedestrian and bicyclist crash problems, the Pedestrian Safety Guide and Countermeasure Selection System (PEDSAFE), which provides practitioners with the latest information available for improving the safety and mobility of those ―ho walk, and the Bicycle Countermeasure Selection System (BIKESAFE), ―hich provides practitioners with the latest information a―ailable for improving the safety and mobility of those who bicycle.

Source: https://pixabay.com/es/bicicleta-de-carreras-corredor-161449/

Additional Data Analysis Tools

- Intersection/Interchange Safety Analysis Tools (ISAT)
- Surrogate Safety Assessment Module (SSAM)

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Other safety analysis tools are not quite as common. The Interchange Safety Analysis Tool (ISAT) provides design and safety engineers with an automated tool for assessing the safety effects of basic geometric design at typical existing interchanges and the adjacent roadway network. ISAT is intended for performing safety assessments of freeway-arterial and freeway-freeway interchanges. ISAT also provides the capability to perform safety assessments of adjoining mainline freeway segments, crossroad ramp terminals and intersections, and arterial crossroad roadway segments.
Another tool is the Surrogate Safety Assessment Module (SSAM). The safety of intersections, interchanges, and other traffic facilities can be assessed by tracking and analyzing police-reported motor vehicle crashes over time. Given the infrequent and random nature of crashes, this process is slow to reveal the need for remediation of either the roadway design or the flow-control strategy. The SSAM software application was developed to automate conflict analysis by directly processing vehicle trajectory data.

Source: https://pixabay.com/es/herramientas-llave-mec%C3%A1nico-308438/

Training and Development

- State DOTs, LTAPs, MPOs, and universities provide training for local practitioners
- Promotes sustainable safety programs
- Builds organizational capacity

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State DOTs, LTAPs, MPOs, universities, and professional organizations provide training for local practitioners and decision-makers. Staff training and development promotes sustainable safety programs in local agencies. Training and development programs give practitioners the skills to conduct safety studies, identify projects and countermeasures, develop, and evaluate projects, and apply for federal aid. Many DOTs and LTAPs have found success with training local practitioners by providing them —ith the tools to improve road safety.
Training and retraining have become essential components of an organization's human resource activities. Technology change and innovation are requiring continuous or lifelong learning to acquire and retain skills at an appropriate level. Formal training of new employees has been found to decrease time to competency significantly, as well as to reduce operational problems.

Source:
https://w—w.fhwa.dot.gov/environment/climate_change/adaptation/publications/bcrt_brochure.cfm

Road Safety Audits

- Formal safety performance examination conducted by independent audit team
- Improved understanding of crash cause and countermeasures
- FHWA provides a set of guidelines used for RSAs

Road Safety Audits*

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As we discovered from our survey, many Idaho cities receive technical assistance from highway districts and counties. Technical assistance involves conducting an activity on behalf of a local agency. DOTs can provide Road Safety Audit (RSA) programs to help local agencies identify projects. A Road Safety Audit (RSA) is a formal safety performance examination of an existing or future road or intersection by an independent audit team. The RSA team considers the safety of all road users, qualitatively estimates and reports on road safety issues and opportunities for safety improvement. FHWA's current efforts reflect its support for new tools such as Road Safety Audits (RSAs), which serve to bring an improved understanding of crash cause and countermeasures. RSA teams often identify safety concerns that would not otherwise have been discovered by a traditional safety review. These safety improvements resulting from RSAs can be achieved at a relatively low cost and with minimal project delay. FHWA provides a set of guidelines that can be used for a Road Safety Audits. The primary purpose of the guideline is to provide a foundation for public agencies to draw upon when developing their own Road Safety Audit (RSA) policies and procedures and when conducting RSAs within their jurisdiction. The availability of a consistent guideline is anticipated to lead to a better understanding of the core concepts of RSAs and to promote their use.

