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The Emory Center for Injury Control: Vision and Priorities for Reducing Violence and Injuries through Interdisciplinary Collaborations

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Injury is the leading cause of death in the United States for persons between the ages of 1 and 44[1]. We see evidence of the scope and burden of injuries in the emergency department (ED), where annually an estimated 41.4 million patients are seen with injury-related visits, accounting for over one-third of ED presentations[2]. While many disciplines are involved in injury-related research, prevention, and practice, emergency physicians are on the frontlines of this epidemic, and they treat patients with preventable injuries as well as those with the sequelae of violence. Emergency physicians are also in a unique position to prevent future injuries and to reduce the consequences of existing injuries especially through screening and brief interventions, and the use of a teachable moment for the benefit and future safety of their patients[2]. It is because emergency medicine is so integrated and important for injury prevention and research[3] that we wanted to showcase current findings and projects by researchers affiliated with the Emory Center for Injury Control (ECIC) in this special issue of the *Western Journal of Emergency Medicine*.

The ECIC was founded in 1993 by Dr. Arthur Kellermann who conducted ground breaking research on firearm injuries, emergency medical services, trauma care and health policy. In 2006, Dr. Debra Houry was named the director of the ECIC and the ECIC was transitioned into an expansive, multi-institutional consortium. Last year, the ECIC was funded by the Centers for Disease Control and Prevention as one of their newest Injury Control Research Centers (ICRCs) enabling additional growth and support of new and exciting research projects and collaborations, training and outreach activities to support injury and violence prevention efforts in the region. In particular, a new emphasis of the center is to intersect academic boundaries and disciplines as well as institutions and to bridge the gap between science and community practice in order to make a difference in injury prevention.

This special issue highlights new findings by authors who are affiliated with Emory University as well as Georgia State University, Morehouse University and the University of Georgia representing multiple academic departments and schools within each institution, as well as the Georgia Poison Center and governmental institutions including the Department of Community Health. The interdisciplinary nature of these projects is highlighted by the extent of collaboration within the individual projects. Among the twelve articles published in this issue, five represent work by authors based at two or more institutions.

Beyond the academic diversity, this issue highlights the extraordinary theoretical diversity and breadth of approaches within the field of injury and violence prevention research. Articles in this issue include topics ranging from teenage drivers[4], to reciprocal dating violence[5], to the relationship between violent crime and the location of alcohol outlets[6]. Equally diverse are the research methodologies applied in the studies, which include focus group interviews[7], secondary analyses of a youth survey[5], and the use of geographic information systems[8], among others.

The products of this collaborative and diverse research extend beyond the covers of this issue. Perhaps the most important products of the research presented herein are the conclusions and lessons that can now be replicated or applied on a larger scale with the goal of reducing rates of injury and violence. In particular some findings may lead the way to future interventions including those that demonstrate that a multifaceted teen safety belt awareness project can lead to significant improvements in seat belt wearing[4], as well as the finding that teenage boys and girls differ with respect to modifiable risk factors for suicidal behavior[9]. Other notable findings include the conclusion that parental perceptions of the risks and benefits of a child maltreatment program may differ by ethnicity[10], and the finding that a sizable proportion of trauma patients, particularly female victims of assault, are receptive to enrollment in a brief intervention to reduce symptoms of Post Traumatic Stress Disorder[11].

This special journal issue also brings to the forefront several recurring themes, including the importance of research focused on the associations between minority and underserved populations and violence and injuries, the unique opportunities and vulnerabilities among children and young adults, and the

critical importance of understanding the many categorizations or classifications of violence and injury research and associated definitions and their implications. In addition, several studies show us the potential of research-driven and evidence-based interventions to reduce the societal impact of violence and unintentional injury.

The opportunity for positive impact in the field of injury prevention is profound. The field has seen a surge of interest and progress and has made great strides over the past few decades[12]. However, much more work and resources are needed to significantly reduce the burden and scope of injuries in the United States and elsewhere[13], and there are many important research priorities remaining[3,14]. Unfortunately, the breadth of this field can lead to a risk of fragmentation, with researchers focusing exclusively on either unintentional or violence-related injuries or within more narrowly defined topics. While these specialized research areas enable us to learn more about specific injuries or experiences with violence and their contexts, we also have to think more broadly about how we can benefit and learn from findings across injury topics and disciplines. Given the scarce resources provided specifically for injury prevention research and interventions, we will need to think strategically and creatively for how to best combine our resources, to determine if it is feasible and appropriate to evaluate the impact of our interventions across outcomes, and to identify the best ways to translate and disseminate our findings to the most important audiences[15,16]. We will also need to continue to emphasize and communicate the significant scope and burden of injuries to a larger audience to garner more support for injury prevention research. Based on the significant scope and burden of injuries, it is clear that we will need additional resources allocated to this important and underfunded field.

It is with these priorities in mind, that the ECIC has created a consortium of injury prevention researchers: to raise the visibility of injuries and violence, to strengthen the infrastructure for injury prevention research, to reduce the occurrence of injuries and violence and their consequences, and to encourage the development of evidenced based programs and practices. We would like to thank Dr. Mark Langdorf and Dr. Shahram Lotfipour for their vision, support, and collaboration of this special issue and their recognition of the importance of disseminating these findings broadly and to deliberately connect injury prevention and emergency medicine through this partnership. We are very excited to showcase the new research findings in this issue of the *Western Journal of Emergency Medicine* and to continue to support important research that will enable us to more effectively reduce injuries, particularly among vulnerable populations, in our region and elsewhere.

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REFERENCES:

1. CDC, National Center for Injury Prevention and Control, Office of Statistics and Programming. WISQUARS, 2006 Data.
2. McCaig LF, Nawar EN. National Hospital Ambulatory Medical Care Survey: 2004 emergency department summary. Advance data from vital and health statistics; no 372. Hyattsville, MD: National Center for Health Statistics.
3. Houry D, Cunningham RM, Hankin A, et al. Violence prevention in the emergency department: future research priorities. *Acad Emerg Med.* 2009; 16(11):1089-95.
4. Burkett KM, Davidson S, Cotton C, et al. Drive Alive: Teen seat belt survey program. *West J Emerg Med.* 2010; 11(3):280-3.
5. Swahn MH, Alemdar M, Whitaker DJ. Nonreciprocal and reciprocal dating violence and injury occurrences among urban youth. *West J Emerg Med.* 2010; 11(3):265-9.
6. Franklin FA II, LaVeist TA, Webster DW, et al. Alcohol outlets and violet crime in Washington D.C. *West J Emerg Med.* 2010; 11(3):284-91.
7. Vargas K, Talley J, Meyers J, et al. High school students' perception of motivations for cyberbullying: an exploratory study. *West J Emerg Med.* 2010; 11(3):270-4.
8. Dai D, Taquchel E, Steward J, et al. The impact of built environment on pedestrian crashes and the identification of crash clusters on an urban university campus. *West J Emerg Med.* 2010; 11(3):295-302.
9. West BA, Swahn MH, McCarty F. Children at risk for suicide attempt and attempt-related injuries: findings from the 2007 youth risk behavior survey. *West J Emerg Med.* 2010; 11(3):258-64.
10. Corso PS, Fang X, Begle AM, et al. Predictors of engagement in a parenting intervention designed to prevent child maltreatment. *West J Emerg Med.* 2010; 11(3):236-42.
11. Malcoun E, Houry D, Arndt-Jordan C, et al. Feasibility of identifying eligible trauma patients for posttraumatic stress disorder intervention. *West J Emerg Med.* 2010; 11(3):275-9.
12. National Center for Injury Prevention and Control. CDC Injury Factbook. Atlanta, GA, Centers for Disease Control and Prevention. Accessed May 11, 2010.
13. Dahlberg LL, Krug EG. Violence—a global public health problem. In: Krug EG, Dahlberg LL, Mercy JA, Zwi AB, Lozano R, eds. World Report on Violence and Health. Geneva: World Health Organization; 2002: 1–21. Available at: http://www.who.int/violence_injury_prevention/violence/world_report/en/. Accessed May 11, 2010.
14. National Center for Injury Prevention and Control. CDC Injury Research Agenda, 2009–2018. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention; 2009. Available at: http://www.cdc.gov/ncipc. Accessed May 11, 2010.
15. Lubell KM, Vetter JB. Suicide and youth violence prevention: the promise of an integrated approach. *Aggres and Viol Behav* 2006; 11:167–75.
16. Swahn MH, Simon TR, Hertz MF, et al. Linking dating violence, peer violence, and suicidal behaviors among high-risk youth. *Am J Prev Med.* 2008; 34(1):30-8.

The Role of the Injury Prevention Research Centers in Promoting the National Center for Injury Prevention and Control Research Agenda

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Unintentional and violence-related injuries represent one of the leading causes of morbidity and mortality in the United States and have a profound impact on the physical, emotional, and economic lives of our society. Among persons aged 1-34 years, unintentional injuries alone claim more lives than any other cause; homicide is the second leading cause of death for persons aged 15-24 years. In 1992, The National Center for Injury Prevention and Control (NCIPC) was organized as the lead center within the Centers for Disease Control and Prevention (CDC), Department of Health and Human Services, to address the need and coordinate efforts to prevent injuries for all major causes of non occupational injury among all age groups in the United States by addressing all phases of the injury research framework - from foundational research through dissemination research. To achieve its goal of translating science into effective programs and policies, NCIPC collaborates with other federal agencies and partners to document the incidence and impact of injuries, understand the causes, identify effective interventions, and promote their widespread adoption through support of intramural and extramural research.

To support this mission and beginning in the late 1980's, the NCIPC/CDC has recognized the importance in supporting the Injury Control Research Centers (ICRCs); a network of national centers of excellence committed to the prevention and reduction in non-occupational injuries and violence. Located in United States academic and medical institutions, these centers of excellence continue to be instrumental in developing and building the scientific base for injury prevention and control. An extramurally funded multidisciplinary/interdisciplinary program, the ICRCs function is to strengthen the injury and violence prevention infrastructure of the NCIPC/CDC by integrating resources at the state, local and national level. The ICRCs accomplish these significant activities and outcomes by integrating professionals from across diverse injury disciplines, through research, surveillance, consulting and advocacy, training professionals and students, providing technical assistance, translating effective interventions, and informing policy.

With the development of the DHHS Healthy People (http://www.healthypeople.gov) and the NCIPC Research Agenda (http://www.cdc.gov/injury/researchagenda/index.html), resources can be better utilized through identified research needs and priorities. The past and the currently funded 11 ICRCs have furthered the NCIPC/CDC research agenda and priorities in intentional and unintentional injuries including but not limited to transportation-related injuries, violence related injuries, acute care, traumatic brain injuries, falls, unintentional prescription drug overdose, older adult falls, and disaster preparedness. Collaborative research with the ICRCs and other research entities has been the extramural corner stone of building the scientific base for injury prevention research. For example, the University of Iowa ICRC (IPRC) in collaboration with the College of Engineering developed the Iowa Driving Simulator that can be used to determine visual impairment, response time, and other measures to determine factors related to impaired driving, thereby reducing motor vehicle-related injuries. To further promote this research, The IPRC sponsored a symposium in 1994 with the CDC and other federal agencies resulting in increased funding. Findings from continued research address injury prevention issues not only related to the average driver, but also address critical studies needed for driving performance related to the elderly, young drivers, distracted, medical and previous trauma-related impairments. Interventions developed from these research findings can not only save thousands of lives in Iowa but can also be translated, implemented, and evaluated in other states and internationally. This is only one example of how the ICRCs move injury prevention forward.

Over the last 20 years, areas of progress in policy changes at the state and national level, resulting in reductions in injury morbidity and mortality, have included child safety restraints, smoke alarms, seat belt use, alcohol screening

and brief interventions, sports injuries, falls, motorcycle and bicycle helmet use. The NCIPC ICRCs inform and influence injury prevention and control guidelines and policies at the national and international level, resulting in changes in morbidity and mortality at the population level, through collaborations with local, state, tribal, and federal legislators, policy makers, and elected officials. One example is the passage of a North Carolina law requiring the sale of only fire-safe cigarettes in the state. The North Carolina ICRC provided technical support and research data on the relationship of tobacco products and fires. They also worked with the NC Coalition for Fire-Safe Cigarettes to develop a website to inform state organizations. This activity resulted in the production of fire-safe cigarettes and the potential reduction in risk to fires from cigarettes in approximately 81% of the US population due to impending state legislation. The NCIPC research agenda and website as well as the individually funded ICRC websites, provide a wealth of information on current research, partnerships, and resources.

As we move through the third decade of the existence of this NCIPC/CDC program, the ICRCs are uniquely poised to address national and international emerging issues and priorities as well as continue to be a partner and resource for state and local organizations to reach affected populations and reduce the burden of injury. In planning together for long-term strategies, the NCIPC and the ICRCs must focus and continue to leverage resources on surveillance, targeted research, build capacity for prevention, communicate, disseminate, and implement appropriate and tested interventions, and strengthen training and technical assistance to reduce the risk to injury and improve the quality of life.

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The Base of the Pyramid

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Recently, after 17 eventful and rewarding years at Emory University, I decided it was time for a change. My son was about to graduate from college, and both the injury prevention center and academic department I had founded were flourishing under my successors. With a strong sense of anticipation, my wife and I set out to write a new chapter of our lives in Washington, DC, where I had agreed to join the RAND Corporation as the Paul O'Neill-Alcoa Chair of Policy Analysis.

One month into my new job, I awoke one Friday morning refreshed and ready to go. As I stood in the shower, I contemplated the upcoming events of the day. That morning, I was scheduled to meet with Rep. Jim Cooper, (D-TN) an expert on health policy and a leading "Blue Dog" in the U.S. House of Representatives. That afternoon, I had a much-anticipated meeting with Dr. Carolyn Clancy, Director of the Agency for Healthcare Research and Quality (AHRQ).

Momentarily distracted by these thoughts, my capacity to perform a necessary task – maintaining my footing in the slippery bathtub of my rental house—momentarily dipped below the threshold required for adequate performance. That was all it took. In an instant, my feet slid apart. Losing my balance, I spun about and heavily fell against the edge of the tub. The crack as my chest struck porcelain was both audible and palpable.

Alarmed by my howls of pain, followed by a torrent of curses, my wife bolted from bed. A lawyer by training, 27 years of marriage to an emergency physician had taught her to assess what's important. Airway, breathing, circulation? Intact. Mental status? Conscious and coherent (albeit profanely so). Motor exam? Intact. Spine or head trauma? Negative. Convinced I would survive; she went back to bed, leaving me to fend for myself.

Determined that I was not going to let a little chest trauma spoil my day, I painfully dressed for work. But as I headed downstairs, I began to feel sick. That's when I realized I might be more seriously injured than I first thought. Meekly, I awoke my wife and asked her to drive me to the emergency department (ED) for a chest X-ray. It confirmed my worst fears. In addition to two fractured ribs, I had a traumatic pneumothorax.

Each year, 1 in 4 Americans is injured seriously enough to require medical attention.[1] The most careful among us – even emergency physicians and injury control center directors – can become momentarily distracted. Depending on the amount of force unleashed, the resulting damage may be relatively minor or catastrophic.

Over the past few decades, the field of injury control has devised a range of techniques to prevent injuries countless and reduce the severity of those that occur. We've discovered a wide range of educational techniques to promote safe behavior. When education is not enough to inspire universal adoption of effective countermeasures, we've shown that compliance of simple and non-intrusive actions (such as buckling a safety belt or wearing a motorcycle helmet) can be boosted through high-visibility enforcement. And we've learned to prevent and reduce injuries by engineering safety into consumer products, motor vehicles and many built environments.[1] A few years ago, a well-engineered motor vehicle prevented my son from sustaining a serious injury and possibly saved his life.[2] Untold thousands, if not millions, are alive today thanks to the science of injury control.

This issue of the *Western Journal of Emergency Medicine* demonstrates that the field of control continues to evolve. Under the leadership of Dr. Debra Houry, a gifted emergency physician who succeeded me 4 years ago as director of the Emory Center for Injury Control, the tiny program two colleagues and I founded in 1993 has grown to involve over 80 faculty and staff at nine Georgia colleges and universities and numerous community partners. Recognized as a "Collaborating Center" by the Pan American and World Health Organizations, the Emory CIC was recently designated an Injury Control Research Center (ICRC) by the Centers for Disease Control and Prevention's (CDC) National Center for Injury Prevention and Control. Emory's program and the other CDC funded ICRCs are committed to discovering practical strategies that make a difference and translating them into every day practice.

Some readers of this journal might wonder, "What does this have to do with emergency medicine?" The answer is "Plenty".

Emergency physicians specialize in making time-critical diagnoses and quickly initiating care to alter the progression of disease. Every time we treat an asthmatic child, an adult with an acute ST segment-elevation MI or an adolescent with

sepsis, we are acting to interrupt a harmful chain of events that will otherwise lead to severe illness or death.

But the case of trauma, we don't have days, hours or minutes to act. The event occurs in the blink of an eye, and is over long before the patient arrives in the ED. Sometimes we can limit the consequences of injury through timely action and take measures to facilitate the healing process, but our capacity to fully reverse the consequences of injury is limited. Try as we might, we cannot unbreak a bone, restore a damaged brain or bring the dead back to life.[3] The best strategy, by far, is prevention.

That's why injury control is important, and why it should matter to emergency physicians and other emergency care practitioners. We are ideally placed to advance the science and practice of injury control through bedside (and roadside) counseling of our patients, by advocating sound public policies and by conducting groundbreaking biomechanical, epidemiological and prevention research.

And we would be wise to direct our efforts at the entire spectrum of injury; not just those that are particularly severe. My personal mishap is instructive. Fortunately, my rib fractures and pneumothorax were not life-threatening, but they were costly and disabling. After initially resisting surgical intervention, I reluctantly agreed to a chest tube and 2-day hospital stay. I did not fully recover for several weeks. The charges for my care are rolling in now. Trust me - American healthcare isn't cheap. I readily concede that my fall could have been worse—after all, I didn't fracture my neck or sustain an epidural hematoma—but it was bad enough.

People like me form the base of the injury pyramid.[4] Our injuries are non-fatal and many, like mine, are only mildly disabling. But we account for almost one-quarter of the roughly 123 million visits Americans make to ED each year.[1] We also contribute the rising costs of healthcare. And our injuries are every bit as preventable as those that garner the headlines.

When I returned home from the hospital, my wife presented me with a gift—a cheap plastic bathmat covered with suction cups that help it firmly attach to the floor of a tub. When I went to work the next day, I found that my RAND colleagues had sent me a second one, covered with autographs and "get well" messages. Now, I can daydream in the shower all I want, because my footing is secure. Cost: about $6.00 retail. Value: Priceless.

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REFERENCES:

1. Kellermann AL, Houry DE. Injury Control. In Tintinalli, JE, Kelen, GD, Stapczynski, JS (ed). Emergency Medicine: A comprehensive Study Guide - Sixth Edition. New York: McGraw-Hill. 2004, pp. 1645-9.
2. Kellermann AL, Martinez R. Hot Wheels. *Am. J. Preventive Med.* 2008:35(3S) S310-2.
3. Kellermann AL, Rivara FP, Lee RK, et al, Somes G. Injuries due to firearms in three cities. *N Engl J Med*. 1996;335:1438-44.
4. Wademan MC, Muelleman RL, Coto JA, et al. The Pyramid of Injury: Using Ecodes on Accurately Describe the Burden of Injury. *Ann Emerg Med*. 2003;42(4):468-78.

Predictors of Engagement in a Parenting Intervention Designed to Prevent Child Maltreatment

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Objective: The objectives of this analysis were to: 1) assess the impact of socio-demographic factors on parents' perception of the benefits of attending a parenting program designed to prevent child maltreatment vs. the costs in terms of time and difficulty to attend, 2) determine if perceived costs and benefits affected the association between socio-demographic factors and participation in a parenting program, and 3) assess whether race/ethnicity moderated the relationship between socio-demographic factors, perceived costs and benefits, and program participation.

Methods: We assessed perceived costs and benefits of the intervention from parents providing self-reports, including satisfaction/ usefulness of the program (benefits), and time/difficulty associated with the program (costs). We defined attendance at both the mid-point and then the number of classes attended throughout the remainder of the intervention. To investigate the direct and indirect effects (through perceived costs and benefits) of parental socio-demographic factors (education, age, gender, number of children, household income) on program attendance, we analyzed the data with structural equation modeling (SEM). To assess the potential moderating effect of race/ethnicity, separate models were tested for Caucasian and African-American parents.

