North Carolina Speed Management Recommendations for Action

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Need for Action

Nearly 5,000 people lost their lives in speeding-related crashes in North Carolina over the past 10 years. Nearly twice as many individuals suffered disabling injuries. Among those killed were 131 children younger than age 14, 85 teens aged 14 to 15, and 974 young people aged 16 to 20.

While crashes, fatalities, and injuries have fallen in North Carolina, as throughout the U.S., over the past decade (Figure 1), more can be done to reduce the risk of serious harm resulting from inappropriate speed. Although these declines are good news, and North Carolina is to be commended on this progress, all of the reasons for these declines are not entirely clear. Engineering safety improvements, graduated driver licensing for young drivers, continuing safety improvements in vehicles, and other policy changes have all contributed. At the same time, some of the decrease in the most recent years is attributable to less driving or changes in the type of driving due to the economic downtown, job losses, and higher fuel prices. In the latter case, the trends may turn upward again as the economy revives, which, in fact, has already been observed in 2011 and in early statistics for 2012.

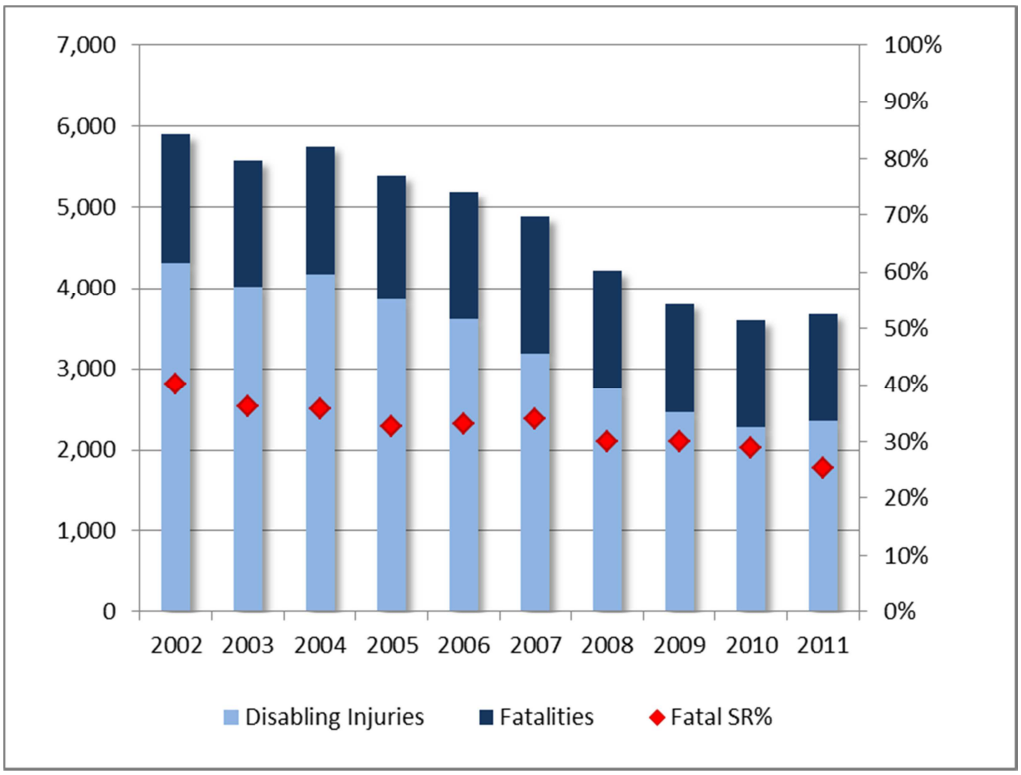

Figure 1. North Carolina 10-year trends in total fatal and disabling type injuries. The red markers indicate the percentage of fatal injuries with speeding as a contributing factor.

After being among the safest countries during the late 1960s and up to the mid-1970s, the U.S. has made less road safety progress in more recent decades than many other developed countries. The U.S. has higher fatality rates per VMT and especially per population than a number of other nations.[1] Within the U.S., North Carolina has ranked 30th safest (per VMT) or lower among the 50 States over each of the most recent five years. Only three States (California, Texas, and Florida) had more total traffic fatalities than North Carolina in 2009.

Speeding remains one of the top driver-contributing factors to fatalities and serious injuries in North Carolina and has been cited as a factor in more traffic fatalities than illegal alcohol use and lack of belt use (Figure 2). Yet, over the past several decades there has also been a relative lack of attention, funding, and progress nationally in addressing speeding compared with restraint use, and, until recent years, compared with progress in reducing drunk-driving-related fatalities (Figure 3).