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Project PrioritIzation

- Benefit/Cost Analysis
- Compares all of the benefits associated with a countermeasure

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Let's continue by addressing the challenge of project prioritization. There are different methods to prioritize a project, and the most common is the benefit/cost analysis. A benefit/cost analysis compares all of the benefits associated with a countermeasure, typically expressed in monetary terms, to the cost of implementing the countermeasure. A benefit/cost analysis provides a quantitative measure to help safety professionals prioritize countermeasures or projects and optimize the return on investment.

Some safety countermeasures have a higher-cost value than others. Geometric improvements to the road, such as straightening a tight curve to reduce run-off-road crashes, tend to be very expensive. Installing a "curve warning" sign and in-curve delineation addresses the same problem, but at a much lower cost. Although both countermeasures address the same problem, the actual safety benefit will not be the same. Straightening the curve would be expected to provide a greater benefit compared to installing the sign and delineation, since it is removing the potential hazard. While the sign provides the driver with ad¯anced ¯arning of the curve and delineation can help the driver recognize and negotiate through the curve, it is still up to the driver to reduce speed. Safety professionals take the relative costs and benefits into consideration when prioritizing among countermeasures.

Part of calculating the cost of a countermeasure is considering how these costs will vary over time, including any maintenance costs, as ⁻ell as the relative resilience or "lasting power" of the countermeasure. One countermeasure may be just as effective as another in the short term but less cost-effective over a longer time period. Safety countermeasures have many direct safety benefits, including reductions in injuries, fatalities, and damage to personal property.

Countermeasure Evaluation Methods

- Net Present Value
- Benefit / Cost Ratio
- Cost-Effectiveness

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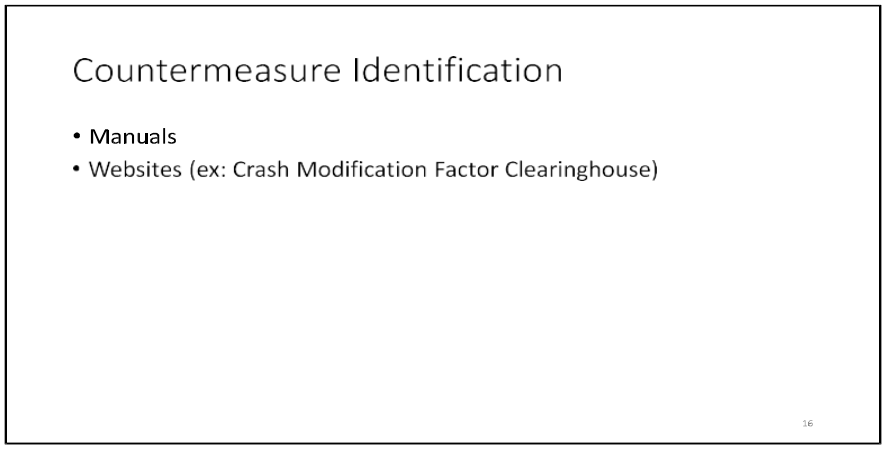
Economic evaluations should be conducted on alternative countermeasures to verify that a project is economically justified. The net present value and benefit/cost ratio are two methods for evaluating the economic effectiveness and feasibility of safety improvement projects at a particular site. A cost-effectiveness index can be used when it is not possible to express the benefits in monetary terms. The net present value (NPV) method, or net present worth (NPW) method, expresses the difference between the discounted costs and discounted benefits of a safety improvement project. The costs and benefits are "discounted" meaning they have been converted to a present value using a discount rate. The benefit/cost ratio is the ratio of the present value of the benefits of a project to the present value of costs of the project. In situations where it is not possible or practical to monetize countermeasure benefits, a "cost-effectiveness" metric can be used in lieu of the net present value or benefit/cost ratio. Cost-effectiveness is simply the amount of money invested divided by the benefit in crash reduction. It is expressed in terms of the crash cost that was avoided because of a certain countermeasure.



There are many resources that discuss the use of countermeasures and how, when and where to use them. Many of them are constantly updating these countermeasures provide the best possible solutions. The countermeasure identification process needs previous data collection and analysis so that the traffic or city engineer can determine which measure or measures to implement. Most of the countermeasure identification is based on experience and if a certain projects countermeasure had worked before in other roads improvement projects. What is important about countermeasure identification is finding the most effective and efficient solution to the road issue with the least cost. There is no countermeasure that solves every issue but it is important to identify the strengths and the weaknesses of every measure.