Results: Perceived benefits positively impacted attendance for both Caucasian (n=227) and African-American (n=141) parents, whereas perceived costs negatively influenced attendance only for Caucasian parents. Parent education and age directly impacted attendance for Caucasian parents, but no socio-demographic factor directly impacted attendance for African-American parents. The indirect impact of socio-demographic characteristics on attendance through perceived costs and perceived benefits differed by race/ethnicity.

Conclusion: Results suggest that Caucasian parents participate in a parenting program designed to prevent child maltreatment differently based upon their perceived benefits and costs of the program, and based on benefits only for African-American parents. Parental perception of costs and/or benefits of a program may threaten the effectiveness of interventions to prevent child maltreatment for certain racial/ethnic groups, as it keeps them from fully engaging in empirically validated programs. Different methods may be required to retain participation in violence-prevention programs depending upon race/ethnicity. [West J Emerg Med. 2010; 11(3):235-241.]

INTRODUCTION

Behaviorally-oriented parenting programs have consistently shown positive effects in preventing youth problem behaviors and violence, and reducing child maltreatment.[1-3] However, limited parental participation often threatens the internal and external validity of potentially useful programs and their widespread implementation.[4,5] Participation, or "engagement," has been defined in the

literature in a number of ways including: stated intent to enroll, actual enrollment, attendance, participation, attrition, graduation, and quality of participation in sessions.[6-11] Given the importance of engagement to the validity of program outcomes, several theories and empirical studies provide evidence that parental perception of benefits and costs of behavioral interventions are important determinants of engagement.[9-17]

There is additional evidence, although mixed, that socio-demographic factors impact engagement in behavioral interventions. For example, caregivers with higher levels of education have been found to be more likely to enroll and attend according to some studies[5,7,9,18] but not others.[10,11,19,20] Higher household income, which is correlated with education, has been found to directly predict engagement in several studies[11,21-23] but not others.[5,7] Married or cohabiting caregivers have also been reported to be more engaged than their single counterparts in some studies[9,11,19,24] but not others.[8,20] The same is true of older caregivers, but again in some studies[20] but not others.[8,10,11] The challenges of attending parenting programs may also vary by race/ethnicity.[19,22,23] Studies suggest that engagement tends to be higher among European Americans (or Caucasian) and Hispanics than among African Americans, Asians, and Native Americans.[8,20,22-24]

Despite the number of studies that have explored these factors, few have simultaneously explored the direct and indirect effects of socio-demographic factors on engagement in prevention programs through perceived benefits and costs,[5,7,18] and even fewer have focused on racial/ethnic differences in these pathways;[22,23] or specifically for interventions that are designed to prevent violence, such as child maltreatment.[11]

In groundbreaking work, Spoth et al.[18] expanded the Health Belief Model[14] defined by perceived severity, susceptibility, program benefits, and barriers to participation, to include the indirect effects of several socio-demographic variables. They found that perceived program benefits and program barriers showed the strongest influence on parents' intent to enroll in a parenting skills program. Although the initial model did not include direct effects of socio-demographic variables on inclination to enroll, they reported that parent education significantly influenced perception of program benefits and that household income and number of children significantly influenced perception of program costs. In a follow-up study, Spoth et al.[7] used the same model to prospectively predict actual program attendance. They found that only educational attainment remained a significant predictor (i.e., increased education predicted higher program attendance), with perceived benefits and perceived barriers dropping out of the model, particularly when inclination to enroll was included.

In later work, Spoth et al.[5] extended their first model to assess the direct effects of socio-demographic variables on enrollment in a prevention intervention, and the indirect effects of these variables through perceived benefits and costs. They found that only parent education directly and significantly impacted enrollment. As with their 1995 model, the authors' extended model also showed that perceived program benefits and program barriers significantly influenced parents' inclination to enroll in the program, which in turn significantly impacted actual enrollment. As before, education significantly influenced perception of program benefits and number of children in the home significantly influenced perception of program costs. However, this model did not show a significant effect of income on perception of barriers/costs.

Although Spoth's research has had a major influence on our understanding of engagement in family-focused prevention interventions, geographic and cultural characteristics of these studies were limited to rural, Midwestern, primarily Caucasian families, and it is not clear whether the findings can be generalized to interventions designed to prevent child maltreatment. Only Coatsworth et al.[22-23] have simultaneously explored the impact of race/ethnicity and parental perception of intervention barriers or costs (but not benefits), on engagement (but not for violence-prevention programs). They found that barriers significantly predicted attendance in a family-focused prevention program for African-American, but not Hispanic, families; and that income, education, and household size significantly predicted attendance for Hispanic, but not for African-American, families. However, they did not explore the direct affect of perceived benefits on attendance, nor did they explore whether these associations differed by race or ethnicity.

This exploratory analysis builds upon the research of Spoth et al.[5,7,16,18,25] and Coatsworth et al.[22-23] by examining the extent to which perception of benefits and costs, and socio-demographic factors predicts ongoing attendance in a program designed to promote parenting effectiveness and prevent child maltreatment. We advance the current research in this field by exploring the indirect impact of socio-demographic factors on engagement, through their impact on perceived benefits and costs. We also explore whether or not any effects are moderated by race/ethnicity by testing separate models for Caucasian and African-American parents. The hypotheses we test are that engagement in a child maltreatment prevention program, as measured by total number of intervention sessions attended, is positively influenced by perception of high program benefits and negatively influenced by perception of high program costs, that socio-demographic factors directly and indirectly impact engagement, and that these associations may vary as a function of race/ethnicity.

METHODS

Description of Program

This exploratory study is part of a larger research project intended to assess the impact of intrinsic and extrinsic incentives and motivated action plans on engagement in

a prevention intervention designed to promote parenting effectiveness and reduce child maltreatment. The program, Parenting Our Children to Excellence–PACE, is a structured group parenting program on parenting and child outcomes, with particular emphasis on the process of engagement and its relationship to those outcomes. The program includes eight sessions designed for parents of preschoolers ages 3 -6 years, delivered at the daycare centers the children attend. To decrease barriers to engagement, the program is delivered at these daycare centers, at a time that is most convenient for the participating parents (i.e., following school dismissal, in the evenings); dinner is served to parents and children; childcare is provided; and parents are reimbursed for transportation costs.

Daycare centers (N = 52) throughout Indianapolis, Indiana, were recruited with the help of Child Care Answers, a childcare provider licensing and training agency. To participate in the program, centers had to serve: 1) a minimum of 35 families with children between the ages of 3 and 6 at the time of recruitment, and 2) an economically and racially/ethnically diverse population. Parents themselves were not required to meet specific socio-demographic requirements and were not recruited to obtain predetermined percentages of parents from specific racial/ethnic or economic groups. Daycare center directors reported that approximately 2 out of 3 families at the participating centers qualified for federal or state financial assistance [mean (*M*) = 65%, standard deviation (*SD*) = 33%). Parents were recruited by displaying poster advertisements at each center, sending registration forms to eligible parents, and staffing a registration table for two days during which parents were informed about the program and evaluation study. All study protocols for participant recruitment, intervention delivery, and data collection were approved by Purdue University's Institutional Review Board.

Participants

The 610 parents enrolled in the PACE program consisted of 566 mothers or mother figures and 44 fathers or father figures – each with one target child between the ages of 3 and 6 at time of recruitment. Parents ranged in age from 17 to 63 (*M* = 31.05, *SD* = 7.12). Forty-nine percent described their ethnicity as African American, 46% as European American, and 5% as Other. Forty-seven percent were married or lived with an adult partner; 53% were single. Parents had an average of 12.64 years of education (*SD* = 2.68), with 13% of parents not completing high school. Mean yearly household income was $26,572 (*SD* = $11,109). Statistics provided by daycare center directors indicated that approximately 1 in 2 families qualified for subsidized childcare (*M* = 0.51, *SD* = 0.35).

Measures

Data on socio-demographic variables were collected from parents prior to session 1 of the 8-session intervention. Five variables were included in the model: 1) parent education, 2) family size, 3), household income, 4) parent age, and 5) gender. Education was coded as (1) never attended school or kindergarten only, or (2) completed Grades 1 through 8, (3) Grades 9 through 11, (4) Grade 12 or GED, (5) College 1 year to 3 years, (6) College 4 years or more, or (7) Graduate work. Household income was coded in ranges as follows: (1) Less than $5,000, (2) $5,000 to $7,499, (3) $7,500 to $9,999, (4) $10,000 to $12,499, (5) $12,500 to $14,999, (6) $15,000 to $19,999, (7) $20,000 to $24,999, (8) $25,000 to $29,999, (9) $30,000 to $34,999, (10) $35,000 to $34,999, (11) $40,000 to $49,999, and (12) $50,000 or more.

We collected data on parental perception of the program's benefits and costs during session 4 of the intervention. Parental perception of the program's costs (in terms of barriers) to engagement was constructed as the mean of two 5-point items adapted from Yates.[26-27] One question asked about the time spent on the program, with a response format ranging from (1) "a lot less than I expected" to (5) "a lot more than I expected." The other question asked about difficulty of being in the program, with responses ranging from (1) "very easy" to (5) "very difficult." Parental perception of the program's benefits was similarly adapted from Yates[26-27] and constructed as the mean of two 5-point items. One question asked about the parent's satisfaction with what had been learned in the program, with a response format ranging from (1) "very dissatisfied" to (5) "very satisfied." The other question asked about usefulness of the program, with responses ranging from (1) "not at all useful" to (5) "very useful." Although there were no generic valid and reliable scales for measuring parental perceptions of the benefits and costs of program participation available in the literature, the Yates[26-27] questions were similarly applied to participation in prevention programs. Further, these questions mirror questions used to measure cost/benefit perceptions by Spoth et al.[5] For example, to measure perceived benefits of participation in a substance-use prevention program, Spoth et al.[5] used the average of four items on a 4-point scale ranging from "not at all beneficial" to "very beneficial" on, for example, improving family communication or preventing substance-use problems (alpha reliability of 0.84). For perceived costs, the authors used the average of five items on a 4-point scale that included time and difficulty as two of the measures (alpha reliability of 0.58).

The main variable of interest, engagement, was defined as a continuous variable by the number of intervention sessions attended, ranging from 1 - 8 sessions. In this analysis, we included only those participants who provided data on socio-demographic factors and parental perceptions of the program's benefits and costs. Thus, this study explores the impact of perceptions on *continued* engagement in a child maltreatment prevention program, given that all parents in this sample minimally participated in one of the eight sessions, rather than engagement as defined by other studies as either stated intent to enroll, actual enrollment, attrition, graduation, or

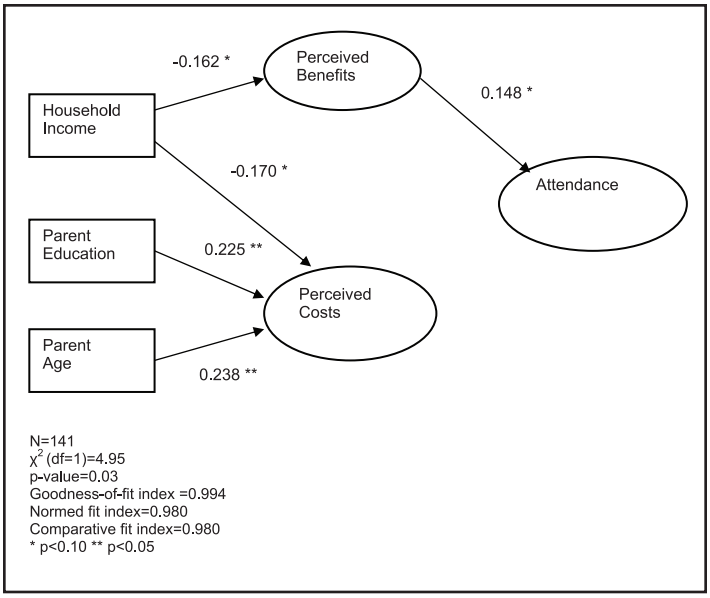

Figure 1. Results of model fitting for Caucasian parents

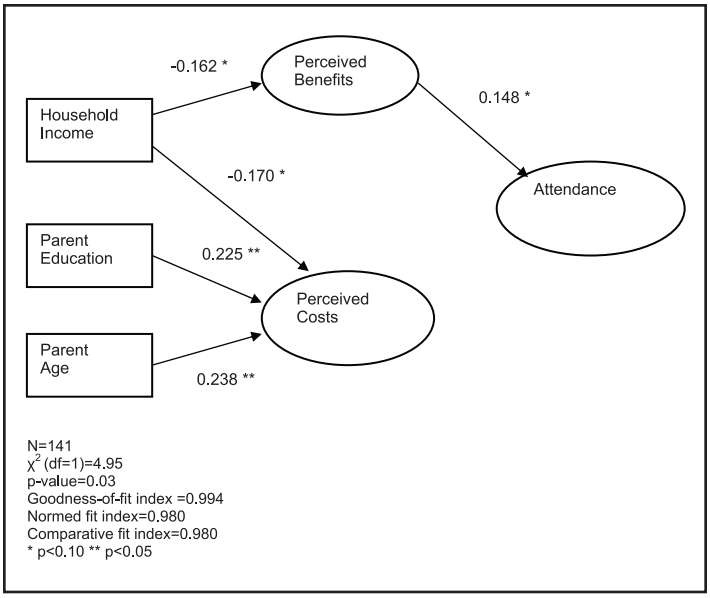

Figure 2. Results of model fitting for African-American parents

quality of participation.[6-11] Using attendance as the primary variable of engagement is consistent with other studies in the literature.[28-29]

Statistical Analysis

To investigate the direct and indirect effects (through perceived benefits and perceived costs) of socio-demographic variables on program engagement, we analyzed the data with structural equation modeling (SEM) using the EQS 6.1 for Windows.[30-31] Overall model fit was determined through two absolute fit indices – the chi-square (χ^2) statistic and the Goodness-of-Fit Index (GFI); and two incremental fit indices – the comparative fit index (CFI) and the normed fit index (NFI). The root mean square approximation (RMSEA) was not used as a fit index in this analysis because it can be misleading when the degrees of freedom are small and sample size is not large, as was the case for our study.[32]

The significance of moderation by race/ethnicity was assessed by testing the hypothesis that interaction terms between the race/ethnicity (Caucasian or African-American) dummy variable and each predictor variable for program attendance are jointly different from zero. Results indicated that the regression models for the two models were marginally significantly different ($F(10, 346) = 1.62$, $p<0.10$). Therefore, subsequent regressions were estimated separately for Caucasian and African-American parents to test the hypothesis that perception of costs and benefits, and socio-demographic factors may affect attendance differently for the two groups. Because preliminary analyses indicated that the daycare center in which the program was held did not significantly affect parental or child outcomes (i.e., less than 1% of the variance in the predictor and outcome variables was accounted for by center, ICC = .79%), adjusting for nesting of families within daycare centers was not necessary in this exploratory study.

RESULTS

Of the 459 parents attending session 4 for which data on parental perception of benefits and costs were available, 91 participants were excluded because of missing socio-demographic data collected at baseline. Analyses (i.e., t-tests) comparing the 610 parents who attended the first session to the 459 parents who attended session 4 did not indicate significant differences on socio-demographic variables. For the remaining sample (n=368), mean age was 31.9 years and mean family size was 3.9. Thirty-eight percent described their race/ethnicity as African-American (N=141) and 62% as Caucasian (N=227). About 28% of parents had a household annual income below $20,000, 32% between $20,000 and $50,000, and 40% above $50,000. A little less than 90% of the parents had completed high school and 36% had completed college.

The final models, including significant predictors only, are illustrated in Figures 1 and 2. Results of the fit indices showed acceptable fit to the data for both models[33-34] and all significant path coefficients were similar in scale to values reported by others.[5,7]

Figure 1 models the impact of socio-demographic variables and perceived benefits and costs on engagement in the PACE program for Caucasian parents. The effects of both perceived benefits and perceived costs on attendance were statistically significant in the hypothesized directions. Education and parental age were also shown to directly impact attendance. Among all the socio-demographic variables, only household income was found to directly impact perceived benefits, and indirectly impact attendance through its impact on perceived benefits.

Figure 2 models the impact of socio-demographic variables and perceived benefits and costs on engagement in the PACE program for African-American parents. In

this model, only perceived benefits significantly impacted attendance. None of the socio-demographic variables significantly impacted attendance directly. However, parent education and age significantly impacted perceived costs; and household income significantly impacted perceived benefits and costs. As with Caucasian parents, household income was found to indirectly impact attendance through its impact on perceived benefits for African-American parents. The indirect impact of the socio-demographic factors on attendance through perceived costs was not established in this model.

DISCUSSION

The significant, yet different, direct and indirect relationships between perceived benefits and costs and socio-demographic variables on attendance at one or more intervention sessions (ongoing engagement) for Caucasian and African-American parents suggest that the theories for parental participation in prevention programs may be empirically validated. For example, the Theory of Planned Behavior (TPB) suggests that human behavior is guided by behavioral beliefs (one's intention to act in a certain way), normative beliefs (one's perception that doing so is likely to be socially beneficial) and control beliefs (one's beliefs about the presence of factors that may help or hinder the situation).[12-13] From the TPB, therefore, enrollment and engagement in a parenting program designed to prevent child maltreatment may reflect parents' stated intent to enroll and parents' perceptions that they or their children stand to benefit from the program. The TPB model also suggests that engagement is determined by parents' perceived costs of the program, as determined by obstacles or barriers that may make it difficult for them to attend sessions regularly.

The Health Belief Model (HBM) provides another general framework for understanding the widespread failure of people to participate in prevention programs.[14] Variables in the HBM model that have been used to explain engagement in prevention programming include perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, and self-efficacy. For example, perceived barriers factor prominently among the reasons parents give to explain why they are not interested in attending interventions that involve parenting groups.[9,16,17] Low perception of the benefits of parenting programs, in terms of relevance and effectiveness, may also act as an obstacle to engagement or attendance in group meetings.[10,17]

Empirical validation of these theories suggests, therefore, that behavioral interventions designed to prevent child maltreatment might be improved with more careful consideration of ethnic/racial differences. Specifically, child maltreatment intervention information provided to parents may need to be culturally adapted to address parents' perceptions of benefits and costs. In addition, actual implementation strategies may need to be adapted to address the differing perceptions of benefits and costs, such as adapting the incentive structure for ethnically/racially diverse families, taking group leader and participant ethnic/racial match into consideration, or taking additional strategies to explain the potential benefit of engagement in behavioral interventions.

LIMITATIONS

This exploratory analysis provides interesting yet potentially contradictory results of the impact of parental perceptions of a program's benefits and costs on engagement in a child maltreatment intervention for ethnically/racially diverse groups. However, a number of practical limitations of these data prevent the generalizeability of these results. First, because data collection on parental perceptions occurred midway through the intervention, our results are limited to understanding predictors of ongoing engagement (attendance equal to one or more of the eight sessions) in the program only. Second, the current study only investigated effects for African-American and Caucasian parents, limiting the findings to these two race/ethnicities alone. However, investigating African-American parents in this analysis is the first of its kind and a natural extension of work done previously in this field.[5,7,25] The definitions of perceived benefits and costs, although similar to others,[5,26-27] may further limit the generalizeability of these results.

CONCLUSION

Despite the preliminary nature of these data and their limitations, our results provide important implications for the area of behaviorally-oriented, family-focused prevention interventions designed to prevent child maltreatment, as parental perception of a program's benefits and costs and socio-demographic variables were shown to affect engagement differently for Caucasian and African-American participants. This study highlights the need for future research on the indirect pathways to engagement in child maltreatment interventions, else factors that impact participation for specific racial groups will be lost. Qualitative assessment of parental perceptions of a program's benefits and costs could provide direction to program developers to improve translation of evidence-based interventions to racially diverse audiences. Future research should also seek to replicate these findings with a larger sample consisting of a broader range of racial and ethnic groups, with additional measurement of parental perceptions measured at baseline to assess other components of program engagement.