Speeding includes exceeding speed limits and exceeding a safe speed for conditions. Exceeding limits is cited most often in fatal crashes (about 26% of fatal crashes). A majority, 85%, of a representative sample of North Carolina drivers, admitted to at least occasional speeding by more than 5 mph when driving on *low-speed* (30 mph) roads (Figure 4). Twenty-two percent admitted they speed more than 5 mph over the limit *most* of the time in low-speed zones. These numbers, and the proportions admitting to speeding on high speed roads, increased in 2011. Yet, a majority (55%) of the surveyed drivers did not recall having read, seen or heard specific messages or safety information related to speed enforcement programs.[2]

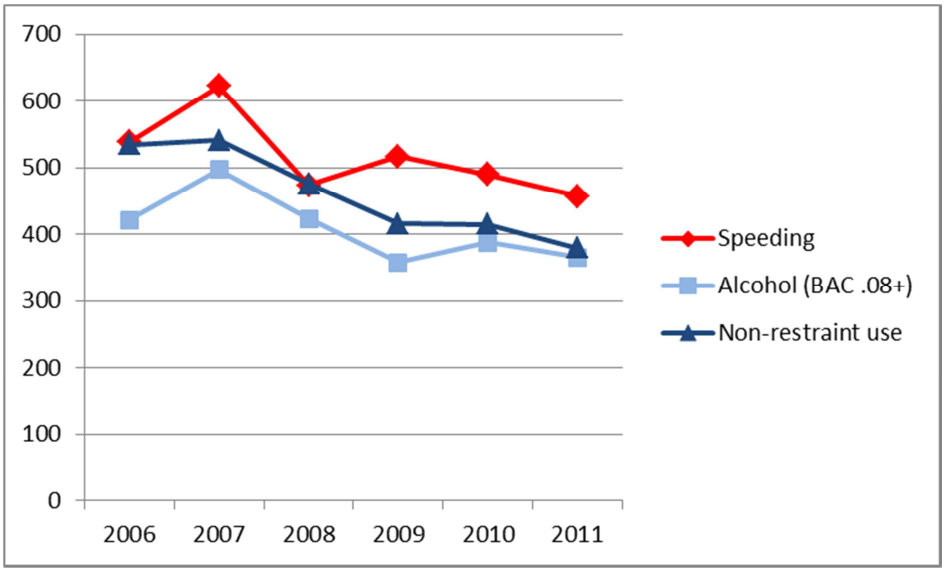

Figure 2. Six-year trend in North Carolina fatalities involving speeding, alcohol, and non-restraint use (data from FARS).

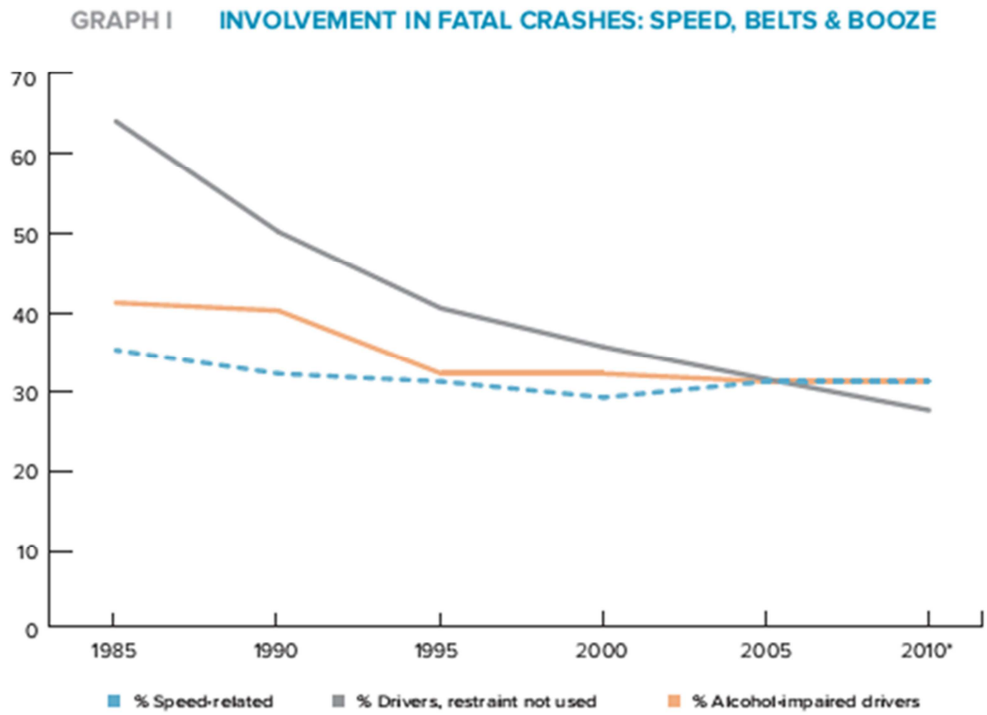

Figure 3. Trends in percentages of speeding-related, alcohol-related, and restraint-not-used fatalities from 1985 to 2010 (U.S. trends), From Governor's Highway Safety Association, Survey of the States: Speeding and Aggressive Driving, 2012).

