
Behavioral and Social Science Contributions to Preventing Teen Motor Crashes

Systems Integrative and Interdisciplinary Approaches

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Motor-vehicle crashes are the leading preventable cause of death for U.S. teenagers, accounting for 39% of all deaths among young adults aged 16 to 20 years.¹ Despite the clear public health impact of adolescent driving behavior, the topic has received little attention in the literature on adolescent development and health risk behavior. For example, a quick search of federally funded biomedical research projects (1972–2008) on CRISP (Computer Retrieval of Information on Scientific Projects; <http://crisp.cit.nih.gov/>) yielded 15 studies when searching under *adolescent and driving*. This is compared to 92 studies of *adolescent and smoking*, 314 for *adolescent and substance use*, and 128 for *adolescent and HIV risk*. Even less attention has been paid to research that can directly inform policy, thereby providing a more solid evidence base for informing decision makers about the most effective and cost-efficient policies to reduce unnecessary deaths, disability, and costs of this public health problem.

Given this state of the field, the National Academies workshop² and the subsequent set of papers presented in this supplement to the *American Journal of Preventive Medicine*^{3–13} are a landmark event. For the first time, experts from diverse disciplines were brought together to highlight the contributions of behavioral and social sciences in preventing teen motor crashes and to identify areas for future research needed to inform practice and policy. The authors provide a broad range of expertise from adolescent development to public health and traffic safety experts, and each articulates a unique aspect of the problem, provides potential solutions, and lays out future research needs. This was truly a tipping point workshop, in that the planners embraced the power of transdisciplinary (team) science as well as gave attention to the continuum of science from basic mechanisms (discovery) research to translational research and policy (development, delivery, and dissemination).¹⁴

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As many of the authors discuss, there have been significant reductions in the number of teen motor-vehicle crashes, most notably in response to nearly universal implementation of some form of graduated licensure laws (GDL), but the problem is far from being solved. The next generation of researchers and policy-makers need guidance on how to proceed to further strengthen the impact of these policies as well as to supplement them with parental and community-level interventions. As Graham and Gootman² reflect, a clear theme emerging from the workshop is the necessity for coordination and dialogue among a broad range of actors.

Indeed, a variety of government agencies will need to work closely in order to adequately address this public health problem. At its core, the problem of teen motor-vehicle crashes is a complex systems challenge, with multiple dimensions, causal pathways and multi-level influences that begs for an integrated approach. Since the problem is associated with health outcomes, developmental stages and phase transitions, and substance use and other risky behaviors, it is a complex one that cuts across a variety of governmental and non-governmental agendas, as well as touches on priority areas across multiple Institutes and Centers (ICs) at the NIH.

Our office, the Office of Behavioral and Social Sciences Research (OBSSR) located within the Office of the Director (OD) at NIH, serves a coordinating role for such trans-NIH issues. The mission of OBSSR is to stimulate and integrate behavioral and social science research within the NIH health research enterprise in order to improve our understanding of the etiology, treatment, and prevention of disease and in the promotion of healthy behaviors, lifestyles, and communities. The vision articulated in OBSSR's new strategic prospectus is quite consistent with this workshop's call for interdisciplinary collaborations to develop multi-level interventions that require the coordination of researchers and policymakers to ensure full implementation of evidence-based policies.¹⁵ This prospectus outlines four key programmatic directions (next generation basic science, interdisciplinary research, systems science, and a problem-based focus for population impact) that, when realized, will facilitate substantial

movement in affecting the public's health and well-being. It is outlined such that through mobilization and vertical integration across the biological/biomedical sciences, the behavioral sciences (intra-individual variation), and the social/population sciences (inter-individual or cluster variation), we can make substantial improvements in the nation's health and well-being.^{14,15} Indeed, the increasing complexity of our current public health challenges necessitates these interdisciplinary and systems perspectives along with strengthening the science of large-scale dissemination, implementation, and policy, in order to ensure that the lessons learned from basic science and intervention development get quickly translated into public health practice.¹⁴

In considering the problem of teen motor-vehicle crashes, we can learn from past successes of behavioral and social sciences research in changing both individual- and population-level behavior to the improvement of public health. Particularly relevant is the dramatic reduction in U.S. tobacco use since the 1960s. Although a range of interventions (e.g., prevention and cessation programs, risk communication) were involved in this shift, it was policy-level interventions (including smoking bans and cigarette taxes) that were ultimately found to be the most effective strategies for reducing smoking prevalence.^{16,17} Thus, contrary to some misperceptions about the lack of credibility and power of behavioral and social sciences, the facts reveal that we can understand the basic mechanisms of individual and collective behavioral and social processes, and that we can successfully intervene at multiple levels to initiate and maintain such changes in problem behaviors. This can be done on a large scale with resultant impact at the societal level, thereby reversing population trends within the relatively short time span of just one or two generations (20 to 40 years).¹⁵ A similar pattern seems to be in place here, in that it has taken policy-level interventions (e.g., GDL and alcohol-related restrictions) to have a noticeable impact on teen motor crash rates. Yet, in order to make significant progress in further reducing crash rates and to achieve success to parallel tobacco, we must take the knowledge base of the behavioral and social sciences seriously, and must have the political will to translate that knowledge into policy at multiple levels of societal structure and function.