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REFERENCES

1. Sander M. The triple P-positive parenting program: a comparison of enhanced, standard, and self-directed behavioral family interventions for parents of children with early onset conduct problems. *J Consul and Clin Psych*. 2000; 68:624-40.
2. Kumpfer KL, Alvarado R. Family-strengthening approaches for the prevention of youth problem behaviors. *Am Psych*. 2003; 58:457-65.
3. Sander MR, Ralph A. Towards a multi-level model of parenting intervention. In: Hoghughi M, Long N, eds. *Handbook of Parenting: Theory and Research for Practice.* London: Sage Publications; 2004.
4. Lochman JE. Parent and family skills training in targeted prevention programs for at-risk youth. *J Prim Preven*. 2000; 21:253-65.
5. Spoth R, Redmond C, Shin CY. Modeling factors influencing enrollment in family-focused preventive intervention research. *Preven Sci.* 2000; 1:213-25.
6. Wenning K, King S. Parent orientation meetings to improve attendance and access at a child psychiatric clinic. *Psych Serv*. 1995; 46:831-3.
7. Spoth RL, Redmond C, Kahn JH, Shin C. A prospective validation study of inclination, belief, and context predictors of family-focused prevention involvement. *Fam Process.* 1997; 36:403-29.
8. Orrell-Valente JK, Pinderhughes EE, Valente W, Laird RD, & Conduct Problems Prevention Research Group. If it's offered, will they come? Influence on parent's participation in a community-based conduct problems prevention program. *Am J of Comm Psych.* 1999; 27:753-83.
9. Cunningham CE, Boyle M, Offord D, Racine Y, Hundert J, Secord M, et al. Tri-ministry study: Correlates of school-based parenting course utilization. *J of Consult and Clin Psych.* 2000; 68:928-33.
10. Gross D, Julion W, Fogg L. What motivates participation and dropout among low-income urban families of color in a prevention intervention? *Fam Relat*. 2001; 50:246-54.
11. Dumas J, Nissley Tsiopinis J, Moreland A. From intent to enrollment, attendance, and participation in preventive parenting groups. *J of Child and Fam Stud*. 2006; 16:1-26.
12. Ajzen I. The theory of planned behavior. *Org Behav and Hum Decis Process.* 1991; 50:179-211.
13. Ajzen I. Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. *J of App Social Psych*. 2002; 32: 665-83.
14. Strecher VJ, Rosenstock IM. Chapter three: The Health Belief Model. In: Glanz K, Lewis FM, Rimer BM, eds. *Health Behavior and Health Education: Theory, Research, and Practice*. 2nd edition. San Francisco: Jossey-Bass; 1997:41-59.
15. Mirotznik J, Feldman L, Stein R. The health belief model and adherence with a community center-based, supervised coronary heart disease exercise program. *J of Comm Heal.* 1995; 20:233-47.
16. Spoth R, Redmond C. Study of participation barriers in family-focused prevention: Research issues and preliminary results. *Int J of Comm Heal Edu.* 1993; 13:365-88.
17. Harachi TW, Catalano RF, Hawkins JD. Effective recruitment for parenting programs within ethnic minority communities. *Child and Adoles Soc Work J.* 1997;14:23-39.
18. Spoth R, Redmond C. Parent motivation to enroll in parenting skills programs: A model of family context and health belief predictors. *J of Fam Psych.* 1995; 9:294-310.
19. Dumka LE, Garza CA, Roosa MW, Stoerzinger HD. Recruitment and retention of high-risk families into a preventive parent training intervention. *J of Prim Preven.* 1997; 18:25-39.
20. Danoff NL, Kemper KJ, Sherry B. Risk factors for dropping out of a parenting education program. *Child Abuse and Neglect.* 1994; 18:599-606.
21. Perrino T, Coatsworth JD, Briones E, Pantin H, Szapocznik J. Initial engagement in parent-centered preventive interventions: a family systems perspective. *J of Prim Preven.* 2001; 22:21-44.
22. Coatsworth JD, Duncan LG, Pantin H, Szapocznik J. Differential predictors of African American and Hispanic parent retention in a family-focused preventive intervention. *Fam Rel*. 2006; 55:240-51.
23. Coatsworth JD, Duncan LG, Pantin H, Szapocznik J. Patterns of retention in a preventive intervention with ethnic minority families. *J Prim Preven.* 2006; 27:171-193.
24. Cohen D A, Linton KLP. Parent participation in an adolescent drug abuse prevention program. *J of Drug Edu.* 1995; 25: 159-69.
25. Spoth R, Redmond C, Hockaday C, Shin CY. Barriers to participation in family skills preventive interventions and their evaluations: A replication and extension. *Fam Relat.* 1996; 45:247-54.
26. Yates BT. Cognitive vs. diet vs. exercise components in obesity bibliotherapy: effectiveness as a function of psychological benefits versus psychological costs. *The South Psychol.* 1987; 3:35-40.
27. Yates BT. Toward the incorporation of costs, cost-effectiveness analysis, and cost-benefit analysis into clinical research. *J of Consult and Clini Psych.* 1994; 62:729-36.
28. Bradley SJ, Jadaa D, Brody J, Landy S, Tallett SE, Watson W, Shea B, Stephens D. Brief psychoeducational parenting program: An evaluation and 1-year follow-up. *J Am Acad Child Adolesc Psychiatry.* 2003; 42:1171-8.
29. Jones K, Daley D, Hutchings J, Bywater T, Eames C. Efficacy of the Incredible Years programme as an early intervention for children with conduct problems and ADHD: long-term follow-up. *Child Care Heal Dev*. 2008; 34:380-90.
30. Bentler PM. *EQS: Structural Equations Program Manual.* Encino, CA: Multivariate Software, 1995.

31. Jöreskog KG, Sörbom D. *LISREL 8: Structural equation modeling with SIMPLIS command language.* Chicago, IL: Scientific Software International, 1993.
32. Bollen KA, Long JS. (eds.). *Testing Structural Equation Models.* Newbury Park, CA: Sage, 1993.
33. Bentler PM. Comparative fit indexes in structural models. *Psych Bull.* 1990; 107:238-46.
34. Hu L-T, Bentler PM. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Struc Equ Model: A Multidiscip J.* 1999; 6:1-55.

Reporting of Intimate Partner Violence among Men Who Have Sex with Men in an Online Survey

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Objective: A growing body of literature suggests that intimate partner violence (IPV) occurs within same-sex relationships and that members of the Lesbian Gay Bisexual Transgender (LGBT) community face a number of unique challenges in accessing IPV-related services. This paper examines the use of an online survey, marketed through a popular social networking site, to collect data on the experience and perpetration of IPV among men who have sex with men (MSM) in the United States.

Methods: Internet-using MSM were recruited through selective placement of banner advertisements on MySpace.com. Participants were eligible for the baseline survey if they were males ≥ 18 years of age, and reported at least one male sex partner in the last 12 months. In total 16,597 men responded to the ad, of which 11,681 were eligible for the study, and 5,602 completed the questionnaire; 543 men completed the follow-up survey, which included questions on the experience and perpetration of IPV. The final analysis sample was 402.

Results: The prevalence of violence among the sample was relatively high: 11.8% of men reported physical violence from a current male partner, and about 4% reported experiencing coerced sex. Reporting of perpetration of violence against a partner was generally lower, with approximately 7% reporting perpetrating physical violence and less than 1% reporting perpetration of sexual violence.

Conclusion: The results presented here find lower levels of experiencing both physical and sexual IPV than have been shown in previous studies, yet show relatively high levels of reporting of perpetration of IPV. Collecting IPV data through surveys administered through social networking sites is feasible and provides a new opportunity to reach currently overlooked populations in IPV research. [West J Emerg Med. 2010; 11(3):242-246.]

INTRODUCTION

Based on United States Census data, approximately 700,000 same-sex couples live together in the U.S.[1] In many states, same-sex partnerships are not recognized legally, and thus couples may have limited or no access to traditional intimate partner violence (IPV) safeguards.[2,3] In the scientific literature the most common depiction of intimate partner violence (IPV) involves a male batterer and a female victim. However, a growing body of literature suggests that IPV occurs within same-sex relationships and that members of the Lesbian Gay Bisexual Transgender (LGBT) community face a number of unique challenges in accessing IPV-related services.[4,5] Additionally, a number of methodological issues have hampered research into IPV among LGBT individuals.[6] These include a tendency to focus on lesbians, often to the exclusion of gay and bisexual men, a focus on child abuse and hate crimes to the exclusion of IPV, and a failure to use representative samples. The latter is due to the problems researchers have faced in recruiting representative samples, and many researchers have thus relied upon convenience samples recruited through LGBT publications, events and organizations.[7,8] Moreover, victims of same-sex IPV may be

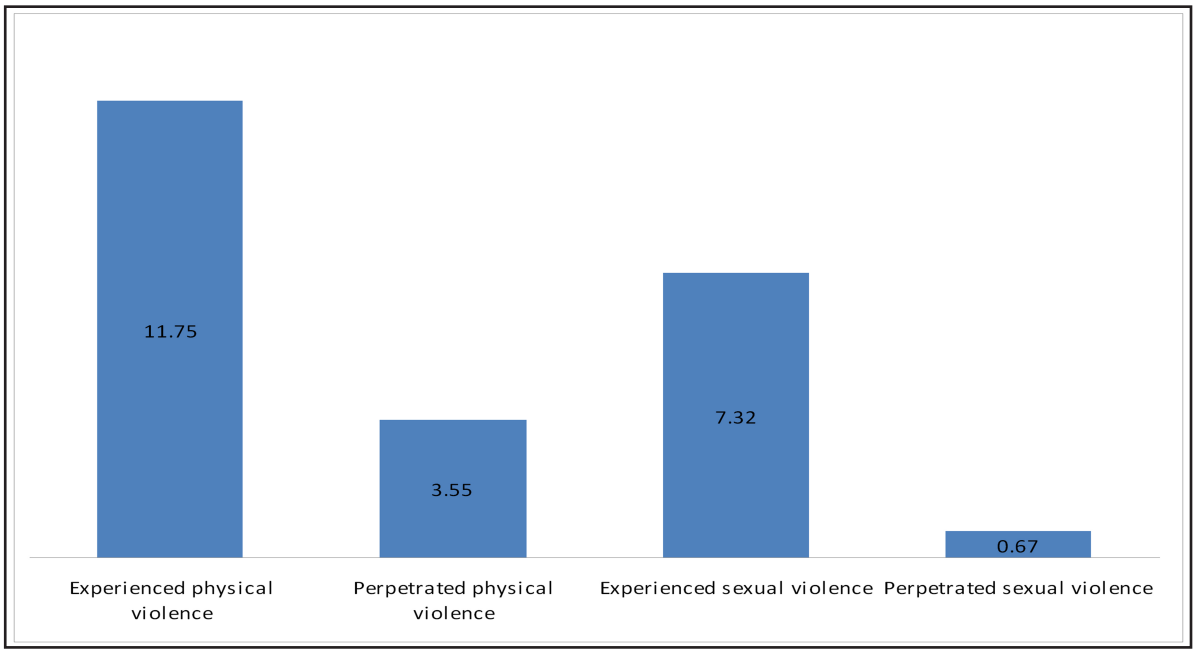

Figure 1. Reporting of experience and perpetration of physcial and sexual intimate partner violence among gay and bisexual men (n=402).

hesitant to seek help, due to internalized or institutionalized homophobia, the nature of the abuse itself, or a perceived lack of useful resources resulting in underreporting of abuse.[6,9-12] The existing evidence suggests that IPV affects approximately one-quarter to one-half of all same-sex relationships.[5,8,9,13] These rates are similar to estimates of abuse in heterosexual relationships.[9] Physical abuse seems to occur in a significant portion of abusive same-sex relationships. Elliot[14] and De Vidas[15] suggest that between 22-46% of lesbians have been in relationships featuring physical violence. McClennen et al.[4] found that participants were often physically struck by their partners, and were coerced into substance abuse. Greenwood et al.[16] reported that 22% of a sample of men who had sex with men (MSM) had been subject to physical abuse from an intimate partner. This paper examines the use of an online survey, marketed through a popular social networking site, to collect data on the experience and perpetration of IPV among self-identifying gay and bisexual men in the U.S. Online surveys have the potential to surmount many of the recruitment issues that have hampered previous attempts to quantify IPV among same-sex populations. The current study adds to the existing body of evidence on IPV among same-sex couples by using a larger sample size than has been used in previous studies, and by demonstrating how social networking sites can be used to collect thus type of data.

METHODS

We recruited internet-using MSM through selective placement of banner advertisements on MySpace.com. The ads displayed men of differing races and ages, in order to attract participants from a range of backgrounds. During the recruitment period, advertisements were displayed to MySpace members based on self-reported demographic profile information. Exposures were made at random times of day to males ≥ 18 years logging into MySpace whose profile indicated a residence in the U.S. and who reported their sexual orientation as gay, bisexual, or unsure. Participants who clicked through the banner advertisements were taken to an internet-based survey. Six banner advertisements were used, all with similar text and graphical design. Two of the advertisements presented a white male model, two presented a black male model, and two presented an Asian male model. Participants referred to the survey site after clicking through were first screened for eligibility. Participants were eligible for the baseline study survey if they were males ≥ 18 years of age and reported at least one male sex partner in the last 12 months. Eligible participants were provided informed consent documents, and consenting participants were passed into an online survey. In the survey, participants were asked for relevant demographic information as well as questions about the use of the internet to meet sex partners, recent sexual risk behaviors, use of technology, HIV testing history, and interest in specific, new HIV prevention interventions. Participants were eligible for a follow-up study if in addition to the baseline eligibility criteria, they were ≤ 35 years of age, reported their race as white (non-Hispanic), Black (Hispanic or non-Hispanic), or who reported their ethnicity as Hispanic, and did not report being HIV sero-positive during the baseline survey. The follow-up study was restricted to men < 35, as one of the aims of the larger project was to look at HIV risk among young MSM. In total 16,597 men responded to the ad, of whom 11,681 were eligible for the study, and 5,602 completed

Table 1. Background characteristics and prevalence of IPV

	%	% reporting experiencing physical IPV	% reporting experiencing sexual IPV	% reporting perpetrating physical IPV	% reporting perpetrating sexual IPV
AGE					
18-24	68.07	11.07	4.56	5.21	0.98
25-29	20.84	14.89	0	12.77	0
30-35	11.09	10	4	10	0
RACE					
Hispanic	37.47	15.38	3.55	8.88	0.59
Black/ African American	14.86	5.97	2.99	5.97	2.99
White/ Caucasian	47.67	10.07	3.72	6.51	0
EDUCATION					
Less than high school/General Educational Development	4.66	14.29	4.76	4.76	0
High School/General Educational Development	26.83	11.57	5.79	9.09	0.83
Some college or higher	68.51	11.65	2.59	6.8	0.65
SEXUAL IDENTITY					
Bisexual	19.07	9.3	3.49	4.65	2.33
Homosexual	80.93	12.33	3.56	7.95	0.27
SEXUALLY TRANSMITTED DISEASE TEST IN LAST 12 MONTHS					
Yes	38.58	12.07	4.02	5.42	0.57
No	61.42	11.60	3.25	10.34	0.72
HUMAN IMMUNODEFICIENCY VIRUS SERO-STATUS					
Negative	67.18	12.87	3.3	7.59	0.33
Positive	3.77	17.65	5.88	5.88	0
Untested	29.05	8.4	3.82	6.87	1.53
LAST SEX WAS UNPROTECTED ANAL SEX					
Yes	34.59	16.03	5.77	5.77	0
No	65.41	9.49	2.37	8.14	1.02
NUMBER OF MALE SEX PARTNERS LAST 12 MONTHS					
None					
One					
Two-Five					
Six-Ten					
Eleven Plus					
FREQUENCY OF ATTENDING BARS					
Once a month or less	74.94	10.65	2.96	7.4	0.59
About once per week	19.73	20.83	5.62	6.74	0
About once per month	5.32	13.48	4.17	8.33	1.12

the questionnaire; 543 men completed the follow-up survey. The follow-up survey included questions on the perpetration and experience of IPV. Men were asked if they had ever been physically hurt by their current male partner ("*In the last 12 months has any partner been physically violent to you? This includes pushing, holding you down, hitting you with his fist, kicking, attempting to strangle, attacking with a knife, gun or other weapon*?"), and if their current male partner had

ever used physical force to force them to have sex when they did not want to ("*In the last 12 months has any partner ever forced you to have sex when you were unwilling?"*). Men were also asked if they had perpetrated either physical or sexual violence against any male partner. The analysis examines the reporting of both the experience and perpetration of physical and sexual IPV among a final sample of 402 MSM with complete data for all questions, and examines differences in the reporting of IPV across background characteristics. The research was reviewed and approved by Emory's Institutional Review Board.

RESULTS

The final sample was predominantly young (18-24), Caucasian and with some college education (Table 1). The majority self-identified as homosexual, reported themselves to be HIV negative, although a large percentage reported recent unprotected anal sex. Figure 1 shows the prevalence of violence among the sample: 11.8% of men reported physical violence from a male partner, while around 4% reported experiencing coerced sex. Reporting of perpetration of violence was generally lower, with approximately 7% reporting perpetrating physical violence towards a male partner and less than 1% reporting perpetration of sexual violence towards a male partner. Table 1 shows variations in the reporting of experience and perpetration of physical and sexual IPV. The only significant variation in the reporting of experiencing physical IPV was across recent high-risk sex, with men who reported recent unprotected anal sex more likely to also report experiencing physical IPV. The reporting of sexual IPV experience varied significantly by age, with higher levels in the 18-24 and 30-35 age groups, and was again highest among men who reported recent unprotected anal sex. Reporting of perpetrating physical IPV was significantly higher among older men and among men who reported not having a recent STD test, while the reporting of perpetrating sexual IPV was higher among Black and bisexual men.

DISCUSSION

A small number of studies have suggested that the prevalence of IPV among same-sex couples in the U.S. is similar to that seen in heterosexual couples.[16] Harms[17] conducted a prevalence study that focused on gay and bisexual men, finding that 26% of respondents reported that they had experienced physical violence in their last relationship. The results presented here find lower levels of both physical and sexual IPV than have been shown in previous studies, yet show relatively high levels of reporting of perpetration of IPV. However, such previous studies have relied on convenience samples of clinic-based populations. The recruitment of LGBT individuals into studies of IPV has posed a challenge to researchers, due primarily to perceived difficulties in disclosing sexual orientation; as such, many previous studies have used convenience samples recruited through LGBT venues and publications.[7] The results presented here demonstrate the feasibility of collecting IPV data through surveys administered via social networking sites, providing a new opportunity to reach currently overlooked populations in IPV research. The results also demonstrate some interesting variations in both the experience and perpetration of violence. Reporting of high-risk sex was associated with reporting of higher levels of experience of both physical and sexual IPV. This result likely reflects an association between risk-taking and vulnerability to IPV: gay men who report lower levels of victimization have been shown to also report lower levels of substance abuse, suicidality, and sexual risk-taking behaviors.[18] The results show higher levels of perpetration of sexual IPV among Black and bisexual men. While these results may reflect an association between minority stress and acts of violence, the overall number of men reporting perpetrating sexual violence was low and these associations should be treated with caution.

LIMITATIONS

The key limitations to the present results are small sample size and possible selection bias in both the decision to complete the questionnaire and the decision to answer the questions on IPV. Research on IPV among same-sex partners remained virtually non-existent until the 1990s, when the emergence of the HIV epidemic increased focus on the LGBT community.[19] Kaschak[11] refers to the "*double closet*" that surrounds IPV in same-sex relationships: the dual burden of shame and silence surrounding both the discussion of IPV and the discussion of sexuality; hence, it is possible that IPV may be under-reported.

CONCLUSION

The results presented here demonstrate high levels of IPV among gay and bisexual men and illustrate how an online survey coupled with social networking sites can be used to collect data on sensitive public health issues such as IPV. There is clearly a need for further research into issues surrounding IPV in same-sex male relationships, a population vulnerable to high levels of IPV, and to understand the complex relationships that exist between IPV, risk-taking and identity. Such information is vital for the development of effective interventions to reduce violence and improve health, in particular sexual health, among MSM in the U.S.