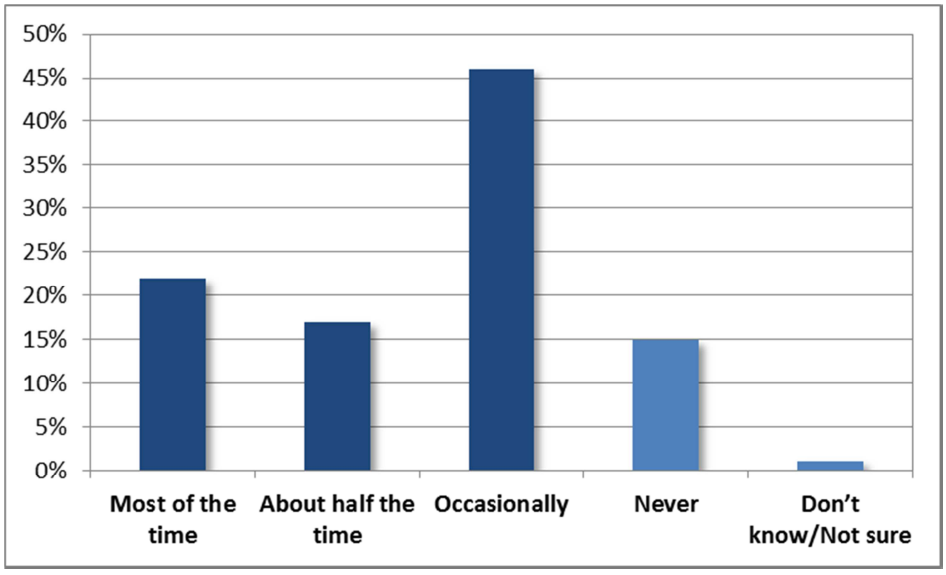

Figure 4. Frequency of speeding at least 5 mph over the limit in 30 mph zones as reported by North Carolina survey respondents in a statewide representative survey (NHTSA-GHSA, 2011).

Speeding-related crashes involve all ages of drivers, with 30% of speeding drivers in crashes being 25 or younger and 70% being older than 25. Young driver risks associated with inexperience, type, and location of driving (exposure), as well as risk-taking tendencies all may explain some of the risk among young drivers. However, given that 70% of crashes involve drivers 25 and older, it is clear that risks of inappropriate speed do not disappear with increasing age and experience.

Exceeding a safe speed for conditions is cited as a factor more frequently than exceeding limits among all ages of drivers. Unexpected conditions such as curves, adverse weather, and nighttime are associated with higher percentages of speeding-related crashes and fatalities, suggesting that drivers often fail to slow sufficiently in order to maintain control or avoid a crash when conditions warrant.

Speeding and speeding-related crashes, injuries, and fatalities are also a problem on all types of roads in both urban and rural locations. Large percentages of speeding related fatalities (80%) and total fatalities (73%) occur on rural roads where crashes are more than three times as likely to be indicated as speeding-related than they are in urban areas. However, rural secondary roads also comprise the vast amount of roadway miles in the State, making treatment targeting a challenge. A map of the fatal crashes in one small area of a single County over a five-year period illustrates the problem and the challenge of targeting widely dispersed serious and speeding-related crashes (Figure 5).

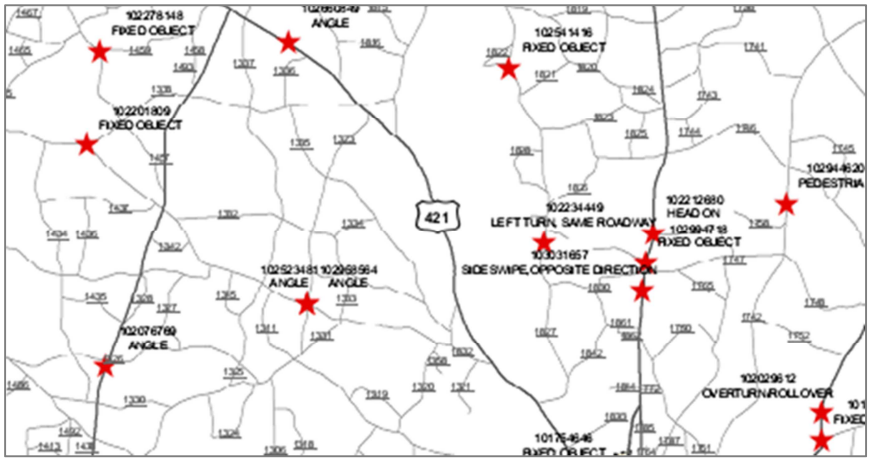

Figure 5. Map of fatal crashes for 2006-2010 in a small area of one North Carolina County.

Some crash types that are often speeding-related, such as road or lane departures, are also highly associated with driving too fast for conditions or exceeding limits. Some of these crash types are already being systematically addressed through implementation of North Carolina's Roadway Departure Safety Plan. But, specific engineering treatments can only target the most problematic sections, and often only roads that also have higher traffic volumes. As mentioned, fatal and speeding-related crashes are dispersed widely over the network, including on many

lower-volume roads, and may occur at any time and place. A speed management program can complement and enhance other safety efforts, and help to address a key contributing factor to fatal and serious injury crashes of all types that may occur anywhere on the network.

In addition to rural speeding crashes, one fourth of all fatalities and about 46% of pedestrian fatalities occur within municipalities where surface street speeds should be low enough to accommodate all modes of travel with a reasonable expectation of safety. Residential and developing, but unincorporated, areas may also account for some of the crashes indicated as "rural." These areas may lack adequate transitions to lower speed zones, putting a mix of users at higher risk in communities. Developed and urban areas also frequently lack adequate infrastructure to separate different weight and speed of users. Pedestrians and bicyclists inherently travel at lower speeds (in most situations) than motorized traffic, need adequate provisions for crossing roads, particularly those with higher speed traffic, and have little protection in the event of a crash. The risk of a pedestrian being killed when struck rises rapidly with higher impact speeds (Figure 6).[3, 4]