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Noteworthy Practice: Data Collection

- Washington State DOT (WSDOT) resolve data inconsistencies by collecting latitude and longitude coordinate data.
- Iowa DOT implemented a program to collect roadway features, structures, and crash data

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To promote consistency and timeliness of reporting, several DOTs and local agencies have streamlined their data reporting by developing or using mobile applications for phones, tablets, or computers that allow officers to record field data electronically which reduces the time burden of data collection and improves data consistency.

Washington State DOT (WSDOT) is working to resolve crash data inconsistencies on local roads by collecting latitude and longitude coordinate data, which eliminates data challenges caused by nonstandard naming conventions. WSDOT manages all data collection and reporting through its MOBILITY database that imports crash data, traffic volumes, functional classification, and other roadway attributes.

Iowa DOT implemented a program to collect roadway features, structures, and crash data on all public roads. Data collected included roadway features such as horizontal/vertical curves, intersection data, pavement conditions, traffic control devices, drainage structures, and right-of-way limits on state and local roads, and large structures (bridges). Crash data for all local roads is available to the public and local agencies.

Source:

Noteworthy Practice: Data Collection

- Alabama AHTD developed eCrash electronic crash form to improve the accessibility and ease of use for crash reporting on local roads
- Colorado DOT worked with Statewide Traffic Records Advisory Committee to streamline data collection and reporting processes

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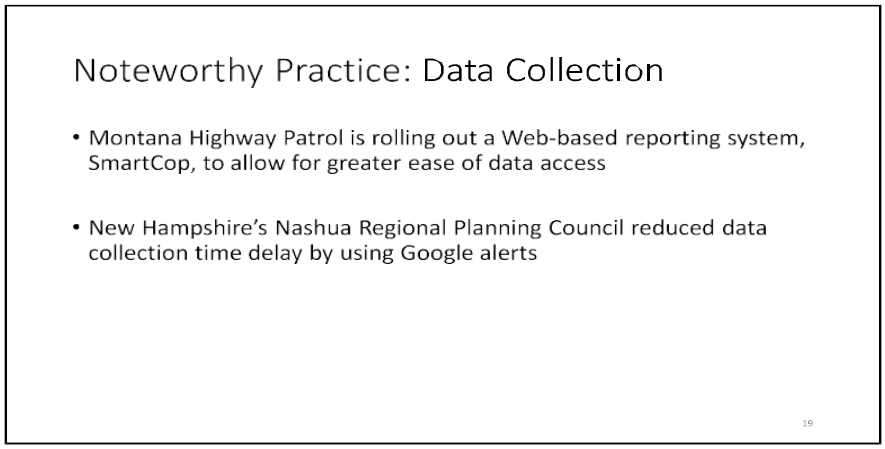
The Alabama State Highway and Transportation Department (AHTD) developed an agreement with the University of Alabama's Center for Advanced Public Safety (CAPS) to implement the eCrash electronic crash form to improve accessibility and ease of use for crash reporting on local roads. The project converted the location of all crashes on local roads from the link/node location format to latitude and longitude coordinates. This change permitted the introduction of a mapping platform within the investigating officer's vehicle that works in unison with the eCrash platform (http://care.cs.ua.edu/eCrash.aspx).

Colorado DOT (CDOT) worked with their Statewide Traffic Records Advisory Committee to identify strategies such as creating an online reporting or data exchange tool to streamline the data collection processes and make data more accessible. In the past several years, CDOT has improved crash data availability lags from four years to four months. CDOT has an effort underway to geolocate crashes on all public roads going back five years.



In Montana, crash reports on the State system are filed electronically, but local agencies submit paper copies. The Montana Highway Patrol is rolling out a Web-based reporting system, called SmartCop, to allow for greater ease of data access. The State will require that the eight largest cities and seven tribes use this new crash reporting system for consistency and access.