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REFERENCES

1. Gay Demographics. 2000 Census information on gay and lesbian couples. Available at: http://www.gaydemographics.org. Accessed October 17, 2006.
2. Aulivola M. Outing domestic violence: Affording appropriate protections to gay and lesbian victims. *Family Court Review*. 2004; 42:162-77.
3. Barnes PG. It's just a quarrel. *J of the American Bar Association,* 1998; 84:24-5.
4. McClennen JC. Domestic violence between same-gender partners recent findings and future research. *J Interpers Violence*. 2005; 20(2):149-54.
5. McClennen JC, Summers B. & Vaugh, C. Gay men's domestic violence: Dynamics, help-seeking behaviors, and correlates. *J Gay Lesbian Soc Serv*. 2002; 14(1):23-49.
6. Balsam KF, Fothblum ED, Beauchaine TP. Victimization over the life span: A comparison of lesbian, gay, bisexual, and heterosexual siblings. *J Consult Clin Psychol.* 2005; 74(3), 477-87.
7. Halpern CT, Young ML, Waller MW, et al. Prevalence of partner violence in same-sex romantic and sexual relationships in a national sample of adolescents. *J Adolesc Health.* 2004. 35:124-31.
8. Burke TW, Jordan ML, Owen SS. A cross-national comparison of gay and lesbian domestic violence. *J Contemp Crim Justice*. 2002; 18:231-56.
9. Alexander CJ. Violence in gay and lesbian relationships. *J Gay Lesbian Soc Serv.* 2002; 14(1):95-8.
10. Browning C. Silence on same-sex partner abuse. *Alternate Routes.* 1995; 12:95-106.
11. Kaschak E. Intimate betrayal: Domestic violence in lesbian relationship. *Women and Therapy*. 2001; 23(3):1-5.
12. Peterman LM, Dixon CG. Domestic violence between same-sex partners: Implications for counseling. *J Couns Dev.* 2003; 81(1):40-7.
13. Pitts EL. Domestic violence in gay and lesbian relationships. *Gay and Lesbian Medical Association Journal*. 2000; 4:195-6.
14. Elliott P. Shattering illusions: Same-sex domestic violence. *J Gay Lesbian Soc Serv*. 1996; 4(1):1-8.
15. De Vidas M. Childhood sexual abuse and domestic violence: A support group for Latino gay men and lesbians. *J Gay Lesbian Soc Serv*. 1999; 10(2):51-68.
16. Greenwood GL, Relf MV, Huang B, et al. Battering victimization among a probability-based sample of men who have sex with men. *Am J Public Health.* 2002; 92:1964-9.
17. Harms B. *Domestic violence in the gay male community*. 1995. Unpublished master's thesis, San Francisco State University, Department of Psychology.
18. Bontempo DE, D'Augelli AR. Effects of at-school victimization and sexual orientation on lesbian, gay or bisexual youths' health behavior. *J Adolesc Health*. 2002. 30(5):364-74
19. Renzetti CM. *Violent betrayal: Partner abuse in lesbian relationships*. Newbury Park, CA: Sage; 1992.

Intimate Partner Violence, Physical Health, Posttraumatic Stress Disorder, Depression, and Quality of Life in Latinas

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Objectives: The purposes of this exploratory study were to a) describe physical health symptoms and diagnoses in abused immigrant Latinas, b) explore the relationships between the women's physical health and their experiences of intimate partner violence (IPV), their history of childhood trauma and immigration status, and c) explore the correlations between their physical health, health-related quality of life (HRQOL), and mental health, specifically symptoms of posttraumatic stress disorder (PTSD) and major depressive disorder (MDD).

Methods: The convenience sample (n=33) for this cross-sectional descriptive study consisted of Latino women receiving emergency shelter and community-based services at a domestic violence services agency in the northeastern U.S. We used Pearson product-moment correlation coefficients to analyze the relationships between physical health variables and IPV type and severity, childhood and adulthood sexual abuse, and HRQOL.

Results: All of the women experienced threatened abuse. More than two-thirds experienced moderate to severe psychological abuse, moderate to severe physical abuse, and/or sexual abuse. Twenty women experienced all three types. Women endorsed one or more items in neuromuscular (69.7%), gastrointestinal (63.6%), and genitourinary/gynecologic (45.5%) groupings. Pain was the most reported symptom: bodily pain in previous month (60%), repeated neck or back pain (54.5%), severe/frequent headaches (54.5%), and pelvic pain (21.2%). Eighty-one percent of women endorsed at least one pain item (mean=2.56), and the same number reported difficulty falling asleep or staying asleep. Pain and sleeping difficulty, the two most frequently reported symptoms, were consistently and highly correlated with PTSD and MDD diagnoses and symptom severity and HRQOL. Childhood sexual abuse was significantly correlated with total pain symptoms (r=0.606, p=0.000) and difficulty sleeping (from the PTSD scale) (r=0.349, p=0.046). Both pain (r=0.400, p=0.023) and sleeping difficulty (r=0.467, p=0.006) were also strongly correlated with undocumented immigration status.

Conclusion: Detailed assessment of patients with pain and sleep disorders can help identify IPV and its mental health sequelae, PTSD and MDD. Accurate identification of the root causes and pathways of the health burden carried by victims and survivors of IPV, who are vulnerable to persisting health problems without adequate healthcare, is critical in both clinical practice and research. [West J Emerg Med. 2010; 11(3):247-251.]

INTRODUCTION

Nearly one in four women have been physically assaulted or raped by an intimate partner in their lifetime.[1, 2] When psychological abuse is included, the prevalence of lifetime intimate partner violence (IPV) approaches 50%.[1,2] IPV is associated with multiple and overlapping health sequelae, which can result in significant and long-term health burdens. The most commonly cited include self-reported poor health,

general chronic pain, headaches, gastrointestinal (GI) disorders, pelvic pain and infections, several mental health disorders, and health-risk behaviors.[3-14]

IPV-related negative health outcomes are likely magnified for abused immigrant Latinas who face multiple stressors, higher levels of social isolation and entrapment, and exacerbating cultural factors.[15-19] Latinos in the U.S. remain a vulnerable population and continue to experience health disparities.[20] As a group, Latinos are subject to health disparities and are disproportionately represented in socio-demographic groups with increased risk for both physical and mental health problems, creating a "double jeopardy" for abused Latinas.[20-22]

This exploratory study investigated the physical and mental health status and healthcare needs of immigrant Latinas who had experienced IPV. Our specific aims were to a) explore the relationships between the women's physical health and their experiences of IPV, their history of childhood trauma and immigration status, and b) explore the correlations between their physical health, health-related quality of life (HRQOL), and mental health, specifically symptoms of post-traumatic stress disorder (PTSD) and major depressive disorder (MDD). A full description of the study methods and the relationships between the women's mental health and their IPV experiences, child sexual trauma, HRQOL, and immigration status was reported previously.[16]

Pain as a Health Effect of IPV

Pain is a prevalent consequence of IPV, both directly through physical injury and indirectly via other causal pathways. Wuest et al.[23] found that PTSD symptom severity mediated the relationship between IPV and chronic pain. They also found that psychological IPV severity had a *direct effect* on chronic pain severity, while IPV-related physical assault had an *indirect effect*.[23]

Mental Health Effects of IPV

MDD, PTSD and anxiety are the most frequently diagnosed mental health problems related to IPV. Golding,[24] who conducted a meta-analysis of the IPV-related research literature, reported that the weighted mean prevalence of PTSD was 63.8% (range 31%-84.4%), of major depression 47.6% (range 15%-83%), and of suicidality 17.7% (range 4.6%-77%). Most reports of the co-morbidity of IPV-related PTSD and MDD approach or exceed 50%.[25-27] Available data suggest that PTSD and MDD are higher among Latinas who report IPV than African-American or white women.[28]

Health-Related Quality of Life

Recent data showed that 24.7% of Hispanics rated their general health as fair or poor versus 12.6% for whites.[29] McGee et al.[34] found that Hispanic women who rated their health as poor or fair, versus good, very good, or excellent had more than twice the odds of death. Abused Latina women have lower HRQOL than abused women of other ethnic groups.[4-6,30-33]

METHODS

Study Design

A cross-sectional mixed-methods design was used to gather descriptive data about the women's IPV experiences, physical and mental health status, health services utilization and healthcare needs.

Sample

The convenience sample (n=33) consisted of Latino women who were receiving services at a domestic violence services agency in an urban area in New England. The mean age was 39.7 years (range 19-74 years). Two-thirds spoke no or minimal English and one in four were undocumented.

Procedure

Recruitment

Institutional review board approval was obtained from the principal investigator's institution. Informed consent was obtained in writing and data de-identified. We obtained a National Institutes of Health Certificate of Confidentiality for additional protection of the participants' confidentiality and personal information.

Data collection

Interviews were conducted in Spanish or English based on the participants' choice. Bilingual study staff and interpreters were used as needed. The survey included validated Spanish translations of all instruments.

Variables and Their Measurement

Intimate partner violence

We used the Severity of Violence Against Women Scale (SVAWS) to assess the severity of IPV on two dimensions: a) threats, which are considered psychological abuse, and b) actual violence, which includes physical and sexual abuse (alpha coefficient 0.92).[34]

Childhood sexual assault

A single question was asked, "Were you ever sexually assaulted as a child?" For positive responses, women were asked to identify the assailant's relationship to her.

Physical health

We assessed physical health using an instrument developed by Coker et al.,[12] which is a modified version of the National Health Interview Survey (NHIS).[35] The instrument contains a review of multiple symptoms for every body system, including multiple recognized physical health consequences and symptoms of IPV.

Mental health

We used the PTSD Checklist-Civilian version (PCL-C)[36] to assess for symptoms of PTSD (alpha coefficient =0.906). The PCL-C can be used as an indicator of symptom severity

Table 1. Violence, physical health and mental health

	n	Percent
Violence		
Psychological abuse (moderate-severe)	22	66.7
Physical abuse (moderate-severe)	28	84.8
Sexual abuse	24	72.7
All three types	20	60.6
Childhood sexual assault	11	33.3
Physical Health Disorders		
Neuromuscular	23	69.7
Gastrointestinal	21	63.6
Genitourinary/gynecologic	15	45.5
Mental health disorders		
Posttraumatic Stress Disorder Diagnosis	23	69.7
Major Depressive Disorder Diagnosis	19	57.6
PTSD/MDD comorbidity	18	54.5
Ever "seriously considered attempting suicide"	15	45.5
Past suicide attempt	7	21.2
Sleeping difficulty	27	81.8
Pain		
Bodily pain in previous month (moderate-severe)	20	60.6
Repeated neck or back pain	18	54.5
Severe or frequent headaches	18	54.5
Pelvic pain	7	21.2

and to establish a diagnosis of PTSD. Depressive symptoms were assessed using the DSM-IV criteria for major depressive episode.[37] We used both symptom totals and diagnoses of PTSD and MDD in data analyses.

Health-Related Quality of Life

Standard HRQOL items from the NHIS were used. Physical pain was included in the HRQOL items, as well as in the health status assessment questionnaire.

Data Analysis

We analyzed data using SPSS 17.0 for Windows. Descriptive statistics were computed for all variables. We used Pearson product-moment correlation coefficients to analyze the relationships between physical health variables and IPV type and severity, childhood and adulthood sexual abuse, immigration legal status and HRQOL.

RESULTS

The frequencies of IPV, childhood sexual assault, and the most common physical and mental health disorders reported are displayed in Table 1. Pain was the most reported symptom with all pain items taken into account. Sleeping difficulty was the single most commonly reported symptom. For both physical and mental health, more than half of the women reported that their health was poor or only fair. Ten women rated their health better than last year and 12 rated their health worse. The respondents' past and current use of tobacco, alcohol and drugs was negligible.

Correlates of Physical Health

Correlations between physical health problems

We created composite variables (total number of endorsed items) for neuromuscular, gastrointestinal (GI), and genitourinary/gynecologic (GU/GYN) groups of symptoms and disorders. Total neuromuscular disorders and total GI disorders were highly correlated ($r=0.644$, $p\leq0.001$). Singularly, repeated neck/back pain was highly correlated with one or more and total GI disorders ($5=0.555$, $p\leq0.001$).

Correlations with violence, mental health, HRQOL, and immigration status

Pain and sleeping difficulty were consistently and highly correlated with various forms of IPV and sexual assault, PTSD, MDD, and HRQOL (Table 2). Sleep is included on both axes in Table 2 to illustrate the multiple interactions sleep has with overall health and well-being. GU/GYN problems were correlated with psychological abuse ($r=0.455$, $p=0.011$) and sexual assault in the previous year ($r=0.403$, $p=0.024$) but not with physical abuse. The composite variables within the neuromuscular, GI, and GU/GYN groups were not correlated with types of IPV and sexual assault.

DISCUSSION

The range and incidence of several common adverse physical outcomes of IPV found in this study were consistent with published reports, including high rates of neuromuscular and functional GI disorders.[6,11] The rates of PTSD and MDD in this study were similar to those reported in domestic violence shelter-based studies and higher than those reported in population-based studies. Substance abuse is strongly correlated with IPV; however, it was nearly absent in this sample.[5,38]

Pain and sleeping difficulty emerged as the most problematic health effects and the mostly strongly correlated with nearly every violence, mental health, and HRQOL dimension analyzed. Pain and sleeping difficulty are not easily located in the false dichotomy of physical and mental health adverse health effects of IPV, nor do they fit into discrete clinical diagnostic boxes. As such, they perfectly illustrate the complex, intertwined and nuanced effects of IPV and other interpersonal trauma on the lives of women. Both pain and sleep are significant contributors to quality of life and overall functioning. PTSD has been shown to strongly mediate the relationship between trauma and health status and functioning.[39] In this study, pain was more strongly correlated with PTSD and MDD than with IPV and sexual assault.

Table 2. Correlations with pain and sleeping difficulty

	Bodily pain	Repeated neck/ back pain	Severe or frequent headaches	Pelvic pain	Sleeping Difficulty	Total Gastrointestinal Disorders
Violence						
Psychological abuse	.235	.254	.079	.300	.087	.102
Physical abuse	.343*	.009	.375*	.151	.172	.217
Sexual abuse	.021	.524**	.140	.018	.064	.122
Childhood sexual assault	.499**	.373*	.433*	.262	.349*	.150
Adult sexual assault	.218	.378*	.087	.058	.157	.064
Adult sexual assault in the past year	.256	.078	.026	.486**	.209	.355*
Mental health						
PTSD diagnosis	.459**	.429*	.188	.181	.476**	.280
PTSD symptom severity	.561***	.550***	.367*	.232	.751***	.388*
MDD diagnosis	.699***	.423*	.244	.238	.486**	.281
MDD symptom total	.658**	.519**	.284	.245	.568***	.331
Co-morbid PTSD and MDD	.573***	.492**	.124	.176	.391*	.271
Sleeping difficulty	.336	.269	.382*	.023	---	.445**
Health-Related Quality Of Life						
Physical health appraisal	.497**	.514**	.224	.243	.433*	.475**
Mental health appraisal	.512**	.398*	.306	.290	.521**	.226
Days physical health not good	.601***	.524**	.337	.166	.483**	.329
Days mental health not good	.480**	.410*	.206	.330	.411*	.238
Impaired daily activity	.318	.366*	.014	.025	.400*	.184
Immigration legal status	.394*	.295	.447**	.052	.428*	.285

LIMITATIONS

This study addresses a gap in the literature regarding the physical health sequelae of IPV in Latinas and the associations of these sequelae with mental health and quality of life. Given the small sample size, the results should be considered exploratory and not generalizable. This sample of Latinas who have sought help for IPV may vary from other Latinas or from abused women who do not seek services.

CONCLUSION

Although this study was exploratory, these results have important implications for research and clinical practice, particularly in emergency settings where pain is a common presenting complaint. Detailed assessment of patients with pain and sleep disorders can help identify IPV and its mental health sequelae, particularly PTSD and MDD. Accurate identification of the root causes and pathways of the health burden carried by victims and survivors of IPV, who are vulnerable to persisting health problems without adequate healthcare, is critical in both clinical practice and research.

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REFERENCES

1. Krug EG, Dahlberg JA, Mercy JA, et al. *World report on violence and health.* Geneva, Switzerland: World Health Organization;2002.
2. Tjaden P, Thoennes N. *Full report of the prevalence, incidence, and consequences of violence against women.* Washington, DC: U.S. Department of Justice, National Institute of Justice;2000.
3. Breiding MJ, Black MC, Ryan GW. Chronic disease and health risk behaviors associated with intimate partner violence - 18 US states/ territories, 2005. *Ann of Epid.* Jul 2008;18(7):538-44.
4. Bonomi AE, Anderson ML, Reid RJ, et al. Medical and psychosocial diagnoses in women with a history of intimate partner violence. *Arch of Inter Med.* 2009;169(18):1692-7.
5. Coker AL, Davis KE, Arias I, et al. Physical and mental health effects of intimate partner violence for men and women. *Am J of Prev Med.* 2002;23(4):260-8.

6. Wuest J, Merritt-Gray M, Ford-Gilboe M, et al. Chronic pain in women survivors of intimate partner violence. *J of Pain.* 2008;9(11):1049-57.
7. Carbone-Lopez K, Kruttschnitt C, Macmillan R. Patterns of intimate partner violence and their associations with physical health, psychological distress, and substance use. *Pub Heal Rep.* 2006;121(4):382-92.
8. Bonomi AE, Anderson ML, Cannon EA, et al. Intimate partner violence in latina and non-latina women. *Am J of Pre Med.* 2009;36(1):43-8.e41.
9. Coker AL. Does physical intimate partner violence affect sexual health? A systematic review. *Trau Vio Abus.* 2007;8(2):149-77.
10. Campbell JC. Health consequences of intimate partner violence. *Lancet.* 2002;359(9314):1331-6.
11. Leserman J, Drossman DA. Relationship of abuse history to functional gastrointestinal disorders and symptoms - Some possible mediating mechanisms. *Trau Vio Abus.* 2007;8(3):331-43.
12. Coker AL, Smith PH, Bethea L, et al. Physical health consequences of physical and psychological intimate partner violence. *Arch of Fam Med.* 2000;9(5):451-7.
13. Tomasulo GC, McNamara JR. The relationship of abuse to women's health status and health habits. *J of Fam Vio.* 2007;22(4):231-5.
14. Ellsberg M, Jansen H, Heise L, el at, Hlth WHOMSW. Intimate partner violence and women's physical and mental health in the WHO multi-country study on women's health and domestic violence: an observational study. *Lancet.* 2008;371(9619):1165-72.
15. Kelly UA. "What will happen if I tell you?" Battered Latina women's experiences of healthcare. *Can J of Nur Res.* 2006;38(4):78-95.
16. Kelly UA. Symptoms of PTSD and major depression in Latinas who have experienced intimate partner violence. *Iss in Men Heal Nur.* 2010;31:119-127.
17. Ramos BM, Carlson BE. Lifetime abuse and mental health distress among English-speaking Latinas. *Affilia J of Women and Soc Work.* 2004;19(3):239-56.
18. Rodriguez M, Valentine JM, Son JB, et al. Intimate partner violence and barriers to mental health care for ethnically diverse populations of women. *Trau Viol & Abuse.* 2009;10(4):358-74.
19. Rodrìguez MA, Heilemann MV, Fielder E, et al. Intimate partner violence, depression, and PTSD among pregnant Latina women. *Ann of Fam Med* .2008;6(1):44-52.
20. Smedley BD, Stith AY, Nelson AR, eds. *Unequal treatment: Confronting racial and ethnic disparities in health care*. Washington, DC: National Academies Press; 2003.
21. Centers for Disease Control. Access to Health-Care and Preventive Services Among Hispanics and Non-Hispanics - United States, 2001-2002. *MMWR.* 2004;53(40):937-41.
22. Centers for Disease Control. Health Disparities Experienced by Hispanics - United States. *MMWR.* 2004;53(40):935-7.
23. Wuest J, Ford-Gilboe M, Merritt-Gray M, et al. Abuse-related injury and symptoms of posttraumatic stress disorder as mechanisms of chronic pain in survivors of intimate partner violence. *Pain Med.* 2009;10(4):739-47.
24. Golding JM. Intimate partner violence as a risk factor for mental disorders: A meta-analysis. *J of Fam Vio.* 1999;14(2):99-132.
25. Fedovskiy K, Higgins S, Paranjape A. Intimate partner violence: How does it impact major depressive disorder and post traumatic stress disorder among immigrant latinas? *J of Imm and Mino Heal.* 2008;10:45-51.
26. Stein MB, Kennedy C. Major depressive and post-traumatic stress disorder comorbidity in female victims of intimate partner violence. *J of Aff Dis.* 2001;66(2-3):133-138.
27. Nixon RDV, Resick PA, Nishith P. An exploration of comorbid depression among female victims of intimate partner violence with posttraumatic stress disorder. *J of Aff Dis.* 2004;82:315-20.
28. Caetano R, Cunradi C. Intimate partner violence and depression among Whites, Blacks, and Hispanics. *Ann of Epid.* 2003;13(10):661-5.
29. Chowdhury PP, Balluz L, Strine TW. Health-related quality of life among minority populations in the United States, BRFSS 2001-2002. *Ethn and Dis.* 2008;18:483-7.
30. Lown EA, Vega WA. Intimate partner violence and health: self-assessed health, chronic health, and somatic symptoms among Mexican-American women. *Psych Med.* 2001;63(3):352-60.
31. Denham AC, Frasier PY, Hooten EG, et al. Intimate partner violence among latinas in eastern North Carolina. *Viol against Women.* 2007;13(2):123-40.
32. Alsaker K, Moen BE, Nortvedt MW, et al. Low health-related quality of life among abused women. *Qual of Life Res.* 2006;15(6):959-65.
33. Lown EA, Vega WA. Prevalence and predictors of physical partner abuse among Mexican American women. *Am J of Pub Heal.* 2001;91(3):441-5.
34. Marshall L. Development of the severity of violence against women scale. *J of Fam Viol.* 1992;7:103-21.
35. Census UBot. National Health Interview Survey Field Representative's Manual. In: Service UPH, ed. Washington, D.C.1994.
36. Weathers F, Litz B, Herman D, et al. The PTSD checklist (PCL): reliability, validity, and diagnostic utility. *Ann Conven of the Intern Soc for Trau Str Stud*. San Antonio, TX2003.
37. American Psychiatric Association. *Diagnostic and statistical manual of mental disorders : DSM-IV-TR*. 4th, Text Revision ed. Washington, DC: American Psychiatric Association; 2000.
38. González-Guarda RM, Peragallo N, Urrutia MT, et al. HIV risks, substance abuse, and intimate partner violence among Hispanic women and their intimate partners. *J of the Assoc of Nur in AIDS Care.* 2007;19(4):252-66.
39. Green BL, Kimberling R. Trauma, post-traumatic stress disorder, and health status. In: Schnurr PP, Green BL, eds. *Trau and heal: Physical health consequences of exposure to extreme stress*. Washington, DC: American Psychological Association; 2004:13-42.