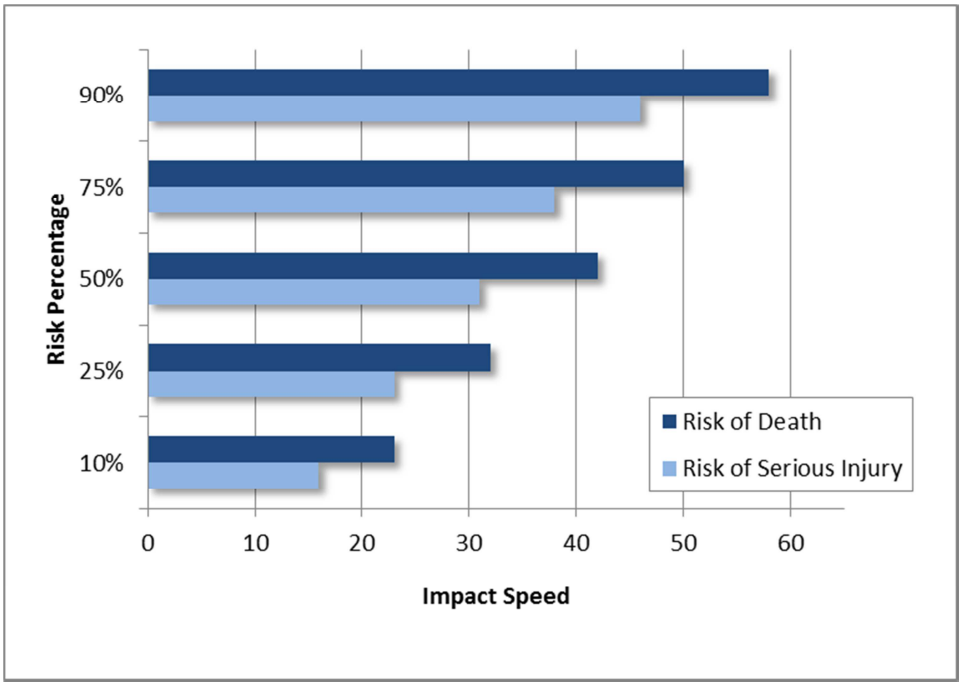

Figure 6. Risk of Serious Pedestrian Injury or Fatality for Different Impact Speeds (results from Tefft, 2011).

Finally, crash numbers do not tell the full story. Determination of speeding involvement is based on an officer's judgment after the crash, not based on scientific investigations. There are no systematic measurements of speeds on our roadways, and little information about the contribution that low-level speeding makes to injuries and fatalities in the State and in cities and towns across the State. It is clear that small changes in mean speeds can have a significant impact on the level of injuries and fatalities.[5]

In summary, the nature of the speeding problems in North Carolina includes the following:

- Speeding-related crashes are more severe, resulting in more fatalities and injuries when a crash occurs.
- A majority of all ages and types of North Carolina drivers admit to speeding, with an even larger proportion admitting to speeding in lower-speed areas.
- Treatment targets are often diffuse.
- There are many miles of roadway; only a small percentage can be treated each year.
- Environments, road designs, and speed limits are often not in close synchrony with each other, sending mixed messages to drivers about safe speeds.
- Enforcement tolerances are generally quite high, even in urban, low-speed areas, sending a message to drivers that speed limits are not maximum safe speeds.
- Enforcement resources are stretched; some communities do not put a priority on speed enforcement.
- Monies from enforcement are not allowed to cover the costs of enforcement or be returned to other safety programs.
- Use of automated enforcement has been restricted because of legal challenges and other barriers.
- There has been minimal use of publicity to supplement enforcement and increase deterrence of speeding.
- The criminal adjudication system is costly and appears broken with respect to convicting speeders as charged, and treating offenders consistently. Practices also vary across jurisdictions. Deterrence effects of court-administered sanctions also appear questionable.
- Planning, design, engineering, enforcement, and public information and educational efforts have not been well-coordinated. [6]

The problems are multifaceted and complex and so are the solutions. Cultural and political acceptance of speeding is also widespread. Effective interventions include changes in policies, laws, planning, road design, vehicles and technologies, enforcement, and public communications. In general, measures that affect structures (road designs, vehicles, etc.), laws and policies are more effective than those that rely on voluntary changes in human behavior. Most drivers know what they should do most of the time, but knowing, and choosing to do the right thing throughout each and every trip are different matters. In general, it is nearly impossible to change driver behavior by just exhorting drivers to change, and stronger

measures and better implementation of current measures are needed.[7] The goal should be to select the most effective intervention points to interrupt causal chains leading up to speeding-related crashes and injuries.[8, 9] Making the tough decisions to intervene at these points can lead to the desired behavior change and, over time, a change in beliefs about the acceptability of speeding, similar to the changed norms of seat belt use and change in social acceptability of alcohol use and driving.

Cost-effectiveness is an important consideration in safety plan implementation,[5, 19] but there may be some costly measures that have a long lifespan or are an important investment for the State to make going forward. One example is prioritizing speed managing designs in new projects, which may require a higher initial outlay than other designs, but also have a longer effective lifespan and potentially reduce enforcement and maintenance costs. Other examples are to improve measurement and tracking of the problem through speed data collection. Collecting speed data is essential to track program progress and may help to build support for the program. Finally, traditional cost-benefit analyses do not typically include all the future lives that could be saved and injuries prevented with better utilization of existing knowledge, tools and technologies, and the commitment to put these tools to work now.