Given the role of political will in the process of widespread adoption of public health policies and programs, we clearly need a better understanding of the social and political processes involved in defining the urgency of problems. Basic social science research can further our understanding of how social movements and policy changes operate. We need research to better understand how social movements develop and grow, what public opinion must be in place before regulatory action is possible, and how messages can be framed that have the maximum impact on motivating and sustain-

ing behavior change.¹⁴ The challenge in the teen driving arena is perhaps greater than in other teen health risk behaviors (e.g., substance use), as driving is seen as a fundamental part of the teen experience in this country and there is often parental and community resistance to restrictions. As noted by Graham and Gootman,² the goal is not to completely prevent the behavior (as with other health risk behaviors) but to facilitate safe driving.

Given the complexity of variables relevant to teen driving behavior—including biological, cognitive, emotional, social/peer, parent, community, and policy-level factors—this public health problem seems a prime candidate for the use of systems science methodologies to further develop our understanding and ability to implement evidence-based policies and programs. Such methodologies are being increasingly utilized to address complex public health issues because of their ability to set up and test a complex web of causal relationships while considering the big picture and the context of such problems.¹⁴ Methods such as agent-based modeling, network analysis, and systems dynamics modeling allow examination of the dynamic interactions among variables at multiple levels of analysis (e.g., biological to societal) while also considering the behavior of the system over time.¹⁴ Such approaches have been successfully utilized in areas such as tobacco-use prevention by modeling “alternative futures” that allow policymakers to simulate the impact over time of a range of policy options in order to inform decision making.^{14,18} Such methods are also useful for understanding why interventions may fail to have the intended positive effects or may even have harmful effects, as several authors noted in the case of skid training programs.^{11,13} For more information on these techniques, we point readers to the 2007 Symposium Series on Systems Science and Health webcast.¹⁹ We strongly encourage the next generation of researchers to explore this highly promising approach to solving complex public health problems.

In addition, we believe that to make progress in developing and implementing successful interventions to prevent teen motor crashes, attention will need to be paid to building the science of dissemination and implementation. Dissemination science is concerned with understanding multi-level factors (e.g., individual, organizational, community) that can facilitate or impede the widespread adoption of efficacious interventions into public health and community settings.²⁰ This burgeoning area of science, which is inherently interdisciplinary, has received recent attention at many levels, including a recent CDC funding announcement entitled “Translation Research to Prevent Motor-Vehicle-Related Crashes and Injuries to Teen Drivers and their Passengers.”²¹ In addition, OBSSR, along with several NIH institutes, sponsored a first annual conference on building the science of dissemination and implementation

and currently have an active program announcement to support research in this area.²² The D'Angelo and Halpern-Felsher¹⁰ discussion of the important role that healthcare providers could play in promoting safe driving behaviors provides an example of the importance of understanding the barriers to the widespread adoption of best-practices and the role of healthcare providers in health promotion activities.

One final note regarding the current state of research in this area. A priority for OBSSR (indeed for all of NIH and USDHHS) is the elimination of health disparities and a better understanding of the role of behavioral and social sciences in advancing this science and policy. There is still much to be learned about the variation of teen driving behavior and risk, as well as the efficacy of interventions among a diverse group of adolescents, as it appears that serious examination of cultural factors has been quite limited thus far.

Although we do not claim to be experts in this area, our interpretation of the limited data presented suggests that there may be some contradictory evidence. For example, it is noted that teens from higher SES backgrounds have more access to and ownership of cars, and that earlier licensure is associated with white ethnicity, two-parent household, and higher parental education and family income, all pointing to potential **increased risk** by virtue of increased exposure.^{4,8} On the other hand, there is additional evidence suggesting that teens from such families may be at **decreased risk**. For example, adolescents from two-parent households have fewer risky driving behaviors, and ethnic-minority teens are more likely than white teens to report never or rarely wearing seatbelts.^{8,23} Thus, even at the epidemiologic level, it remains unclear whether certain groups of teens are at increased risk for risky driving behavior and injury or death from crashes. Clearly, additional research is needed and more attention needs to be paid to diversity and cultural factors in developing, implementing, and evaluating a full range of potential preventive interventions.

We are encouraged that the increased awareness of this pressing public health issue is coming at the same time that OBSSR, and all of NIH, is increasingly recognizing the necessity of interdisciplinary work, vertical integration, systems thinking, dissemination, and evidence-based policy if we are to ultimately affect our nation's health and well-being. The prevention of teen motor-vehicle crashes presents a formidable challenge to the research community, as it is not a "disease" and thus does not clearly fit into one domain or discipline. In the past, this has led to its virtual neglect as an area of research within the adolescent development and risk behavior fields as well as the exclusion of knowledge of development from the traffic safety field. Yet, this lack of a "home" in the current times may turn into an advantage, as it provides a ripe opportunity for collaboration between researchers and policymakers to

develop and implement sound evidence-based policies. Despite the challenges, we are confident that the combined energy evolving from this workshop, along with the movement within the research community toward systems thinking and population-impact strategies, can be capitalized on in order to move the science and policy forward and keep our nation's teenagers safe and healthy.

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