New Hampshire's Nashua Regional Planning Council has taken steps to reduce the time delay for crash data collection using Google alerts to manually input crash information into their databases: Google alerts allow you to receive email notifications any time Google finds new results on a topic that interests you. This process allows the agency to use news stories on fatal or serious crashes to identify crashes in an area and follow up with local agencies for additional information.

Noteworthy Practice: Data Access

- Wisconsin DOT (WisDOT) operates the WisTransPortal System
- Iowa DOT has a suite of crash data analysis tools available for cities and counties

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Crash data collected by state and local law enforcement agencies are typically submitted to a statewide crash database maintained by the State DOT or another agency designated as the data repository. Agency partners and stakeholders may be allowed varying degrees of access to the data based on State legislation and agency policies and procedures. In states where all crash data are housed in a statewide agency database, local agencies may have to submit official requests to access specific records for their purposes. To address the time and labor involved in selective requests, more state agencies now provide Web-based access to state crash databases.

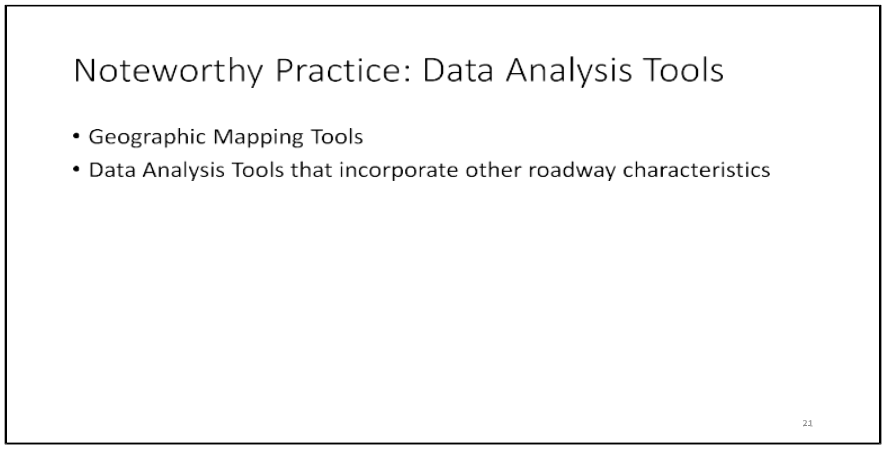
Wisconsin DOT (WisDOT) operates the WisTransPortal System, providing a complete database of reported Wisconsin traffic crash data from 1994 to the current year. WisDOT maintains the database, allowing crash data access to the database to local agencies and the general public, and access to crash reports for government agencies and consultants ―orking on WisDOT projects through online inquiries.

Iowa DOT has a suite of crash data analysis tools available for cities and counties. The Crash Mapping Analysis Tool (CMAT) is an easy to use crash data software package that includes crash maps, summary reports, and details for individual crashes. The

Safety Analysis, Visualization, and Exploration Resource (SAVER) is a fully functional geographic information system (GIS) crash data resource that includes crash maps, collision diagrams, summary reports, and individual crash details.

Plan4Safety is a decision-support tool created for the New Jersey DOT (NJDOT) and is a multilayered decision-support program for transportation engineers, planners, enforcement, and decision-makers in New Jersey's transportation and safety agencies to analyze crash data in geospatial and tabular forms. Plan4Safety integrates statewide crash data and roadway characteristic data, calculates statistical analyses, incorporates network screening layers and models, and includes visual analytical tools (GIS).

Sources: https://rspcb.safety.fhwa.dot.gov/noteworthy/html/intersection1.aspx



State DOTs use a variety of strategies to leverage their data to analyze safety trends and identify potential locations for improvement. The programs, tools, and analysis methods used to support local road safety are similar to the efforts for all public roads; however, many of these tools have been available for use on State-maintained roadways for many years. States have made access to and tools for local road safety data analysis available in more recent years. Common strategies used include software data tools, Web-based tools, GIS or geographic mapping tools, and training.