Some of the countries that have made greater safety progress in recent decades use speeding and injury relationships as a framework to guide policies including speed-limit setting, roadway design decisions, and the use of beneficial technologies to improve the safety performance of the entire system for the people who depend on it.[10] In fact, speed management to reduce the risk of harm is one of the organizing principles for safety in a number of those countries.[11] The "Sustainable Safety" approach in the Netherlands exemplifies the use of speed managing principles. The Netherlands' injury minimization approach to speed limit setting and prioritization of appropriate supporting roadway and enforcement measures is credited with a 9.7% reduction in the number of road fatalities and 4.1% in injury crashes.[11]

Similar reductions in North Carolina's road trauma would save 50 lives and prevent 370 injuries in the first year alone. If the State implements more effective speed management measures, these strategies would improve safety for all types of road users and help to set North Carolina on a path to save many more future lives. Effective speed management strategies may also be expected to help improve the livability of the State's cities and towns, and provide more balanced access to the network for people of all ages who drive, walk, bike, and use transit to meet their mobility needs. Again, the will and the commitment to wisely and effectively implement new laws, policies, and practices and to sustain and improve effective strategies are essential for a successful speed management program.[12]

Key Recommended Strategies for North Carolina Speed Management

The set of recommendations that follow are based on the problems identified in North Carolina through a review with key agencies and stakeholder meetings, and are based on best practices in speed management and the evidence of what works to reduce speeding-related crashes and injuries. A speed symposium and workshop were held in October 2011, and a number of issues and strategies were identified during that workshop. More information on the process, findings and recommendations is available in a final report to NCDOT.[13] A number of the recommendations are management or policy-oriented. These policy strategies provide a necessary foundation for developing a more effective speed-management infrastructure and to enable and encourage the use of effective crash-reducing countermeasures.

The strategies recommended also aim to strengthen a comprehensive and cooperative public health approach to speed management that has achieved improvements in belt use, reductions in young driver-related crashes, and helped advance safety in a number of countries that aim to minimize injury and death from road trauma. A benefit of a comprehensive approach, first championed by William Haddon in the traffic safety field, is that multiple causes for speeding and crashes are acknowledged. Risk factors or causes (driver, roadway, vehicle, and environment) are not studied in isolation, but in a comprehensive way so that the most effective points of intervention may be selected.[14] Successful traffic injury prevention efforts such as safer vehicles and occupant protection, safer road designs, and young driver graduated licensing programs exemplify how strategies that target issues at infrastructure and policy levels are effective at saving individual lives, but do so by changing the environment first. Individual attitudes may change later. Multiple private and public partners also support and implement mutually effective strategies.

Fifteen potential strategies are organized by:

- Management strategies: those that are deemed crucial for establishing a sustainable and credible speed management framework
- Engineering
- Enforcement
- Education and public information
- Information technologies

In addition, six unproven innovative strategies with potential are described. These strategies lack a clear track record of effectiveness, but are promising in terms of preliminary data or fitting speed management principles that aim to create a safe system for road users.

Just as problems and crash causes do not occur in isolation, strategies should be selected as part of a package of strategies, several of which may depend on others, in a comprehensive approach to speed management. To provide further guidance in countermeasure selection, the strategies are also categorized according to whether they are proven measures, tried (and

promising), or experimental. “Tried” or “experimental” strategies that have little chance of working were not included. However, some of the experimental treatments seem very promising and should be considered for a longer-term plan. As always, the quality of implementation affects chances and degree of success. Finally, funding sources and costs will vary for engineering versus enforcement and other measures. Some enforcement strategies could be set up to pay for themselves and potentially other safety programs.

Further discussion and work by stakeholders is needed to assess the feasibility and determine the expected costs and benefits to prioritize strategies to be pursued. A number of these strategies will require extensive stakeholder involvement and coordination as well as commitment for successful implementation.

Management Strategies

The following measures are recommended to establish a Speed Management Framework and provide the basis for risk measurement, performance and progress assessment, communicating about the program and promoting other effective countermeasure strategies.

☐ **Re-establish an on-going speed monitoring program.**

Goals:

- track speeding risk and trends over time
- measure progress of overall program
- adjust targets and program elements
- use data gathered for communicating about the risks

Tried/Proven – Speed monitoring was carried out in the past, prior to repeal of the National Maximum Speed Limit (although for non-safety reasons). Monitoring is currently used for restraint use and driver impairment to track trends and progress for these traffic safety risks. The data and knowledge gained have likely contributed to raising the profile of these other safety issues. Collecting and using speed data can help raise awareness of the risks involved in speeding, increase support for developing and implementing effective measures, for tracking overall program progress, and may have helped to develop a political champion at the highest political level in France. [10] Speed monitoring in France is also used to track road safety progress, make and refine policies, and benchmark performance.[15]

☐ **Frame the speeding safety problem in terms of injury prevention. Develop coordinated internal and external communications about the issue.**

Goal: Increase public and political input and support for effective speed management strategies.

Experimental (for speeding)/ Proven in other traffic safety areas and public health contexts such as tobacco use - For example, framing the young driver crash problem in a public health context and communicating effectively with stakeholders and decision-makers has led to new and effective policy solutions including the Graduated Driver Licensing program. The history of occupant restraint use shows a similar trajectory, with changes in laws and enforcement driving behavior change and changes in beliefs.