Correlation Between Intimate Partner Violence Victimization and Risk of Substance Abuse and Depression among African-American Women in an Urban Emergency Department

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Objective: To assess rates of substance abuse (including tobacco, alcohol, and drug abuse) as well as rates of intimate partner violence (IPV) among African-American women seen in an urban emergency department (ED).

Methods: Eligible participants included all African-American women between the ages of 21-55 years old who were seen in an urban ED for any complaint and triaged to the waiting room. Eligible women who consented to participate completed a computer-based survey that focused on demographic information and general health questions, as well as standardized instruments to screen for alcohol abuse, tobacco abuse, and illicit drug use. This analysis uses results from a larger study evaluating the effects of providing patients with targeted educational literature based on the results of their screening.

Results: Six-hundred ten women were surveyed; 430 women reported being in a relationship in the past year and among these, 85 women (20%) screened positive for IPV. Women who screened positive for IPV were significantly more likely to also screen positive for tobacco abuse (56% vs. 37.5%, $p< 0.001$), alcohol abuse (47.1% vs. 23.2%, $p < 0.001$), and drug abuse (44.7% vs. 9.5%, $p<0.001$). Women who screened positive for IPV were also more likely to screen positive for depression and report social isolation.

Conclusions: African-American women seen in the ED, who screen positive for IPV, are at significantly higher risk of drug, alcohol, tobacco abuse, depression and social isolation than women who do not screen positive for IPV. These findings have important implications for ED-based and community-based social services for women who are victims of intimate partner violence. [West J Emerg Med. 2010; 11(3): 252-256.]

INTRODUCTION

Intimate partner violence (IPV), defined as a "pattern of assaultive and coercive behaviors in intimate relationships,"[1] is a serious and widespread problem in the United States. General population estimates suggest that rates of lifetime incidence of IPV among women in the U.S. range from 25-54%,[2] with higher rates noted among women accessing medical care, particularly in the emergency department (ED) setting.[3] Rates of IPV are highest in low-income and inner-city populations,[4] and among minority populations.[5]

IPV is associated with both mental and physical health problems. Population-based surveys have confirmed the association between IPV and depression and chronic health problems among both men and women victims.[6] A 2001 study conducted among minority women in an inner-city hospital in New York City also found that women who had experienced

IPV in the prior year were significantly more likely to report alcohol and drug dependence.[4] Other studies conducted in our ED setting with a similar population found higher rates of posttraumatic stress disorder, suicidal ideation, and depressive symptoms among women who were victims of IPV.[7,8]

These associations with IPV victimization and mental health problems, medical problems, and substance dependence highlight the fact that IPV exists within a complex web of social, cultural, relational, and personal factors.[9] This provides an opportunity to understand how best to provide interventions and services for IPV victims and underscores the importance of mental, physical, social, and substance-related challenges facing them.

In this study we endeavored to add to the existing research about IPV victims accessing the ED. We focused on African-American women who access our ED, as this population is known to report a relatively high rate of IPV.[10] We expanded this survey to include both mental health indicators and substance abuse screening and indicators of social and economic support. Our goal was to define the interconnections between these risk factors among at-risk patients in the ED, a step which could benefit and inform the development of ED-based IPV prevention and victim-assistance programs.

We conducted a computer-based survey of African-American female patients in our inner city ED to evaluate prevalence of current IPV in this population and to study the correlations between IPV victimization and alcohol, tobacco, and drug abuse, as well as depression and social support networks.

METHODS

We conducted a descriptive analysis of survey results obtained during the enrollment phase of a prospective, randomized longitudinal study, which evaluated the impact of patient-targeted educational brochures on patient-initiated contacts with local support resources and patient implementation of harm-reduction measures.

The study took place at an ED based in the only Level One trauma hospital of a large, southeastern U.S. city. The hospital is academically affiliated and staffed by faculty and residents from two local medical schools, and the ED sees approximately 105,000 patient visits each year. This study was reviewed and approved by the institutional review boards of our university and the hospital research oversight committee.

All African-American women seeking medical care in the ED who were in the waiting room between the ages of 18-55 were eligible for participation in this study, regardless of chief complaint. Women were excluded if they did not speak English, if they were acutely intoxicated, critically ill, currently taking anti-psychotic medication, or if they were otherwise unable to stand for 15 minutes.

Eligible patients were approached by research assistants (who were present in the ED Monday through Wednesday, 12pm to 8pm) informed about the nature of the study and asked if they were willing to participate. Women who agreed then read and completed an informed consent form and were t taken to a private booth in the ED to complete the survey on a touch-screen computer. The survey was designed with a skip pattern, with the first question in each section inquiring about relationship status or substance use in the prior 12 months. If participants answered "no" to this initial question, the survey advanced to the next section.

The survey included questions from several previously validated instruments, including the Index of Spousal Abuse (ISA),[11] the Tolerance, Worried, Eye openers, Amnesia, K(Cut) down survey (TWEAK, an alcohol-abuse survey),[12] Drug Abuse Screening Test (DAST),[13] the Hooked on Nicotine Checklist (HONC),[14] the Beck Depression Inventory (BDI),[15] as well as a brief questionnaire assessing participants' self-report of their general health, health behaviors, as well as economic and interpersonal resources.

The Index of Spousal Abuse is a 30-item scale designed to detect spousal abuse in women. There are two subscales, the ISA-P (measuring severity of physical abuse) and the ISA-NP (measuring severity of nonphysical abuse).[16] Each question is answered on a Likert-type scale and scored on a scale of 1-5 points each. The questions are phrased in the present tense and focus on detection of abuse at the time of survey administration. For the purposes of this study, any woman with an ISA-P score ≥ 10, or an ISA-NP score of ≥ 25 was considered to have a positive IPV screen.[17]

We used the TWEAK (Tolerance, Worried, Eye openers, Amnesia, K(C)ut down) scale for detecting alcohol abuse. This instrument, which consists of five questions, was developed by combining elements from both the MAST and CAGE questionnaires.[18] The questions are all answered yes/no, and the test is scored on a seven-point scale. In this study, a score of ≥ 2 was used to identify a positive screen.[19,20]

The Drug Abuse Screening Test (DAST) is a questionnaire consisting of yes/no answers. In this survey, we utilized the DAST-20, an abbreviated format shown to correlate nearly perfectly ($r=0.99$) with the longer 28-item survey.[21] In this survey, we utilized a score of ≥ 6 to indicate a positive screening for drug dependence.

The Hooked on Nicotine Checklist (HONC) is a 10-item tool initially developed to assess adolescents' loss of autonomy over tobacco, and has since been validated for use in adults.[22] In this yes/no questionnaire, we utilized a score of ≥ 1 to indicate a positive screen.

The Beck Depression Inventory, II (BDI- II) was used to assess the presence and severity of depressive symptoms.[23] In this study, we used a BDI-II score of 20 or greater, consistent with moderate to severe depression, as a positive depression screen. Prior validation studies have established an overall classification rate of 88% using this cut point (sensitivity 71%, specificity 88%).[24]

The survey also included a series of questions about general health and well-being, including questions about

Table 1. Demographic characteristics by intimate partner violence screening.

	IPV + (total: 85 women)	IPV - (total: 340 women)	
Age	39.6 years†	36.6 years†	P=0.02
Marital Status			P=0.39
Single	51 (60%)	241 (70.9%)	
Separated	10 (11.8%)	28 (8.2%)	
Divorced	12 (14.1%)	33 (9.7%)	
Widowed	1 (1.2%)	5 (1.5%)	
Married	11 (12.9%)	33 (9.7%)	
Education			P < 0.01
< 9th Grade	9 (10.6%)†	11 (3.2%)†	
Some High School	21 (24.7%)†	54 (15.9%)†	
High School	31 (36.5%)†	138 (40.6%)†	
Some College	18 (21.2%)†	99 (29.1%)†	
College	6 (7.1%)†	38 (11.2%)†	
Chief Complaint			P=0.43
Genitourinary	5 (5.9%)	21 (6.2%)	
Injury	6 (7.1%)	22 (6.5%)	
Medical	50 (58.8%)	210 (61.8%)	
Physical	20 (23.5%)	69 (29.3%)	
Unknown	1 (1.18%)	0	

†, denotes P<0.05

Table 2. Rates of positive screens for substance dependency and depression by intimate partner violence victimization.

	IPV +	IPV -		Relative Risk:
HONC + (Tobacco Dependent)	48 (56.5%)	135 (39.7%)	P<0.01	RR: 1.72 (1.2 - 2.5)
TWEAK + (Alcohol Dependent)	40 (47.1%)	85 (25.0%)	P<0.01	RR: 2.13 (1.5-3.1)
DAST + (Drug Dependent)	38 (44.7%)	35 (10.3%)	P<0.01	RR: 3.90 (2.8 - 5.5)
BDI + (Depression)	42 (49.4%)	34 (10.0%)	P<0.01	RR: 4.49 (3.2 - 6.3)

HONC, Hooked on Nicotine Checklist; *TWEAK*, Tolerance, Worried, Eye Opener, Amnesia, (K)cut down; *DAST*, Drug Abuse Screening test; *BDI*, Beck's Depression Inventory.

patients' perceived state of health, family medical history, social and family situation, and health-related behaviors.

We analyzed the survey data utilizing t-test and chi square analysis to determine the associations between IPV status and presence of mental health symptoms, alcohol or substance abuse, and general health assessment and social/family support. All usable data were included for participants who were unable to finish the survey.

RESULTS

A research assistant screened 1,250 women, of whom 610 (49%) agreed to participate in this survey. Of these, 430 women (69.9%) stated they had been in a relationship in the prior year and were queried about IPV. Of women who had been in a recent relationship, 85 (20%) screened positive for any type of IPV, with 55 women (12.9%) screening positive for both physical and non-physical IPV; 12 (2.7%) screened positive for isolated physical IPV, and 18 women (4.2%) screened positive for isolated non-physical violence.

There was no significant difference between IPV victims and women who did not report IPV with respect to marital status or chief complaint. The groups were significantly different with respect to education and age, with IPV victims less likely to have achieved an educational level of a high school graduate or beyond, and significantly older than women who were not victims of IPV (Table 1). Among women who screened negative for IPV, the mean age was 36.6 years of age, with 241 women (70.9%) listing their marital status as "single." Among this group, 138 (40.6%) had completed high school, and 137 (40.3%) had attended and/or completed college. By chief complaint, 22 women without IPV (6.5%) presented for evaluation after an injury, which was not significantly different from the rate among women who were positive for IPV (7.1%) (Table 1).

Women who were IPV victims were at significantly higher risk of screening positive for tobacco dependence (Relative risk of positive HONC: 1.72 [95% CI: 1.2-2.5]), alcohol abuse (RR of positive TWEAK: 2.13 [95% CI: 1.5-3.1]), drug abuse (RR of positive DAST: 3.90 [95% CI: 2.8-5.5]), and depression (RR of positive BDI-II: 4.49 [95% CI: 3.1-6.3]) (Table 2).

Participants also responded to a general health questionnaire, which included questions about past medical history, individual preventive health practices, and social and financial resources. We found that IPV victims were significantly less likely to respond affirmatively to question about economic security, (RR 0.48 [95% CI: 0.31-0.76]), and were also significantly less likely to report current employment (RR 0.50 [95% CI: 0.33-0.75]). IPV victims were also significantly less likely to report daily social contact (RR 0.38 [95% CI: 0.26-0.73]), the presence of a social support structure (RR 0.48 [95% CI: 0.32-0.71]), or friends/relatives who they could stay with in an emergency situation (RR 0.56 [95% CI: 0.38-0.84]) (Table 3).

DISCUSSION

In this cross-sectional survey of African-American women presenting to an urban, inner-city hospital, we found that among women who had been in a relationship in the

Table 3. Patient self-report of social and financial resources/support, by intimate partner violence victim status.

	IPV +	IPV -	
"Do you have daily contact with other people?"	63 (76.8%)	299 (92.9%)	P < 0.01
"Is there someone in your life that you can talk to about any problem?	58 (70.7%)	279 (86.7%)	P < 0.01
"Do you have someone to stay with in case of an emergency?"	58 (69.1%)	264 (82.5%)	P < 0.01
"Do you have a job outside the home?"	27 (32.9%)	174 (54.0%)	P < 0.01
"Do you usually have enough money to meet your needs?"	22 (26.8%)	152 (47.2%)	P < 0.01

prior year, 20% disclosed current IPV. This figure is mid-way between the point prevalence of IPV found in previous ED-based studies (11.7% acute incidence among women seen in the ED for any complaint)[25] and prior estimates of the annual prevalence (36%) of IPV in ED patients, found in a prior study by our group performed among the same population.[26]

The differences in rates of IPV found in these different studies may be due to several factors. First, this study queried only women who reported being in a relationship in the prior year. Adding this limiter may skew results upward or downward, depending on women's definitions of the relationships in their lives. It may be that women in our population are at risk of violent injury by people such as ex-husbands, in addition to current boyfriends/husbands. These variations may also be related to differences between point prevalence of IPV versus annual prevalence, slight differences of test characteristics of different screening tools in these patient populations over time, or to changes over time in IPV rates or willingness to disclose among patients in different communities over time.

We found that IPV victims were likely to be slightly older than non-victims (mean age 39.6 vs. 36.6, p=0.02) and were significantly less likely to have completed high school and/or have some college education. Furthermore, we found that respondents who were victims of IPV were less likely to report access to financial resources such as a job or having "enough money to meet [their] needs." We also found that IPV victims have a weaker social network and fewer sources of social support.

Identification of social isolation and economic distress among a population at risk for IPV is critical, given that both of these factors are known risk factors for IPV, as well as modifiers of women's ability to remove themselves from abusive relationships.[27,28] Furthermore, the strong correlation between IPV victimization and depression as well as alcohol and substance abuse highlight the importance of identifying and providing resources geared at depression and addiction in conjunction with support services for victims of IPV.[29]

LIMITATIONS

This study is limited by the use of a single study site, an inner-city academic ED located in a major southeastern U.S. city, as well as the focus on a single demographic group - African-American women. While the chosen study group may limit generalizability of our findings, it provides data about a population at high risk for IPV and underlines the importance of learning about substance abuse, depression, economic stressors, and social isolation among other populations in other medical and non-medical settings.

An additional limitation is the use of a survey design with reliance on patient self-reported data. We addressed this limitation through the use of previously validated survey instruments, but the possibility of recall bias or social desirability bias impacting patient responses does remain.

CONCLUSION

African-American females who experience IPV are at risk for tobacco dependence, alcohol and substance use, and depression. In addition, these women have less social support and economic stability. Future directions include extending this computer-based kiosk survey technology to other settings and to other patient populations. Additionally, these findings highlight the need for prevention and victim-support interventions that provide support for substance dependency and social isolation, in addition to IPV. To this end, future research might aim to evaluate the effectiveness of hospital-based substance abuse programs among women who are victims of IPV, as well as mechanisms to encourage women with substance dependency and limited social support to leave abusive relationships.

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REFERENCES

1. Intimate Partner Violence and Comorbid Mental Health Conditions Among Urban Male Patients. Available at: http://www.ncbi.nlm.nih.gov.proxy.library.emory.edu/pmc/articles/PMC2625845/?tool=pubmed. Accessed April 12, 2010.

2. Thompson RS, Bonomi AE, Anderson M, et al. Intimate partner violence: prevalence, types, and chronicity in adult women. *Am J Prev Med*. 2006; 30(6):447-57.
3. McCloskey LA, Lichter E, Ganz ML, et al. Intimate partner violence and patient screening across medical specialties. *Academic emergency medicine*. 2005;12(8):712-22.
4. El-Bassel N, Gilbert L, Witte S, et al. Intimate partner violence and substance abuse among minority women receiving care from an inner-city emergency department. *Women's Health Issues*. 13(1):16-22.
5. Breiding MJ, Black MC, Ryan GW. Prevalence and Risk Factors of Intimate Partner Violence in Eighteen U.S. States/Territories, 2005. *Am J Prev Med*. 2008; 34(2):112-8.
6. Coker AL, Davis KE, Arias I, et al. Physical and mental health effects of intimate partner violence for men and women. *Am J Prev Med*. 2002; 23(4):260-8.
7. Leake J, Houry D, Kaslow N, et al. Mental health symptoms and intimate partner violence in emergency department patients. *Ann Emerg Med*. 2004; 44(1):S97.
8. Houry D, Kaslow NJ, Kemball RS, et al. Does Screening in the Emergency Department Hurt or Help Victims of Intimate Partner Violence? *Ann Emerg Med*. 2008; 51(4):433-42.e7.
9. Jewkes R. Intimate partner violence: causes and prevention. *The Lancet*. 2002; 359(9315):1423-9.
10. Cunradi CB, Caetano R, Clark C, et al. Neighborhood Poverty as a Predictor of Intimate Partner Violence Among White, Black, and Hispanic Couples in the United States: A Multilevel Analysis. *Ann Epidemiology*. 2000; 10(5):297-308.
11. Campbell DW, Campbell J, King C, et al. The reliability and factor structure of the Index of Spouse Abuse with African American women. *Violence Vict.* 1994; 9(3):259-74.
12. Chan AWK, Pristach EA, Welte JW, et al. Use of the TWEAK Test in Screening for Alcoholism/ Heavy Drinking in Three Populations. *Alcoholism: Clinical and Experimental Research*. 1993; 17(6):1188-92.
13. Gavin DR, Ross HE, Skinner HA. Diagnostic validity of the Drug Abuse Screening Test in the assessment of DSM-III drug disorders. *Addiction*. 1989; 84(3):301-7.
14. Richardson CG, Johnson JL, Ratner PA, et al. Validation of the Dimensions of Tobacco Dependence Scale for adolescents. *Addictive behaviors*. 2007; 32(7):1498-1504.
15. Beck AT, Rial WY, Rickels K. Short form of depression inventory: cross-validation. *Psychological Reports*. 1974; 34(3):1184-6.
16. Campbell DW, Campbell J, King C, et al. The reliability and factor structure of the index of spouse abuse with African-American women. *Violence Vict*. 1994; 9(3):259-74.
17. Hudson WW, McIntosh SR. The assessment of spouse abuse: Two quantifiable dimensions. *J Marriage Family*. 1981; 43(4):873-88.
18. Russell M, Martier SS, Sokol RJ, et al. Detecting risk drinking during pregnancy: a comparison of four screening questionnaires. *American Journal of Public Health*. 1996; 86(10):1435.
19. Cherpitel CJ. Screening for alcohol problems in the emergency department. *Ann Emerg Med*. 1995; 26(2):158-166.
20. Bradley KA, Boyd-Wickizer J, Powell SH, Burman ML. Alcohol screening questionnaires in women: a critical review. *JAMA*. 1998; 280(2):166.
21. Skinner HA. The drug abuse screening test. *Addictive Behaviors*. 1982; 7(4):363-71.
22. Wellman RJ, DiFranza JR, Savageau JA, et al. Measuring adults' loss of autonomy over nicotine use: The Hooked on Nicotine Checklist. *Nicotine & tobacco research*. 2005; 7(1):157.
23. Beck AT, Steer RA, Brown GK. Manual for the Beck depression inventory-II. *San Antonio, TX: Psychological Corporation*. 1996.
24. Dozois DJ, Dobson KS, Ahnberg JL. A psychometric evaluation of the Beck Depression Inventory-II. *Psychological Assessment*. 1998; 10(2):83-9.
25. Abbott J, Johnson R, Koziol-McLain J, Lowenstein SR. Domestic violence against women: incidence and prevalence in an emergency department population. *JAMA*. 1995; 273(22):1763-7.
26. Houry D, Kemball R, Rhodes KV, Kaslow NJ. Intimate partner violence and mental health symptoms in African American female ED patients. *Am J Emerg Med*. 2006; 24(4):444-50.
27. Van Wyk JA, Benson ML, Fox GL, et al. Detangling Individual-, Partner-, and Community-level Correlates of Partner Violence. *Crime Delinquency*. 2003; 49(3):412-38.
28. Coker AL, Smith PH, Thompson MP, et al. Social Support Protects against the Negative Effects of Partner Violence on Mental Health. *Journal J Womens Health Gend Based Med*. 2002; 11(5):465-76.
29. Houry D, Kaslow NJ, Thompson MP. Depressive Symptoms in Women Experiencing Intimate Partner Violence. *J Interpers Violence*. 2005;20(11):1467-77.