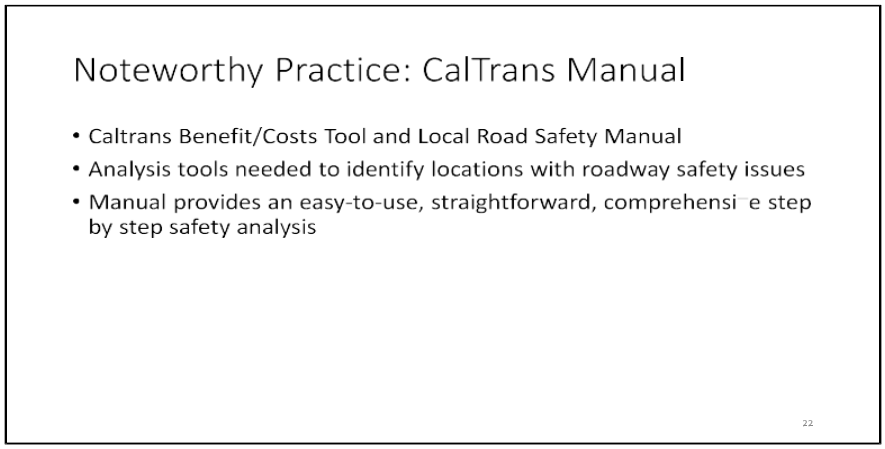
As a result of the University of California's Transportation Injury Mapping System (TIMS) web tool, California has seen increased accuracy of average HSIP benefit/cost ratios, increased HSIP funding for bicycle and pedestrian projects, and increased HSIP funding for projects. This geographic mapping tool has several Web-based tools, including a California Statewide Integrated Traffic Records System (SWITRS) query and map, a SWITRS GIS map, an SHSP data viewer, a Safe Routes to School Collision map viewer, Fatality Analysis Reporting System (FARS) visualizations, a Benefit/Cost calculator, and a Motorcycle Collision Map vie—er.

Michigan DOT (MDOT) developed a Web-based data analysis tool called RoadSoft, an asset management system for collecting, storing, and analyzing transportation data,

particularly for crash data. RoadSoft has expanded its capabilities to include a wide range of data, including bridges, intersections, pavement markings, signs, and traffic counts. RoadSoft is available to localities at no cost, and more than 400 road agencies and consultants use RoadSoft.

WSDOT manages its data collection and reporting for the state through the MOBILITY database that imports crash data, traffic volumes, functional classification, and other roadway attributes.

The Rutgers Transportation Safety Resource Center uses a Web-based-only crash data tool that gives users the ability to filter by roadway elements. The Plan4Safety Tool is tied to the New Jersey DOT road inventory database; and within the tool, some of the MPOs have provided mobile applications. For instance, the South Jersey Transportation Planning Organization (SJTPO), developed the "Mapper Mobile," a mobile application that allows users to map crash locations.



The Caltrans Benefit/Costs Tool and Local Road Safety Manual offer local agencies a framework of the steps and analysis tools needed to identify locations with roadway safety issues. The Caltrans Division of Local Assistance sets criteria for HSIP project applications, reviews applications for accuracy, and selects projects. The division does not identify the projects for the local jurisdictions or administer the projects once selected, but provides guidance, tools, and training so the local jurisdictions are empo—ered to make informed decisions on effective safety improvements. To improve Caltrans's overall data-driven approach to statewide safety project selection and to maximize the long-term safety improvements across California, DLA developed Local Roadway Safety: A Manual for California's Local Road Owners. The manual provides an easy-to-use, straightforward, comprehensive framework of the steps and analysis tools local jurisdictions would need to proactively identify locations with roadway safety issues and the appropriate countermeasures. The manual is not intended to be a comprehensive guide for roadway design or the only guide local agencies utilize for safety analysis. The intended audience is both novice and experienced practitioners hoping to position their local agencies to better compete in future Caltrans calls-for-safety projects. The local agencies need to understand the safety program application process, the project identification and analysis steps, and the evaluation criteria Caltrans uses to rank and prioritize projects. DLA works in

coordination with FHWA to deliver webinars to the locals on the project application process, proven countermeasures, the latest research and trends, Federal initiatives, and local case studies.