Transportation consumers are important stakeholders in speed management, and should be informed about the risks of speeding and engaged in policies and decision-making. [16] However, it is important to communicate about injury in ways that frame the problem as one that can be solved as a society with cost-effective solutions that improve the quality of life for all, as has been done in other health and injury prevention areas. [17]

Engineering Strategies

The following engineering strategies are recommended to develop more proactive, consistent, and safer approaches to speed limit setting and road design, and identification and treatment of existing safety problems.

☐ **Increase standardization of speed limit setting methods across the State using an injury minimization approach to establish appropriate limits.**

Goal: Increase safety, credibility and consistency of established speed limits for different types of roads.

Tried/Proven – Setting safer speed limits to reduce the risk of serious injury is tried and proven as a key component of a safe systems coordinated strategy as used in the Netherlands and other countries. [10,11,] Well-established limits established form the basis for enforcement and engineering strategies and these strategies in turn also support credibility to drivers of speed limits established.[16, 18, 19, 20]

☐ **Prioritize use of design features that limit or manage speeds to the appropriate level.**

Goal – Design improvements so that roads are self-enforcing to the extent feasible to prevent future speeding and speeding-related crashes.

Proven – A number of design and engineering measures, including roundabouts, are proven to significantly reduce fatal and injury crashes and control speeds particularly in lieu of signalized intersections and intersections with stop-control on only the minor approaches.[5,21,22] Other speed managing measures include reductions in the number of travel lanes (road diets), lane narrowing, shifting alignments, and other traffic calming measures to manage speeds in appropriate contexts.[23, 24, 25, 26]

☐ **Implement methods for triggering and prioritizing roads for review of speed limits and conducting safety assessments. (Supporting strategy)**

Goal – Develop effective methods to identify roads that may benefit most from speed limit review, potential speed limit change, roadway improvements, or enhanced enforcement.

Experimental to Proven – Although somewhat experimental with respect to identifying roads warranting speed limit and associated safety and design review, network screening, diagnosis, and prioritization of cost-effective solutions is now state-of the practice with respect to safety treatment and is recommended by The American Association of State Highway and Transportation Officials (AASHTO)/strategic safety program to maximize benefits.[5, 27] The Dutch have developed a roadway data tool to assess the entire network of roadways and determine whether speed limits are set appropriately to start the initial discussion (Figure 7).[28] The Netherlands also uses a cost-benefit approach to prioritize design changes and other countermeasures within the country's Sustainable Safety framework. These measures are credited with a 10% reduction in fatalities.

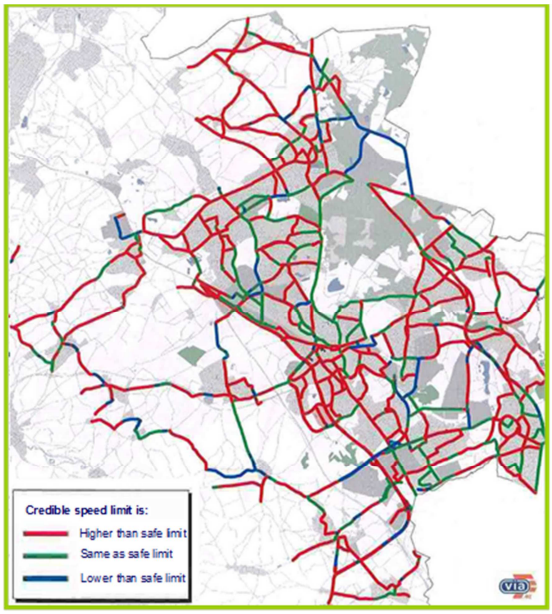

Figure 7. Network and speed limit assessment outcomes in the Netherlands.

☐ **Determine desired operating speed and speed limit before designing new projects and upgrades, and design to support that limit. Conduct a speed and safety review of all new designs and at key stages throughout the implementation process.**

Goal – Ensure new roads are designed in accordance with best practices and in keeping with intended operating speed and limit to reduce the opportunities of future speeding and other speed-related safety problems.

Tried/Proven – Consideration of speed limit and intended operating speed should be a key aspect of planning, design, and safety review. Design inconsistencies violate driver expectation, with drivers often failing to slow sufficiently for the lower design features.[29, 30] Using higher design speeds than the intended speed limit/operating speed may also counteract intended safety benefits by inducing drivers to adopt higher speeds.[30] Such roads also create enforcement challenges. Urban streets and streets that provide access to all users and destinations in particular may warrant low speeds and different design approaches than roads intended primarily for throughput and with limited access.

☐ **Lower maximum default rural speed limits from 55 mph to 45 mph.**

Goal – Lower the baseline risk of rural roads that provide access and distributor functions to all modes of traffic and do not meet modern design standards for 55 mph roadways.

Tried/Proven – Lowering statutory speed limits in urban areas, when supported by automated enforcement and publicity, works to reduce speeds and crashes. [9,31,32] The strategy of lowering default limits in rural areas is being tried in Australia. The limits may be posted more extensively in these trials than in North Carolina, and the limits are also supported by the presence of automated enforcement and media campaigns.

Enforcement Strategies

The recommended enforcement strategies are intended to address the challenges of increasing enforcement presence and effectiveness on North Carolina's 100,000 miles of streets and highways.