Children at Risk for Suicide Attempt and Attempt-related Injuries: Findings from the 2007 Youth Risk Behavior Survey

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Purpose: The current study examines the associations between a range of risk factors and reports of suicide attempts and attempts requiring medical care in a nationally representative study of high school students. The goal is to examine sex differences in the risk factors associated with suicide attempts and attempt-related injuries requiring treatment by a health-care provider.

Methods: We used data from the 2007 Youth Risk Behavior Survey for students in grades 9-12 to assess the prevalence and risk factors for suicidal behavior, as well as differences in these for boys and girls. Cross-sectional multivariate logistic regression analyses were computed to determine the most important risk factors for suicide attempts and for suicide attempts requiring medical care for the sample overall and also stratified for boys and for girls.

Results: Overall, 6.9% of adolescents attempted suicide (9.3% of girls versus 4.6% of boys). Girls were more likely than boys to report a suicide attempt in the past year (Adj.OR=2.89). Among girls, sadness (Adj.OR=5.74), weapon carrying (Adj.OR=1.48), dating violence (Adj.OR=1.60), forced sex (Adj.OR=1.72), and huffing glue (Adj.OR=2.04) were significantly associated with suicide attempts. Among boys, sadness (Adj.OR=10.96), weapon carrying (Adj.OR=1.66), forced sex (Adj.OR=2.60), huffing glue (OR=1.63), hard drug use (Adj.OR=2.18), and sports involvement (Adj.OR=1.52) were significantly associated with suicide attempts.

Conclusion: These findings demonstrate similarities and differences in the modifiable risk factors that increase risk for suicide attempts among boys and girls. In terms of the differences between boys and girls, hard drug use and sports involvement may be important factors for suicide-prevention strategies directed specifically towards boys, while dating violence victimization may be an important risk factor to address for girls. Overall, these findings can help guide prevention, clinical practice, and intervention strategies to prevent suicidal behaviors among adolescents. [West J Emerg Med. 2010; 11(3):257-263.]

INTRODUCTION

Youth suicide is an increasingly important public health issue in the U.S. that impacts many adolescents, their families and communities.[1-9] In 2006 suicide was the third leading cause of death among youth 10-24 years of age.[2] Research shows that 8.4% (10.8% for girls and 6.0% for boys) of high school students in the U.S. reported attempting suicide in the past year.[10] Several well known risk factors exist for suicidal behavior among youth.[1,3-9] These include depression, impulsive and aggressive behaviors, previous victimization, social isolation, alcohol and drug use, sexual activity, and family factors. Previous studies show that several of these risk factors vary by sex.[1,8-9,11-25] However, considerable gaps still remain in understanding the extent to which these suicide risks vary by sex, particularly among nationally representative youth. More specific knowledge is needed to direct future youth suicide-prevention strategies and to decide how limited resources can be best dispersed.

The purpose of the current study is to examine the associations between a range of risk factors and reports of suicide attempts and attempts requiring medical care in a nationally representative study of high school students. The selected and modifiable risk factors have been identified as important in previous empirical and theoretical research including the developmental–transactional model of youth suicidal behaviors[6] and will be examined separately for boys and girls since the prevalence of both the risk factors and the outcome often varies by sex.[1,7,8,11,16,21,26] Moreover, focusing specifically on modifiable risk factors will ensure that information from the current study can inform future prevention strategies, clinical practice and resource allocation.

METHODS

Analyses are based on cross-sectional data from the 2007 Youth Risk Behavior Survey (YRBS), which includes a nationally representative sample (n=14,041) of high school students in grades 9-12. Details of the survey have been reported elsewhere.[27-28] The overall response rate for the study was 68%. Students voluntarily completed the anonymous, self-administered questionnaire in school following local parental permission procedures. The data are weighted to be representative of high school students in the U.S. IRB approval was obtained at Georgia State University to conduct these secondary data analyses.

Table 1 presents the 14 psychosocial variables examined in our analysis. All of these factors were di/trichotomized and have been described elsewhere.[27-28]

Two outcome variables were examined: 1) "During the past 12 months, how many times did you actually attempt suicide?" (suicide attempt); 2) "If you attempted suicide during the past 12 months, did any attempt result in an injury, poisoning, or overdose that had to be treated by a doctor or nurse?" (suicide attempt requiring medical care). Both outcome variables were dichotomized into 'No' vs. 'Any' for all analyses. Associations between all previously listed risk factors and both of these outcome variables were examined separately.

Table 1. Prevalence and wording of the psychosocial factors included in the analyses.

Variable	Wording of Question	Prevalence
Sadness	Percentage of students who felt so sad or hopeless almost every day for two weeks or more in a row that they stopped doing some usual activities during the past 12 months.	28.5%
Weapon Carrying	Percentage of students who carried a weapon such as a gun, knife, or club on one or more of the past 30 days.	18.0%
Physical Fighting	Percentage of students who were in a physical fight one or more times during the past 12 months.	35.5%
Alcohol Initiation	Percentage of students who had their first drink of alcohol other than a few sips before age 13 years.	23.8%
Binge Drinking	Percentage of students who had five or more drinks of alcohol in a row, that is, within a couple of hours, on one or more of the past 30 days.	26.0%
Monthly Drinking	Percentage of students who had at least one drink of alcohol on one or more of the past 30 days.	44.7%
Marijuana Use	Percentage of students who used marijuana one or more times during their life.	38.1%
Hard Drug Use	Percentage of students who used any form of cocaine, including powder, crack, or freebase, heroin, methamphetamines, ecstasy, or steroids one or more times during their life.	11.8%
Glue Huffing	Percentage of students who sniffed glue, breathed the contents of aerosol spray cans, or inhaled any paints or sprays to get high one or more times during their life.	13.3%
Number of Sexual Partners	Percentage of students who had sexual intercourse with three or more people during their life.	20.3%
Sports Involvement	Percentage of students who played on one or more sports teams run by school or other organizations in the past 12 months.	56.2%
Change Body Image	Percentage of students who are trying to change their weight by either gaining or losing weight.	61.7%
Dating Violence Victimization	Percent of students who were ever hit, slapped, or physically hurt on purpose by their boyfriend or girlfriend during the past 12 months.	9.9%
Forced Sex	Percentage of students who had ever been physically forced to have sexual intercourse when they did not want to.	7.8%

Table 2. Demographic and psychosocial correlates of suicidal attempt among U.S. high school students, 2007

	Suicide Attempters		Girls (Attempters)		Boys (Attempters)	
	%	OR_{adj}[1](95%CI)	%	OR_{adj}[2](95%CI)	%	OR_{adj}[2](95%CI)
Grade						
9th	32.6	**1.67 (1.28, 2.19)****	32.1	**1.86 (1.30, 2.67)***	33.6	1.40 (0.92, 2.12)
10th	30.9	**1.60 (1.10, 2.34)****	32.1	**1.83 (1.17, 2.86)***	28.2	1.35 (0.83, 2.19)
11th	19.8	1.23 (0.92, 1.66)	20.4	1.27 (0.89, 1.82)	18.8	1.24 (0.76, 2.02)
12th	16.7	1.00	15.4	1.00	19.4	1.00
Race						
Black	15.4	1.29 (0.90, 1.84)	14.7	1.23 (0.81, 1.87)	17.0	1.43 (0.84, 2.44)
Hispanic	10.4	**1.65 (1.22, 2.23)****	10.2	**1.65 (1.12, 2.43)***	10.9	**1.63 (1.02, 2.61)***
Other	23.3	**1.66 (1.25, 2.22)****	23.1	**1.63 (1.17, 2.28)***	23.9	**1.93 (1.19, 3.11)***
White	50.8	1.00	52.1	1.00	48.1	1.00
Alcohol Initiation						
After 13	45.3	1.08 (0.75, 1.57)	48.5	1.08 (0.67, 1.75)	38.6	1.12 (0.61, 2.05)
13 or Before	44.0	1.36 (0.99, 1.89)	41.0	1.47 (0.92, 2.35)	50.5	1.25 (0.59, 2.67)
None	10.7	1.00	10.6	1.00	10.9	1.00
Monthly Drinking						
Yes	42.7	1.00 (0.73, 1.37)	39.7	1.01 (0.71, 1.45)	49.9	0.91 (0.57, 1.46)
No	57.3	1.00	60.3	1.00	50.1	1.00
Binge Drinking						
Yes	48.1	**1.44 (1.03, 2.01)***	45.7	1.45 (0.99, 2.11)	53.7	1.39 (0.78, 2.49)
No	51.9	1.00	54.3	1.00	46.3	1.00
Hard Drug Use						
Yes	37.7	**1.45 (1.02, 2.06)***	32.4	1.18 (0.77, 1.81)	48.6	**2.18 (1.24, 3.84)****
No	62.3	1.00	67.6	1.00	51.4	1.00
Glue/Huffing						
Yes	38.7	**1.93 (1.54, 2.42)*****	38.2	**2.04 (1.56, 2.67)*****	39.6	**1.63 (1.08, 2.47)***
No	61.3	1.00	61.8	1.00	60.4	1.00
Marijuana Use						
Yes	51.9	1.17 (0.83, 1.64)	47.9	1.26 (0.85, 1.87)	60.4	1.03 (0.61, 1.73)
No	48.1	1.00	52.1	1.00	39.6	1.00
Weapon Carrying						
Yes	33.2	**1.53 (1.21, 1.95)*****	20.6	**1.48 (1.07, 2.07)***	61.0	**1.66 (1.00, 2.77)***
No	66.8	1.00	79.4	1.00	39.0	1.00
Physical Fighting						
Yes	40.7	1.32 (1.00, 1.76)	32.7	1.27 (0.89, 1.81)	57.9	1.50 (0.86, 2.60)
No	59.3	1.00	67.3	1.00	42.1	1.00
Dating Violence Victimization						
Yes	24.7	**1.51 (1.14, 1.99)****	22.6	**1.60 (1.06, 2.41)***	29.0	1.25 (0.84, 1.86)
No	75.3	1.00	77.4	1.00	71.0	1.00
Forced Sex						
Yes	29.1	**1.84 (1.30, 2.59)*****	31.4	**1.72 (1.20, 2.47)****	24.6	**2.60 (1.19, 5.70)***
No	70.9	1.00	68.6	1.00	75.4	1.00
Number of Sex Partners						
1/2	28.4	1.03 (0.73, 1.45)	29.5	1.01 (0.68, 1.51)	26.0	1.20 (0.83, 1.72)
3+	42.2	1.28 (0.96, 1.70)	38.1	1.51 (1.06, 2.16)	51.6	1.00 (0.60, 1.65)
No	29.4	1.00	32.5	1.00	22.4	1.00
Change Body Image						
Yes	72.6	1.09 (0.82, 1.45)	76.9	1.33 (0.95, 1.87)	63.7	0.76 (0.50, 1.17)
No	27.4	1.00	23.1	1.00	36.3	1.00
Sports Involvement						
Yes	51.2	1.05 (0.84, 1.32)	54.6	0.89 (0.70, 1.14)	43.9	**1.52 (1.07, 2.16)***
No	48.8	1.00	45.4	1.00	56.1	1.00
Sadness						
Yes	77.5	**7.13 (5.44, 9.35)*****	79.5	**5.74 (4.08, 8.07)*****	73.4	**10.96 (6.87, 17.49)*****
No	22.5	1.00	20.5	1.00	26.6	1.00

Adj, fully adjusted for all variables listed. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Data Analysis

We computed prevalence estimates and multivariate logistic regression analyses with the SPSS (v 15.0) complex survey procedure to account for the complex sampling design. Odds Ratios (OR) were computed to evaluate the strength of the associations, and statistical significant levels were determined based on both $p<0.05$ and 95% confidence intervals (CIs) that did not include 1.

RESULTS

In 2007, 6.9% of high school students reported attempting suicide, and 2.0% reported a suicide attempt that required medical care. The prevalence and associations between demographic and other characteristics and suicide attempts is presented in Table 2. Overall, sadness, binge drinking, huffing glue, hard drug use, weapon-carrying, dating violence victimization, and forced sex were associated with attempting suicide. For girls, being in a younger grade, being of 'other' minority race or Hispanic ethnicity, sadness, huffing glue, weapon-carrying, dating violence victimization, and forced sex were significantly associated with suicide attempts. Similarly, for boys, sadness, hard drug use, glue huffing, weapon-carrying, forced sex, and sports involvement were significantly associated with suicide attempts.

Associations between risk factors and suicide attempts requiring medical care are presented in Table 3. In these analyses, sadness and binge drinking were significantly associated with suicide attempts requiring medical care. Stratified analyses by sex show that for girls, sadness and having sex with more than two partners were significantly associated with suicide attempts requiring medical care. However, for boys, none of these risk factors were found to be significantly associated with suicide attempts requiring medical care.

DISCUSSION

This study examined the risk behaviors associated with suicide attempts and suicide attempts requiring medical care among high school students in the U.S. using recent national data. Four important findings need to be highlighted. First, the findings confirm previous research that have identified important risk factors for suicidal behaviors among youth.[1,3-9,11-25] In particular, the current findings show that sadness, substance use, and violent victimization were among the most important risk factors for suicide attempts among both girls and boys. Second, this study did not find significant associations, for boys or girls, between early alcohol use initiation, monthly drinking, or binge drinking and suicide attempts which have been observed in previous research.[8,24] This finding is intriguing and warrants further analyses and replication. Third, this study demonstrates that there is a range of factors contributing to suicide attempts, among both boys and girls. However, in analyses specifically of those adolescents who had attempted suicide and required medical care, few risk factors were statistically important. This finding underscores the importance for future research to consider more proximal situational and contextual factors to determine risk for injury specifically. Finally, the study highlights important sex differences in the risk factors that are important for both suicide attempts and for attempts requiring medical care. These findings need to be considered in future research, as well as in clinical practice, especially for the emergency departments (ED) where adolescent may seek care. Research shows that a suicide attempt is the strongest predictor for a future attempt and completed suicide.[29-31] Therefore, appropriate clinical intervention at the time of seeking care in the ED that is designed to reduce future attempts and injuries will be needed. Moreover, researchers also must consider the need to develop and implement potentially sex-specific prevention strategies directed towards boys and girls, separately.

Overall, these findings highlight that sadness, substance use and violent victimization remain critically important factors for suicidal behaviors and should be a priority for prevention efforts. Although the study did not specifically assess health utilization or service provision, the relatively high prevalence of these risk factors examined appear to indicate high levels of unmet health needs and the importance of providing more health services to youth. Unfortunately, mental health treatment and related services are typically underfunded at all levels of government.[32,33] However, these strategies need to be reconsidered within the context of adolescent health promotion and suicide prevention.

The findings also highlight that younger girls are at increased risk for suicide attempts, which may be due to transitions within adolescence as well as pubertal development. Previous research has shown that younger girls are more likely to engage in suicidal behaviors than younger boys, implicating the hormonal changes that girls undergo during puberty as the cause of this phenomenon.[34]

LIMITATIONS

Several limitations should be considered when interpreting the findings of this study. First, it is based on students who are attending school; therefore, the findings may not be generalizable to students who no longer attend school. Second, the data were self reported and may reflect biases and misreporting. Third, while the study included a very large sample that was also weighted to be nationally representative, the overall response rate for the survey was a relatively low 68% which may also have impacted the findings. Fourth, because of the cross-sectional survey design, the temporal ordering or any causality between the risk factors and outcome variables could not be determined. Fifth, the measures used were given equal weight and based on single indicators, not a comprehensive scale, which may further have impacted the findings. Sixth, the risk factors examined reflected different time frames, which may have also impacted

Table 3. Demographic and psychosocial correlates of suicidal attempt requiring medical care among U.S. high school students, 2007

	Injured Suicide Attempters		Girls (Injured Attempters)		Boys (Injured Attempters)	
	%	OR_{adj}[1](95%CI)	%	OR_{adj}[2](95%CI)	%	OR_{adj}[2](95%CI)
Grade						
9th	33.9	0.86 (0.53, 1.38)	31.6	1.24 (0.64, 2.43)	37.5	0.58 (0.20, 1.68)
10th	28.4	0.78 (0.40, 1.49)	34.0	0.88 (0.37, 2.07)	19.2	0.43 (0.10, 1.78)
11th	19.4	0.79 (0.44, 1.41)	17.7	0.78 (0.39, 1.52)	22.3	0.97 (0.39, 2.40)
12th	18.3	1.00	16.7	1.00	21.1	1.00
Race						
Black	16.5	0.92 (0.43, 1.96)	11.9	0.77 (0.27, 2.16)	24.6	1.62 (0.49, 5.35)
Hispanic	8.2	0.75 (0.43, 1.32)	6.9	0.62 (0.27, 1.44)	10.4	1.39 (0.40, 4.83)
Other	26.0	1.09 (0.65, 1.80)	26.6	0.89 (0.45, 1.77)	25.0	1.38 (0.44, 4.34)
White	49.3	1.00	54.6	1.00	40.1	1.00
Alcohol Initiation						
After 13	41.2	0.73 (0.29, 1.83)	46.8	1.29 (0.40, 4.17)	31.0	0.27 (0.5, 1.56)
13 or Before	52.2	0.67 (0.28, 1.65)	49.2	1.33 (0.46, 3.86)	57.6	0.16 (0.02, 1.16)
None	6.6	1.00	4.0	1.00	11.4	1.00
Monthly Drinking						
Yes	59.5	1.57 (0.84, 2.96)	58.4	1.58 (0.68, 3.65)	61.5	1.79 (0.41, 7.86)
No	40.5	1.00	41.6	1.00	38.5	1.00
Binge Drinking						
Yes	64.7	**1.87 (1.08, 3.24)***	66.4	1.74 (0.87, 3.48)	61.6	1.78 (0.45, 7.06)
No	35.3	1.00	33.6	1.00	38.4	1.00
Hard Drug Use						
Yes	52.0	1.07 (0.54, 2.10)	47.7	1.31 (0.65, 2.64)	59.3	0.86 (0.18, 4.03)
No	48.0	1.00	52.3	1.00	40.7	1.00
Glue/Huffing						
Yes	48.4	1.34 (0.78, 2.31)	50.0	1.50 (0.71, 3.17)	45.7	0.95 (0.35, 2.55)
No	51.6	1.00	50.0	1.00	54.3	1.00
Marijuana Use						
Yes	59.9	0.84 (0.47, 1.50)	57.2	0.84 (0.43, 1.63)	64.7	0.90 (0.31, 2.61)
No	40.1	1.00	42.8	1.00	35.3	1.00
Weapon Carrying						
Yes	40.5	0.97 (0.50, 1.88)	26.2	1.03 (0.51, 2.09)	67.9	1.04 (0.31, 3.57)
No	59.5	1.00	73.8	1.00	32.1	1.00
Physical Fighting						
Yes	49.7	1.03 (0.59, 1.78)	43.7	1.02 (0.54, 1.93)	60.1	1.11 (0.32, 3.92)
No	50.3	1.00	56.3	1.00	39.9	1.00
Dating Violence Victimization						
Yes	35.9	1.19 (0.66, 2.16)	32.7	1.10 (0.54, 2.26)	41.3	1.58 (0.47, 5.24)
No	64.1	1.00	67.3	1.00	58.7	1.00
Forced Sex						
Yes	41.2	1.01 (0.57, 1.80)	38.5	0.69 (0.37, 1.32)	45.7	2.62 (0.89, 7.77)
No	58.8	1.00	61.5	1.00	54.3	1.00
Number of Sex Partners						
1/2	28.8	1.78 (0.98, 3.23)	31.5	**2.81 (1.41, 5.62)***	23.7	0.73 (0.16, 3.35)
3+	53.3	1.65 (0.74, 3.67)	50.2	**2.60 (1.02, 6.62)***	59.3	0.71 (0.08, 6.70)
No	17.9	1.00	18.3	1.00	17.0	1.00
Change Body Image						
Yes	71.4	0.76 (0.46, 1.23)	75.2	0.71 (0.41, 1.25)	64.8	0.69 (0.29, 1.63)
No	28.6	1.00	24.8	1.00	35.2	1.00
Sports Involvement						
Yes	49.8	0.82 (0.51, 1.32)	52.9	0.69 (0.38, 1.26)	44.4	1.17 (0.46, 2.99)
No	50.2	1.00	47.1	1.00	55.6	1.00
Sadness						
Yes	84.6	**2.81 (1.50, 5.25)****	89.0	**3.67 (1.68, 8.03)*****	77.3	2.81 (0.91, 8.67)
No	15.4	1.00	11.0	1.00	22.7	1.00

Adj, fully adjusted for all variables listed. * p < 0.05, ** p < 0.01, *** p < 0.001

the findings. Seventh, other factors not captured in the current study may also be important for suicide attempts and related injuries and should be considered in future research. Eighth, findings regarding boys who reported a suicide attempt requiring medical care should be interpreted with caution due to the smaller number of boys who actually had an attempt that required medical care (n=114). Finally, the risk factors examined in the current study were dichotomized, which could have further impacted the findings. However, dichotomization has been shown to generate findings that are both easily understandable and do not decrease the strength of association.[35]

CONCLUSION

These findings provide an updated view based on recent and nationally representative data of the risk factors likely to increase risk for suicide attempt or suicide attempt-related injuries among high school students. Sadness, substance use, and prior victimization were particularly strong risk factors for suicide attempts. However, important differences were noted between boys and girls. These differences should be considered in future research, clinical practice and in the design of future prevention efforts. Although youth suicide mortality has seen a slight decline over the past few years,[2,14] the current findings suggest that youth suicidal behavior and related injuries remain a significant problem that need renewed resources and prevention efforts.