Noteworthy Practice: Ohio GCAT

- Ohio's Crash Data Analysis Tools
- Developed a crash-mapping tool
- Crash data for all local roadways is available

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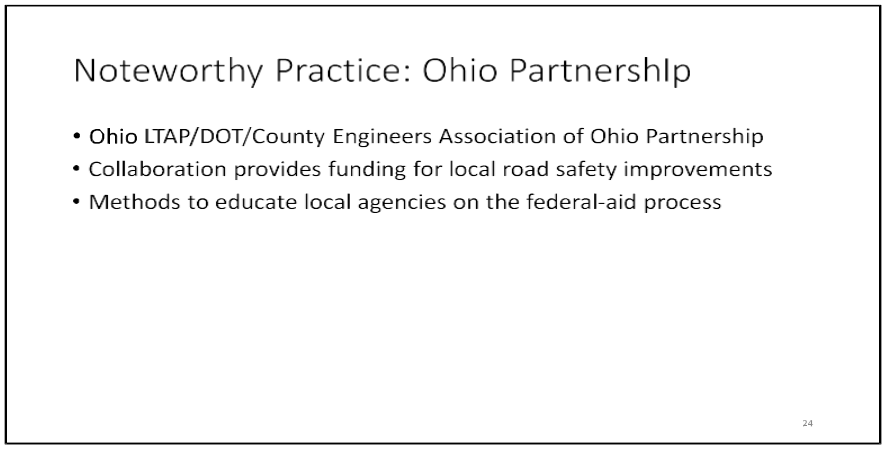
Local roadway agencies must have a method in place to obtain the necessary data to justify funding requests for road safety improvement projects. The Ohio Department of Transportation (ODOT) developed a crash-mapping tool called GCAT (GIS Crash Analysis Tool), which is used to map crashes occurring on the State's roadways. GCAT uses Geographic Information Systems (GIS) to produce spatially located (latitude/longitude) data. Crash data for all local roadways available.
The tool is a web application and can be accessed from any computer on-line through the ODOT web site. Access to GCAT is free and easy to obtain for employees of any city, county, village, township, metropolitan planning organization, law enforcement agency, and prequalified safety study consultants.



We discussed the importance of partnerships earlier. One such example is the Ohio Local Road Safety Program, a three-part collaboration among the Ohio DOT, Ohio LTAP center, and County Engineers Association of Ohio (CEAO). The collaboration provides funding for local road safety improvements, offers training and technical assistance to local agencies, and assists with the administration of local safety projects. ODOT funds a position at CEAO to administer the county safety projects and provide technical assistance to counties as they develop and implement local safety projects. Once projects are approved for safety funding, they are administered by ODOT through the district offices or by local governments through the Office of Local Programs. Local agencies are eligible to apply for HSIP funds through the statewide program managed by ODOT. Multidisciplinary committees review applications each year and award funds based on scored criteria and other factors, such as cost, compatibility between countermeasures and crash patterns, and relevance to the SHSP. Ohio LTAP has developed educational, outreach, and RSA programs designed to build safety knowledge at the local le¨el. Participation in RSA programs and training has increased now that an incentive is tied to local agency RSA participation. Ohio LTAP has used a variety of methods to educate local agencies on the Federal-aid process. LTAP is developing a series of on-line training modules based on the Locally Administered Transportation Projects (LATP) manual in order to certify local

Conclusions

- Data are needed to establish reasonable goals, objectives, performance measures and targets
- Agencies can collect data using automated, semi-automated, and manual systems
- Start small to overcome data analysis barriers

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Data are needed to establish reasonable goals, objectives, performance measures and targets, or to identify programs and projects. Fortunately, the data collection process is continually improving, as technology advances and organizational capacity improves. Summarizing the who, what, when, where, and why of crashes will provide an excellent starting point to understanding safety conditions in the community. Many tools have been designed to assist practitioners in understanding safety problems on their roadways, link crashes to their roadway environments, and select and apply appropriate countermeasures.