☐ **Develop random allocation enforcement strategies using regular marked, parked patrol vehicles (all agencies and divisions) and other overt and covert enforcement methods to cover a larger portion of the network where serious crashes occur.**

Goal: The goal is to maximize deterrence through visible, but sustainable levels of enforcement and increase the perception that enforcement may be encountered anytime and anywhere.

Proven.[9, 33] Adding quality publicity or media coverage would be expected to enhance effectiveness.[20]

☐ **Lower enforcement tolerances and publicize the enforcement.**

Goal: To reduce the number of vehicles exceeding the limit by amounts less than typical enforcement tolerances. Low-level speeding is a serious safety problem due to the large numbers of vehicles involved.[34, 35] This strategy may help to shift the distribution of higher speeds down as well.

Tried/Proven – Estimates from AASHTO show that risk of fatal and injury crashes decrease significantly with small changes in average operating speeds. Effects are most pronounced on lower speed roads.[5] This approach has been tried and proven when used with automated enforcement systems and publicity. [36, 37] If well-publicized, compliance may increase enough that the number of violations (and consequent administrative burden) may not increase. If backed up by stringent prosecutions, the burden on the courts may not increase substantially, as was found in a North Carolina speed enforcement pilot, and in an automated enforcement threshold reduction.[37,38]

☐ **Use automated speed enforcement to supplement traditional enforcement.**

Goal – Increase perceived and actual risk of being detected speeding to improve individual and population level deterrence of speeding.

Proven – Automated speed enforcement systems (both mobile and fixed camera systems) are proven to reduce speeds and injury crashes.[39, 40, 41] Media coverage and publicity associated with the campaigns have also been found to add to crash reductions.[20]

☐ **Shift most speeding violations to a civil and uniform penalty system (with procedures for appeal similar to parking tickets).**

Goal – Increase the actual and perceived expectation of receiving penalties that are appropriate to the violation when caught speeding to improve deterrence effects of enforcement.

Tried with respect to automated enforcement – Automated enforcement systems around the world (highly effective) use a civil penalty system. Principles of deterrence, the current adjudication situation in North Carolina, and research from other jurisdictions, suggest that the present criminal adjudication system, while very costly to operate, is not providing effective deterrence of speeding. [9, 6, 42, 43, 44]

Education and Public Information Strategies

Educational and informational strategies should be used to support and increase the effectiveness of other strategies.

☐ **Utilize earned, paid, and social media campaigns to enhance the deterrent effects of all enforcement efforts. Campaigns should reinforce the type of enforcement undertaken.**

Goal – Enhance the perceived risks of being caught speeding and consequently, the deterrence of speeding.

Proven – High-visibility anti-speeding campaigns have not received as much attention or funding in the U.S. as restraint use and alcohol enforcement, but Australia has used campaigns extensively to support enforcement efforts and even challenge the social norm of speeding. Controlled studies of Charlotte's pilot automated speed enforcement program and from Australia found that publicity and median campaigns have reduced crashes above and beyond reductions contributed by automated and other speed enforcement efforts alone.[20, 36, 40] Publicity should be used to make drivers aware of enforcement efforts and increase their expectations of being caught. [9,20]

☐ **Educate judges and prosecutors about the importance of their role in traffic safety.**

Goal – Improve consistency and certainty of prosecution of speeding violations.

Experimental/Tried for alcohol impairment – Measures to educate and influence courts officials through advocacy organizations, court monitoring, and publicity may have helped raise the profile and success in effectively prosecuting DUI offenders and altering the social norm of drink-driving. It is unknown if this strategy has been tried with regard to speed enforcement (except in a North Carolina pilot study in Iredell County),[38] but there are no known measures of effectiveness. Progress in reducing DUI crashes has also slowed in recent years. Since courts officials (judges and prosecutors) turn over frequently, such a strategy would have to be continued/repeated or made self-sustaining through institutionalized training or courts monitoring.

Information Technologies

New technologies should be available among the tools to increase safety and reduce crashes in the State.

☐ **Make wider use of variable speed limits (VSL) on freeways or other roads with conditions where a single posted speed limit may frequently be inappropriate.**

Goal – Provide a safer and more credible indication of appropriate travel speed for varying conditions.

Proven/Tried – European countries have been using variable speed limits for managing speeds during peak hours for over two decades on freeway types of roads. Several U.S. states have conducted trials of VSL related to weather conditions with promising speed reductions.[20] Coupling such a strategy with publicity about the reasons for VSL (which could include peak hour congestion, intermittent congestion related to crashes or other adverse conditions) and, perhaps with automated enforcement may be keys to effectiveness. Continue to monitor research from other states.

☐ **Improve availability of accurate driver history data to enforcement officers and the courts.**

Goal – Improve knowledge of violators' prior histories by prosecutors and judges and improve prosecution outcomes of speeding violations.

Experimental – It is unknown if any States have tried this measure, but improving driver records and strengthening penalties for repeat and egregious speeders is an often-recommended strategy [19] and one identified by the stakeholders work group. There is some evidence that court outcomes have little deterrent effect on future speeding behavior and crashes under the current system,[32, 33] but deterrence could improve if improvements in prosecution were widely known and consistently implemented.