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REFERENCES

1. Waller MW, Hallfors DD, Halpern CT, et al. Gender differences in associations between depressive symptoms and patterns of substance use and risky behavior among a nationally representative sample of U.S. adolescents. *Arch of W Men Heal.* 2006; 9:139-50.
2. CDC, National Center for Injury Prevention and Control. Web-based Injury Statistics Query and Reporting System (WISQARS). Available at: www.cdc.gov/ncipc/wisqars. Accessed March 31, 2008.
3. Swahn MH, Simon TR, Hertz MF, et al. Linking dating violence, peer violence, and suicidal behaviors among high-risk youth. *Am J of Prev Med.* 2008; 34(1):30-8.
4. Department of Health and Human Services. The Surgeon General's call to action to prevent suicide. Washington, DC: Department of Health and Human Services; 1999. Available at: http://www.surgeongeneral.gov/library/calltoaction/default.htm. Accessed March 31, 2008.
5. Moscicki EK. Epidemiology of completed and attempted suicide: toward a framework for prevention. *Clin Neurosci Res.* 2001; 1:310-23.
6. Bridge JA, Goldstein TR, Brent DA. Adolescent suicide and suicidal behavior. *J Child Psychol Psychiatry.* 2006; 47:372-94.
7. Borowsky IW, Ireland M, Resnick MD. Adolescent suicide attempts: risks and protectors. *Pediatrics.* 2001; 107:485-93.
8. Swahn MH, Bossarte RM. Gender, early alcohol use, and suicide ideation and attempts: findings from the 2005 Youth Risk Behavior Survey. *J of Adol Heal.* 2007; 41:175-81.
9. Cho H, Hallfors DD, Iritani BJ. Early initiation of substance use and subsequent risk factors related to suicide among urban high school students. *Addict Behav*. 2007; 32:1628-39.
10. CDC, YRBSS Online. Youth online: comprehensive results interactive query system. Available at: http://apps.nccd.cdc.gov/yrbss/. Accessed March 31, 2008.
11. Kreiter SR, Krowchuk DP, Woods CR, et al. Gender differences in risk behaviors among adolescents who experience date fighting. *Pediatri*. 1999; 104:1286-92.
12. Orr DP, Beiter M, Ingersoll G. Premature sexual activity as an indicator of psychosocial risk. *Pediatri*. 1991; 87(2):141-7.
13. Swahn MH, Bossarte RM, Sullivent EE. Age of alcohol use initiation, suicidal behavior, and peer and dating violence victimization and perpetration among high-risk, seventh-grade adolescents. *Pediatr*. 2008; 121(2):297-305.
14. CDC. Suicide trends among youths and young adults aged 10--24 years --- United States, 1990—2004. MMWR. 2007; 56(35):905-8.
15. Adcock A, Nagy S, Simpson JA. Selected risk factors in adolescent suicide attempts. *Adolesc*. 1991; 26(104):817-27.
16. Shrier LA, Pierce JD, Emans SJ, et al. Gender differences in risk behaviors associated with forced or pressured sex. *Arch Pediatr Adolesc Med*. 1998; 152:57-63.

17. Brunner R, Parzer P, Haffner J, et al. Prevalence and psychological correlates of occasional and repetitive deliberate self-harm in adolescents. *Arch Pediatr Adolesc Med*. 2007; 161(7):641-9.
18. Silverman JG, Raj A, Mucci LA, et al. Dating violence against adolescent girls and associated substance use, unhealthy weight control, sexual risk behavior, pregnancy, and suicidality. *JAMA*. 2001; 286(5):572-9.
19. Berenson AB, Wiemann CM, McCombs S. Exposure to violence and associated health-risk behaviors among adolescent girls. *Arch Pediatr Adolesc Med.* 2001; 155:1238-42.
20. Bae S, Ye R, Chen S, et al. Risky behaviors and factors associated with suicide attempt in adolescents. *Arch Suicide Res*. 2005; 9:193-202.
21. Ge X, Conger RD, Elder GH Jr. Pubertal transition, stressful life events, and the emergence of gender differences in adolescent depressive symptoms. *Dev Psychol.* 2001; 37(3):404-17.
22. Brady J. The associations between alcohol misuses and suicidal behavior. *Alcohol Alcohol.* 2006; 41(5):473-8.
23. Dunn MS, Goodrow B, Givens C, et al. Substance use behavior and suicide indicators among rural middle school students. *J of School Health*. 2008; 78(1):26-31.
24. Miller JW, Naimi TS, Brewer RD, et al. Binge drinking and associated health risk behaviors among high school students. *Pediatrics*. 2007; 119(1):76-85.
25. Olshen E, McVeigh KH, Wunsch-Hitzig RA, et al. Dating violence, sexual assault, and suicide attempts among urban teenagers. *Arch Pediatr Adolesc Med.* 2007; 161(6):539-45.
26. Allison S, Roeger L, Martin G, et al. Gender differences in the relationship between depression and suicidal ideation in young adolescents. *Aust N Z J Psychiatry*. 2001; 35(4):498-503.
27. CDC. 2002 Surveillance Summaries. MMWR. 2002; 51(SS--4):1-64.
28. CDC. 2007 YRBS: Data user's manual. Available at: http://www.cdc.gov/HealthyYouth/yrbs/pdf/2007_National_YRBS_Data_Users_Manual.pdf. Accessed March 31, 2008.
29. Qin P, Jepsen P, Norgard B, et al. Hospital admission for non-fatal poisoning with weak analgesics and risk for subsequent suicide: a population study. *Psychol Med.* 2009; 39(11):1867-73.
30. Comtois KA. A review of interventions to reduce the prevalence of parasuicide. *Psychiatr Serv.* 2002;53(9):1138-44.
31. Deykin EY, Perlow R, McNamarra J. Non-fatal suicidal and life-threatening behavior among 13- to 17-year old adolescents seeking emergency medical care. *Am J Public Health.* 1985;75(1):90-2.
32. Ruiz P. The fiscal crisis in New York City: effects on the mental health care of minority populations. *Am J Psychiatry.* 1979; 136(1):93-6.
33. No Author. Final budget for fiscal year 2006 changes Medicaid and Medicare rules, cuts funds for mental health programs. *Psychiatr Serv*. 2006; 57(3):432-3.
34. Born L, Shea A, Steiner M. The roots of depression in adolescent girls: is menarche the key? *Curr Psychiatry Rep*. 2002; 4(6):449-60.
35. Farrington DP, Loeber R. Some benefits of dichotomization in psychiatric and criminological research. *Crim Behav Ment Health*. 2000; 10(2):100-23.

Nonreciprocal and Reciprocal Dating Violence and Injury Occurrence among Urban Youth

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Objective: Dating violence is a significant health problem among youth that leads to adverse health outcomes, including injuries. Reciprocal violence (perpetrated by both partners) is associated with increased injury in adults, but very little is known about the prevalence and context for reciprocal violence, as well as injury rates, among youth. We sought to determine the prevalence and scope of reciprocal dating violence and injury occurrence among urban youth in a high-risk community.

Methods: Analyses were based on data from the Youth Violence Survey, conducted in 2004, and administered to over 80% of public school students in grades 7, 9, 11, and 12 (N=4,131) in a high-risk, urban school district. The current analyses were restricted to those who reported dating in the past year and who also reported any dating violence (n=1,158). Dating violence was categorized as reciprocal (the participant reported both violence perpetration and victimization) and non-reciprocal (the participant report either violence perpetration or victimization, but not both).

Results: Dating violence reciprocity varied by sex. Girls who reported any dating violence were more likely to report reciprocal dating violence (50.4%) than were boys (38.9%). However, reciprocity did not vary by race/ethnicity or grade level. Reciprocal dating violence was more common among participants who reported more frequent violence experiences. Reciprocal violence was also associated with greater injury occurrences relative to non-reciprocal relationships (10.1% versus 1.2%).

Conclusion: Reciprocal dating violence is common among adolescents and leads more often to injury outcomes. In particular, relationships in which boys report reciprocal violence against their partner appear to lead to more frequent injury occurrences. These findings underscore the importance of addressing dating violence and factors that increase risk for reciprocal violence and therefore exacerbate injury occurrence. [West J Emerg Med. 2010; 11(3): 264-268.]

INTRODUCTION

Dating violence is common among adolescents; about one in 10 high school students report that they have been hit, slapped or physically hurt on purpose by their boyfriend or girlfriend in the past year.[1] However, the prevalence and severity of dating and sexual violence victimization are even higher among high risk samples.[2-4] Dating violence is often perpetrated by both boys and girls against their dating partners[2-3] and research shows that in relationships where there is reciprocal violence (mutual violence), injuries are more likely to occur.[5] While reciprocity of dating violence does not necessarily mean that the frequency or the severity of the violence is equal or similar between partners, it does indicate that both dating partners engage in violence.[5]

To date, there is limited research on reciprocity of dating violence among youth; one study shows that the percentage of violent adolescent relationships, in which there was reciprocal partner violence, ranged from 45% to 72%.[6] Research on reciprocity of intimate partner violence among adults has found that much of partner violence is reciprocal.[5,7,8] For example, in

Table 1. Demographic characteristics of involvement in nonreciprocal versus reciprocal dating violence.[1]

	Adolescents who date (n=2,888)								
	No violence		Any dating violence perpetration or victimization (n=1,158)						
			Nonreciprocal dating violence				Reciprocal dating violence		
			Victimization		Perpetration				
	n	%	n	%	n	%	n	%	P-value[2]
Participant's sex									
Boys	1378	47.9	242	49.8	55	11.3	189	38.9	<.0001
Girls	1500	52.1	130	22.8	153	26.8	287	50.4	
Participant's Race/ethnicity									0.8867
Hispanic	1257	44.5	163	33.7	99	20.5	221	45.8	
Non-Hispanic African American	774	27.4	103	35.2	61	20.8	129	44.0	
Non-Hispanic White	667	23.6	83	38.3	38	17.5	96	44.2	
Non-Hispanic Other	127	4.5	17	34.7	8	16.3	24	49.0	
Participant's grade									0.7734
7th	821	28.6	103	36.2	52	18.3	129	45.4	
9th	823	28.6	107	33.6	70	22.0	141	44.3	
11/12th	1231	42.8	162	35.6	85	18.7	208	45.7	

[1]Missing non-reciprocal/reciprocal items: 97, n=1056.
[2] Pearson's Chi-Square test of association.

the national studies of family violence, about half of the cases had reciprocal violence[7] and similar results were observed in the National Survey of Families and Households.[8] However, there is little information about reciprocal dating violence among youth, especially with regard to the prevalence, context, or severity. Based on research with adults, reciprocity of dating violence is more likely to lead to injury outcomes.[5] Accordingly, reciprocal violence may implicate different kinds of prevention and intervention strategies than those typically used.[5,9,10] It is, therefore, critically important to determine the scope and prevalence of dating violence reciprocity among teens where most prevention efforts are targeted.[11]

METHODS

The "Youth Violence Survey: Linkages among Different Forms of Violence" was administered in 2004 to all public school students enrolled in grades 7, 9, 11 and 12 in a school district in a high-risk community in the U.S. The details of the study have been described elsewhere.[2-4,12,13] Briefly, the school district was identified and selected using community indicators of risk (i.e., poverty, unemployment, single-parent households, and serious crimes), was racially and ethnically diverse, and located in a city with a population of less than 250,000. This district operated 16 schools (elementary, middle, high schools, alternative schools), which all agreed to participate in the study. Within these 16 schools, all students in grades 7, 9, 11, and 12 were invited to participate. Because of the high drop-out rate, students in grades 11 and 12 were grouped to produce a sufficient number of participants in the oldest of the three age groups.

Data collection occurred in April 2004. Students voluntarily completed the anonymous, self-administered questionnaire in classrooms during a 40-minute class period. The questionnaire, an optically scannable booklet in multiple-choice format, was administered by field staff. Prior to data collection, active, signed, written parental permission, and student assent were required for all students under 18 years of age to participate in the study. Students 18 years of age or older provided written consent prior to participating in the survey. Parental permission forms were provided in English, Spanish, and other major languages as requested by the schools. Return of the parental permission forms by invited students was high (14% of students did not return the form), and parent and student refusals were very low (approximately 1% each). Of the 5,098 students who met eligibility criteria, 4,131 participated, yielding a participation rate of 81%: 1,491 in 7th grade (83.0%), 1,117 in 9th grade (73.4%), and 1,523 in 11th and 12th grades combined (79.0%). The study received IRB approval from the Centers for Disease Control and Prevention and ORC Macro International. Secondary analyses of the study were also approved by the local institutional review committee.

Table 2. Severity of nonreciprocal and reciprocal dating violence in the past year among adolescents who reported any dating violence (n=1,158).

	Violence frequency			Injury occurrence		
	Low n (%)	Medium/High n (%)	p-value[1]	Yes n (%)	No n (%)	p-value[2]
Reciprocity			<.0001			<.00001
Nonreciprocal	403 (64.0)	173 (30.0)		7 (1.2)	571 (98.8)	
Reciprocal	72 (15.1)	404 (84.9)		48 (10.1)	428 (89.9)	
Participant's sex			.2396			<.001
Boy (against partner)	227 (47.3)	253 (52.7)		36 (7.4)	447 (92.6)	
Girl (against partner)	248 (43.7)	320 (56.3)		18 (3.2)	549 (96.8)	
Participant's sex by reciprocity			<.0001			
Boy against partner: nonreciprocal	194 (66.0)	100 (34.0)		6 (2.0)	290 (98.0)	
Boy against partner: reciprocal	33 (17.7)	153 (82.3)		30 (16.0)	157 (84.0)	
Girl against partner: nonreciprocal	209 (74.1)	73 (25.9)		*[3]	281 (99.6)	
Girl against partner: reciprocal	39 (13.6)	247 (86.4)		17 (6.0)	268 (94.0)	

[1] Pearson's Chi-Square test of association.
[2] Fisher's Exact test of association.
[3] Cell size smaller than 5 and not reported.

Measures

The dating-violence measures used in the current study were adapted from previous research[14,15] and the modifications are described elsewhere.[2,3,12] Briefly, dating violence perpetration and victimization were assessed through two identical 10-item scales to determine if participants had experiences with certain forms of violence (e.g., scratched, hit or slapped, threw something that could hurt, slammed or held against wall, kicked, pushed, grabbed or shoved, punched or hit with something that could hurt, threatened with a weapon, forced to have sex, and hurt badly enough to need bandages or care from a doctor or nurse) in the past 12 months. Response options for each scale were as follows never, 1-3 times, 4-9 times, and 10 or more times.

Analyses

The current analyses were restricted to those who reported dating in the past year and who also reported any dating violence (n=1,158). The data were grouped into four categories of dating violence: 1) No dating violence; 2) Dating violence victimization only; 3) Dating violence perpetration only; and 4) Dating violence reciprocity (both victimization and perpetration). Because responses to the dating violence frequency measure were not normally distributed (negatively skewed), and there were small cell sizes within levels of some of the independent measures, the median was used to group the violence data into two ordinal categories to indicate low or medium-high violence frequency. We conducted Chi Square and Fisher's exact tests to determine if there were statistically significant associations with reciprocity (nonreciprocal vs. reciprocal) and differences in categorical demographic variables (by gender, race/ethnicity and grade level), as well as violence frequency and injury occurrence.

RESULTS

There was a statistical difference between boys and girls in terms of reporting reciprocal dating violence (p<.0001) (Table 1). Among those who reported any dating violence, 38.9% of boys and 50.4% of girls reported reciprocal violence. There were no statistical significant differences in terms of reciprocity and participants' race/ethnicity or grade level. Reciprocity was associated with the frequency of violence (p<.0001) and of injury occurrence (P<.00001), with reciprocal violence associated with more frequent violence and greater injury occurrence (Table 2). However, participant's sex was not associated with violence frequency but was associated with injury occurrence (p<.001). Boys were more likely to report injuries than were girls.

DISCUSSION

Our study of urban youth in a high-risk community shows that reciprocal dating violence is relatively common among those engaging in dating violence; 38.9% of boys and 50.4% of girls reported reciprocal dating violence. Moreover, the study found that when violence is reciprocal, violence is more frequent, and there are also more reports of injuries. These findings corroborate research on adults[5] and highlight that prevention efforts that seek to reduce injuries from dating violence may need to target reciprocity specifically. More importantly, since reciprocal dating violence is common among high school students in this study, prevention strategies that seek to reduce dating violence and related injuries among

high-risk youth may need to implement prevention strategies much earlier.[2]

It is important to note also that similar to research with adults, injury occurrence was particularly common when boys reported engaging in reciprocal dating violence against their partners. Previous research has shown that boys and men are more likely to inflict injuries on their partners than are girls.[2,16] The likelihood of injury outcomes may be exacerbated because the dispute or argument escalates in severity when both partners are engaged in the act. Moreover, research shows that a woman's perpetration of violence is the strongest predictor of also being a victim of violence,[17] suggesting that the prevention of escalating violent interactions could be an important prevention target.

LIMITATIONS

Our findings are subject to several limitations. First, all participants were students in a high-risk urban school district, and results may not reflect the experiences of those who have dropped out of school or who live in other communities. Second, our measures of violence perpetration and victimization were self-reported and may be subject to reporting biases. Third, our study asked participants about their experiences and those of their dating partners, which may have varied across relationships. Accordingly, findings may pertain across dating relationships and as well as to multiple partners. Research shows that involvement in physical violence varies across relationships.[18] Finally, this study did not include any specific information about the partner or the relationship contexts that could provide more detail about factors that exacerbate dating violence and injury occurrence. These limitations must be considered in the context of the relative novelty of the analyses presented; future studies can and should address the various limitations, for example, by asking both partners about a broader range of violence-related information and by surveying participants over time to assess experiences with potentially different partners.

CONCLUSION

Despite these limitations, this is one of very few studies that have sought to determine patterns of dating-violence reciprocity and injury occurrence among adolescents. Our findings show that reciprocal dating violence is common among adolescents who are engaged in violence and that it is associated with more frequent involvement in violence and that it also more often leads to injuries. Further research is clearly needed to better determine the factors that contribute to dating violence and injury occurrence among adolescents. Meanwhile, new strategies and approaches are needed to prevent and reduce the injury outcomes associated with dating violence among youth.