Innovative (Unproven) Strategies

The strategies that follow are not yet proven, and may require additional research and interagency discussion to verify their efficacy and appropriateness for North Carolina. In the authors' opinion, North Carolina should begin long-term planning and consideration of several of these strategies. Several, including the first, would enhance or fit within a safe systems approach to speed management, helping to create a road network that supports and communicates safe driving speeds, and that provides a sound basis for effective enforcement strategies.

- ☐ **Improve recognizability and consistency among roads of the same type and speed limit.**

  Another core principle of the Dutch road safety vision includes the principle of predictability. Related to this principle, is the principle "functionality of roads," and that road layouts facilitate homogeneous use in "speed, mass, and direction." One of the objectives is to create design consistency within the same functional class of roads, or what is more widely known as "self-explaining roads."[45] Establishing fewer different speed limits is also a strategy of the Dutch safe systems approach.

  Europe is carrying out a research program to develop a self-enforcing, self-explaining road system. North Carolina could consider a similar program to develop a system of design standards, markings and signing to clearly distinguish the type of roadway, with its associated speed limit, that one is traveling on.

- ☐ **Implement a driver reward approach to encourage safe speeds.**

  A number of recent studies suggest that rewards may work to improve compliance with speed limits, at least for some drivers. [20] Lease car drivers exemplified compliance with speed limits and improved following behavior more of the time when driving was monitored and monetary incentives were offered with the lease agreement. A pay-as-you drive plan to save young drivers' insurance costs also reduced the percentage of miles that young drivers exceeded the limit by 14%. We are not aware of any studies reporting crash effects of such systems.

☐ **Implement Intelligent Speed Adaptation.**

Intelligent Speed Adaptation (ISA) trials have been conducted in at least 10 European countries[46] and several Australian states are currently conducting trials and exploring the use of ISA, such as potentially requiring it for repeat speeding offenders. Significant crash and injury reductions have been predicted from a full roll-out, given certain assumptions about operating speeds and expected reductions in mean speeds.[47] The ETSC addressed barriers to implementation ("myths") and concluded that ISA works is reliable, is technically simple (more so than other automatic devices such as collision avoidance systems), and that the expected crash reductions far outweigh the costs, particularly if the devices are required by law.[48]

☐ **Create guidelines and conduct training and outreach to cities and other local planning agencies to help ensure that new developments and local roads also follow best design practices for speed management and safety.**

Conducting outreach and developing agreements has also been practiced in the Netherlands Sustainable Safety approach, which required 24 inter-agency agreements with provincial, municipal, and local road managers.

☐ **Maximize use of existing capacity by improving and increasing use of transit, and demand management strategies such as HOV and managed lanes, flex-time work arrangements, and compact development patterns to minimize the need for adding traffic lanes.**

This measure could reduce exposure to driving and speeding in general, and potentially the risk of speeding. As a proportion of crashes, speeding-related crashes, and especially fatal crashes, are higher on weekends and during other non-peak hours (see Chapter 3, Appendix 2). Excess capacity during non-peak hours may increase opportunities to speed during hours when fewer vehicles are on the road.

In models of safety, congestion, and the number of lanes on freeways, Kononov, Bailey, and Allery (2008), found that, while practitioners generally believe that additional capacity afforded by additional lanes is associated with more safety, their findings suggest that adding lanes to multilane freeways may initially result in a temporary safety improvement that disappears as congestion increases. In addition, Kononov et al. found that crash rates may increase at a faster rate on freeways with more lanes compared with freeways with fewer lanes.[49]

☐ **Discourage car advertising that glamorizes speed.**

Although the State has no direct control over advertising, the State and partners could encourage such a national measure. Such a measure would support the safe systems approach to speed management that addresses risks for speeding at the level of driver attitudes and beliefs and intention to speed. As part of a systemic approach to break the culture of speeding, Australia has enacted an advertisers' "Code of Practice," whereby vehicles cannot be depicted speeding or driving recklessly in commercials. It is a voluntary code, but people are reportedly quick to call in and get the ad off air if it breaks the code, so it can be costly for little gain.[50]

The Challenge

In 2007, North Carolina's fatal crash rate was 1.64 per 100 million VMT. In the State's Strategic Highway Safety Plan, the North Carolina Department of Transportation had adopted an ambitious target to reduce the fatal crash rate to 1 fatality per 100 million VMT by 2008. Although significant progress has been made, the State has yet to reach that goal. The fatality rate was 1.19 as of 2011. As the Strategic Plan states, "a more concentrated effort will prevent many more crashes and injuries and save a significant number of lives and dollars." The State might also consider adopting the national Toward Zero Deaths (TZD) strategy. The US DOT has adopted TZD, a highway safety framework that aims to unite and develop strategies that minimize death and serious injury by strengthening traffic safety culture and building a safety foundation. Traffic crash injuries are consistently a leading cause of death for all ages of North Carolinians and are the leading cause of death each year for youth ages 5 to 24 years of age.[51] Speed management strategies, because of the indisputable role of speed in the severity of injuries received in crashes, should be a cornerstone of the State's plans to ensure that participating in a daily and necessary activity does not continue to be responsible for such outcomes. A comprehensive speed management plan can play significant roles in helping the State meet ambitious fatality and injury reduction goals by creating a more comprehensive and cooperative speed management program, a safer transportation infrastructure, and by improving policies and practices to uphold compliance with well-established safety laws.

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