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REFERENCES

1. Centers for Disease Control and Prevention. (2008). YRBSS: Youth Risk Behavior Surveillance System. Available at: http://www.cdc.gov/HealthyYouth/yrbs/index.htm.
2. Swahn MH, Simon TR, Arias I, et al. Measuring Sex Differences in Violence Victimization and Perpetration within Date and Same-Sex Peer Relationships. *Journal of Interpersonal Violence.* 2008; 23:1120-38.
3. Swahn MH, Simon TR, Hertz M, Arias I, Bossarte RM, Ross J, Gross L, Iachan R, Hamburger, M. Linking Dating Violence, Peer Violence, and Suicidal Behaviors among High-Risk Youth. *American Journal of Preventive Medicine*. 2008; 34:30-8.
4. Swahn MH, Bossarte RM. Assessing and Quantifying High-Risk: Comparing Risky Behaviors by Youth in an Urban, Disadvantaged Community with Nationally Representative Youth. *Public Health Reports*. 2009; 224-33.
5. Whitaker DJ, Haileyesus T, Swahn MH, et al. Differences in Frequency of Violence and Reported Injury Between Relationships With Reciprocal and Nonreciprocal Intimate Partner Violence. *American Journal of Public Health*. 2007;97(5):941-7.
6. Gray HM, Foshee V. Adolescent dating violence: differences between one-sided and mutually violent profiles. *J Interpers Violence.* 1997;12:126-41.
7. Straus MA. Women's violence toward men is a serious social problem. In: Gelles RJ, Loseke DR, eds. *Current Controversies on Family Violence*. 2nd ed. Newbury Park, Calif: Sage; 2004:55–77.
8. Brush LD. Violent acts and injurious outcomes in married couples: methodological issues in the National Survey of Families and Households. *Gender Society.*1990;4:56–67.
9. Capaldi, D., Kim, H., & Pears, K. (2009). The association between partner violence and child maltreatment: A common conceptual framework. Preventing partner violence: Research and evidence-based intervention strategies. In D. Whitaker & J. Lutzker (Eds.), *Preventing Partner Violence: Research and evidence-based*

intervention strategies (pp. 93-111). Washington DC: American Psychological Association.

10. Straus H, Cerulli C, McNutt LA, et al. Intimate partner violence and functional health status: associations with severity, danger, and self-advocacy behaviors. *J of Women Heal* 2009 ;*18*(5), 625-31.
11. Whitaker, D. J., Morrison, S., Lindquist, C., et al. (2006). A critical review of interventions for the primary prevention of perpetration of partner violence. *Aggres and Viol Behav, 11*(2), 151-66.
12. Bossarte RM, Simon TR, Swahn MH. Clustering of Adolescent Dating Violence, Peer Violence, and Suicidal Behavior. *J of Interper Viol*. 2008;6:815-33.
13. Swahn MH, Bossarte RM, Sullivent EE. Age of Alcohol Use Initiation, Suicidal Behavior, and Peer and Dating Violence Victimization and Perpetration among High-Risk, 7th grade Adolescents. *Pediatr.* 2008;121:297-305.
14. Foshee VA. Gender differences in adolescent dating abuse prevalence, types and injuries. *Heal Educa Resea*. 1996;11:275-86.
15. Foshee VA, Linder GF, Bauman KE, et al. The Safe Dates Project: Theoretical basis, evaluation design, and selected baseline findings. *American Journal of Preventive Medicine*. 1996;12(5 Suppl.):39-47.
16. Archer J. Sex differences in aggression between heterosexual partners: a meta-analytic review. *Psychol Bull.* 2000;126:651-80.
17. Stith SM, Smith DB, Penn CE, et al.Intimate partner physical abuse perpetration and victimization risk factors: a meta-analytic review. *Aggress Violent Behav.* 2004;10:65–98.
18. Whitaker DJ, Le B, & Niolon PH. Persistence and Desistance of the Perpetration of Physical Aggression Across Relationships: Findings From a National Study of Adolescents. *J of Interper Viol.* 2009; Epub ahead of print.

High School Students' Perceptions of Motivations for Cyberbullying: An Exploratory Study

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Objectives: Internet usage has increased in recent years resulting in a growing number of documented reports of cyberbullying. Despite the rise in cyberbullying incidents, there is a dearth of research regarding high school students' motivations for cyberbullying. The purpose of this study was to investigate high school students' perceptions of the motivations for cyberbullying.

Method: We undertook an exploratory qualitative study with 20 high school students, conducting individual interviews using a semi-structured interview protocol. Data were analyzed using Grounded Theory.

Results: The developed coding hierarchy provides a framework to conceptualize motivations, which can be used to facilitate future research about motivations and to develop preventive interventions designed to thwart the negative effects of cyberbullying. The findings revealed that high school students more often identified internally motivated reasons for cyberbullying (e.g., redirect feelings) than externally motivated (no consequences, non-confrontational, target was different).

Conclusion: Uncovering the motivations for cyberbullying should promote greater understanding of this phenomenon and potentially reduce the interpersonal violence that can result from it. By providing a framework that begins to clarify the internal and external factors motivating the behavior, there is enhanced potential to develop effective preventive interventions to prevent cyberbullying and its negative effects. [West J Emerg Med. 2010; 11(3):269-273.]

INTRODUCTION

Cyberbullying has been defined as a type of bullying that involves the use of communication technologies.[1,2] Like traditional bullying, it is intentional and repetitive.[3] Unlike in traditional bullying, researchers have not agreed that an imbalance of power is a necessary component.[4] We identify the behavior's unique characteristics as 1) the cyberbullies may be anonymous; 2) the perpetrators and targets are disassociated from the physical and social cues of a cyberbullying incident; and 3) adults may feel less empowered to intervene due to the role of technology.[3] Examples of cyberbullying include sending harassing texts, instant messages, or e-mails.[5]

Researchers have begun to investigate motivations for cyberbullying.[2,6] Two common and inter-related motivations include anonymity and the disinhibition effect.[3,5-10,12,13] Mason described how anonymity breeds disinhibition due to the distance provided by electronic communication, normal self control can be lost or greatly reduced for potential bullies. Thus, anonymity can protect adolescents from the consequences of their actions in cyberspace.[6,8] Some adolescents may feel free to do and say things they would never do in person.[6,7] Raskaukas and Stoltz[10] stated that cyberbullies were physically and emotionally removed from their victims; therefore, they did not experience the impact of their actions (i.e., disinhibition effect).

Additional motivations include homophobia, racial intolerance, and revenge.[1,2,14] Adolescents reported engaging in cyberbullying because they gained satisfaction or pleasure from hurting their victims.[1,2,8] While some cyber-perpetrators reported victimizing targets in order to feel better about themselves,[10] others cyberbullied because the perpetrators believed they were provoked by their victims[2] and sought revenge.[1,4,12] In addition, some cyberbullies may torment their victims because they dislike the person[1] or are jealous of them.[8] Further, adolescents may cyberbully just "for fun."[9,11] This motivation differs from gaining pleasure by hurting others because adolescents who bully just for entertainment may not be concerned about whether or not their targets are hurt.

Rationale for Study

Despite preliminary efforts to investigate motivations for cyberbullying,[1,2] there is a dearth of information on this topic,[15] particularly among high school populations.[16] The purpose of this study was to investigate high school students' perceptions of the motivations for cyberbullying. We used qualitative methodology to provide an in-depth understanding of this phenomenon from the adolescents' perspective.[17]

METHOD

Participants

Our research team used convenience, targeted, and snowball sampling techniques.[16] Criteria for inclusion in this study required participants to be enrolled in high school and to have experience with technology. Recruitment procedures involved displaying flyers and daily public announcements. The sample was comprised of 20 students from one suburban high school. Their ages ranged from 15 to 19 [mean (*M*) = 18; standard deviation (*SD*) = 1.05] with grade levels from 10-12. The participant sample was ethnically diverse, including: 40% African American; 30% Caucasian; 15% Hispanic; 5% Asian; 5% Trinidadian; and 5% Middle Eastern. The gender breakdown was 35% female and 65% male. Ninety percent of the participants used a cell phone, 100% had a computer at home, 100% had internet access at home, and 90% reported having a social networking site profile. Participants reported four hours of daily technology usage.

Procedures and Instrumentation

A semi-structured individual interview format allowed the researchers to further investigate topics as necessary.[18] Eight questions (e.g., "What contributes to threatening electronic communication?") were asked to each student with follow-up questions (e.g., "What are the sender's motivations?) posed as needed. Please contact the author for a copy of the interview protocol. Students age 18 and older signed consent forms prior to participating in the interview. Participants younger than 18 returned a signed parental consent form and completed an assent form prior to the interview. Students completed a demographic form on age, grade level, ethnicity and technology use. The one-on-one interviews ranged from 45 to 90 minutes. All forms and procedures were approved by the university Institutional Review Board.

Data Analysis

The students' responses were audio recorded and transcribed verbatim. The researchers imported the transcriptions into Atlas-Ti 5.0, a software program designed for the management of qualitative data. Grounded theory[20] was used due to the exploratory nature of this study and the limited literature available regarding the motivations for cyberbullying. The sample size of 20 was consistent with the recommended number of participants for studies using in-depth interviews and grounded theory.[21]

The research team developed the coding manual using an inductive-deductive process.[22] Inductive coding involved the identification of codes from the current data set to develop an informed coding manual. Deductive coding used preexisting data, research, or theory to develop codes. A second researcher with expertise in the content area of cyberbullying, reviewed the coding manual, discussed disagreements to clarify definitions, and identified exemplar quotes. Once the coding manual was finalized, researchers independently coded interviews to establish inter-rater reliability (IRR).[23] IRR is defined as the level of agreement among coders on identifying codes and subcodes within the interviews. In this study, researchers defined blocks for coding as question-and-answer responses. The researchers reached 95% IRR and discussed coding disagreements until 100% consensus was obtained. Coders determined that theoretical saturation[20] had been achieved once information redundancy[17] occurred. Researchers maintained an *audit trail,* which involved maintaining the raw records of data analysis.[17]

RESULTS

Level one codes (*internal motivations, external motivations*) emerged regarding high school students' perceived motivations for cyberbullying (Figure 1). We identified level two codes under each level one code. Each code will be defined and presented with illustrative quotations from the students.

Internal Motivations

The level one theme, *internal motivations*, described high school students' motivations for bullying that were perceived to be influenced by the cyberbully's emotional state. There were ten level two codes (*redirect feelings, revenge, make themselves feel better, boredom, instigation, protection, jealousy, seeking approval, trying out a new persona, anonymity/disinhibition effect*) categorized as *internal motivations*.

The level two code, *redirect feelings*, described a motivation that involved previous hurtful experiences. The

cyberbully may have been bullied or hurt in the past and in response bullied an innocent person online as a motivation to take their feelings out on someone else other than the perpetrator. A student stated: "You know, people have been doing it to me for so long, I deserved to be able to do it to someone."

The level two code, *revenge*, described situations in which the cyberbully was provoked or angered and wanted to get back at the perpetrator. This code was different from *redirect feelings* because the cyberbully is going after the specific person who "wronged them" to feel better, rather than randomly targeting anyone vulnerable. A student admitted to cyberbullying, stating "I was really angry and he was not nice to me and he deserved it."

The level two code, *make themselves feel better*, was defined as when the perpetrator cyberbullies someone else in an attempt to make themselves feel better. This code was differentiated from *redirect feelings* because the cyberbully may or may not have been hurt in the past and from *revenge* because the person may not have been provoked. One student stated, "Personally, that's what I think, that's why anybody tears a person down, to make themselves feel better."

The level two code, *boredom*, was characterized by the fact that the cyberbully was motivated to victimize others in an effort to fill time or create entertainment. A student described that someone may be "bullying because they have nothing better to do." Another student talked about youth online and how "they have nothing better to do than to go on the web, on a web video and just talk bad about it."

The level two code, *instigation*, was defined as the use of cyberbullying to provoke a response out of someone else, sometimes with no specific reason given in order to feel better. One student reported that when a person that "…post[s] something like that [a bad rumor], like on a bulletin, they want someone to talk to." Occasionally a student may cyberbully in response to events outside of the internet.

In the level two code, *protection,* the perpetrator was motivated to cyberbully others to be the toughest person and avoid being picked on by others. This student stated that "growing up in a rough part of town, they have been the predator of the area and that's the only way they know how to survive so they prey on other people."

The level two code, *jealousy*, was used when the person was motivated to bully someone else out of envy or resentment. One student reported that he talked to a girl whose boyfriend then became jealous. The student said "he [the boyfriend] gets jealous and says it all through MySpace."

The level two code, *seeking approval*, was defined as cyberbullying to gain approval or attention. For example, cyberbullies may bully others to impress their friends. One student reported that cyberbullies "want attention. They crave the attention, which is why they are arguing over something that's so little and petty like that. In my opinion I guess it's making them feel better to hear their friends' opinions."

The level two code, *Trying out a new persona*, was defined as wanting to represent himself or herself in a different way in cyberspace than he or she may be perceived in real life (e.g., tougher, cooler). In one example, a student stated:

> I was just trying to seem bad and would never consider doing something like that to anyone, but it's like I was really pissed off and I was like you ever say anything like that about me again I will kill you. It's so funny to think about now.

The level two code, *anonymity/disinhibition effect*, was the final code for *internal motivations*. These two motivations were combined since we found that the ability to be anonymous has a direct effect on feelings of disinhibition. In *Anonymity*, either the cyberbully may not know his online victim or the perpetrator did not reveal his identity to the cybervictim. In the *disinhibition effect* the cyberbully feels that she can say or do things that she may not do face to face. A student described the *anonymity/disinhibition effect*:

> If this person probably doesn't even know me then they are not going to know who is saying those things about them, so they are probably going to have less inhibiting from saying more and doing more.

External Motivations

The level one code *external motivations,* was defined as the reasons for cyberbullying provoked by the characteristic of the cybervictim or by something specific to the situation. Three level two codes (*no consequences, non-confrontational, target was different*) were categorized as *external motivations*.

In the level two code*, no consequences*, the cyberbully feels that he or she can get away with cyberbullying without fear of ramifications, physical retaliation from the victim, a permanent consequence (e.g., jail time), or witnessing an emotional reaction from the victim. Examples included a student quoted saying, "Well, I don't know the person and they're not going to try to come beat me up if I say this to them. So I'll say whatever I want to."

The level two code, *non-confrontational* was identified when a cyberbully did not want to have a face-to- face encounter with the victim or expressed fear of actually facing the person. One student stated, "because they [cyberbullies] don't like the confrontation."

The level two code, *target was different*, referred to a cyberbullying motivation based on the victim appearing different, having a negative reputation, or standing out in a way that the cyberbully perceived as negative. When asked why cyberbullying happens, a student stated, "because somebody doesn't like somebody else because the way they look or what people say about them."

DISCUSSION

An important contribution of this study was the finding that high school students reported a range of internal and external motivations for cyberbullying (Figure 1). This

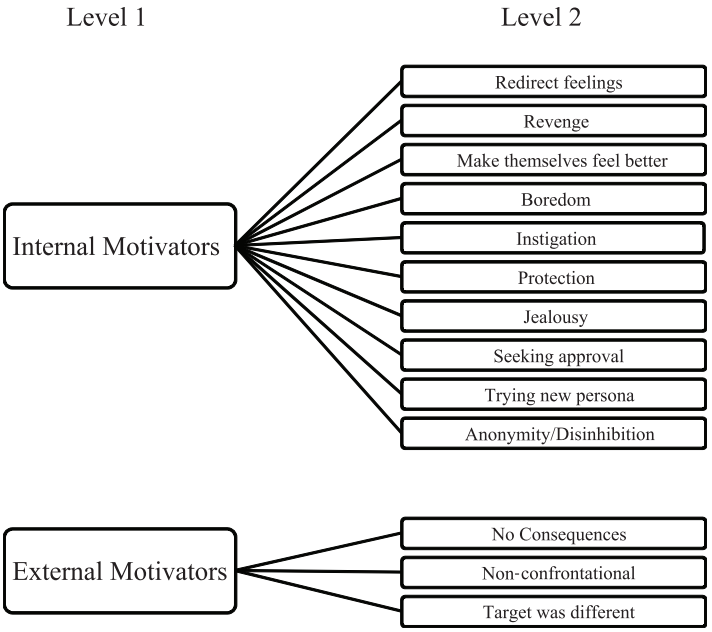

Figure 1. Coding hierarchy

illustration provides a framework to conceptualize motivations that may be useful for guiding future research and to develop preventive interventions designed to thwart the negative effects of cyberbullying. In this study *internal motivations* were associated with the perpetrators' emotional states and *external motivations* were derived from factors specific to the situation or the target. This information may be helpful for adults working with perpetrators in developing preventive interventions to address the emotional state and internal needs (e.g., to feel better) of the cyberbully, as well as focusing on external motivators.

A significant finding was that the students in this study reported *internal motivations* with greater frequency than *external motivations*. In addition, although the *anonymity/ disinhibition effect* was confirmed as a motivation for cyberbullying, it was mentioned less often than other internal motivations. This finding was interesting due to the emphasis in the literature on anonymity as a primary motivation for perpetrators.[3,5-10,12,13] Further research is needed to investigate the reasons for these findings to enhance the understanding of motivations and to develop ideas about how adults and students can effectively intervene to prevent cyberbullying, particularly for vulnerable populations [e.g., lesbian, gay, bisexual and transgender youth (LGBT)].

Another unique finding of this study was the discovery of motivations for cyberbullying not reported in the current literature (i.e., *protection*) or were not explicated in prior research (i.e., *redirect feelings*). For example, *redirect feelings* in this study emphasized the need of the perpetrator to release negative feelings rather than targeting a victim based on target characteristics. *Protection* was defined as the cyberbully wanting to protect himself/herself from being hurt so the perpetrator targeted others. Future research is needed to replicate and extend these findings.

LIMITATIONS

Because this was an exploratory study, future research is needed to continue to develop an understanding of the motivations for cyberbullying among high school students. The current sample included cyberbullies, cybervictims and bystanders. Future research should interview cyberbullies to confirm the initial findings from this study. The small sample from one suburban high school in the southeastern U.S. limits the generalizability of these findings and suggests the need for research to broaden the population of respondents and to include those from rural and urban settings, those with a wider age range, and those from diverse regions in the U.S. Males (65%) were overrepresented in this sample, prohibiting data analysis by gender. Future research is needed to systematically evaluate gender differences and similarities in the motivations for cyberbullying. Although this sample included heterosexual and gay students, it would be important for researchers to interview LGBT youth regarding their experiences with and their perceived motivations for cyberbullying. As the database about the motivations for cyberbullying continues to grow there will be a stronger basis for developing ideas for research about treatment and prevention of this behavior.

This study made several contributions to the literature regarding high school students' motivations for cyberbullying that should promote greater understanding and potentially help reduce injury associated with the interpersonal violence that can result from cyberbullying. By providing a framework that begins to explicate the internal and external factors that may motivate cyberbullying, we can begin to develop effective preventive interventions to prevent the behavior and its negative effects. This investigation illustrates one way to use qualitative methodology to produce in-depth information on the motivations of cyberbullying in a local context (e.g., culture specificity) that may be a useful model for future research on this topic.[22]

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REFERENCES

1. Hinduja S, Patchin JW. Offline consequences of online victimization: School violence and delinquency. *J of School Viol*. 2007; *6*(3):89-112.
2. Diamanduros T, Downs E, Jenkins SJ. The role of school psychologists in the assessment, prevention, and intervention of cyberbullying. *Psych in the Schools*. 2008; *45*(8):693-704.
3. Dehue F, Bolman C, Völlink T. Cyberbullying: Youngsters' experiences and parental perception. *CyberPsych & Behav*, 2008; 11(2):217-23.
4. Vandebosch, H., & Van Cleemput, K. Defining cyberbullying: A qualitative research into the perceptions of youngsters. *CyberPsych & Behav*. 2008; 11(4):499-503.
5. Katzer C, Fetchenhauer D, Belschak F. Cyberbullying: Who are the victims?: A comparison of victimization in internet chatrooms and victimization in school. *J of Med Psych: Theories, Methods, and Applications*. 2009; 21(1):25-36.
6. Mason KL. Cyberbullying: A preliminary assessment for school personnel. *Psych in the Schools*. 2008; 45(4):323-48.
7. Aricak T, Siyahhan S, Uzunhasanoglu A, et al. Cyberbullying among Turkish adolescents. *CyberPsych & Behav*, 2008; 11(3):253-261.
8. Kowalski, R. M. (2008). *Cyber Bullying: Bullying in the Digital Age*. Malden, MA: Blackwell.
9. Li Q. New bottle but old wine: A research of cyberbullying in schools. *Comput in Hum Behav*. 2007; 23:1777-91.
10. Raskauskas J, Stoltz AD. Involvement in traditional and electronic bullying among adolescents. *Develo Psych*. 2007; 43:564-75.
11. Slonje R, Smith PK. Cyberbullying: Another main type of bullying? *Scandanavian J of Psych*. 2008; 49:147-54.
12. Smith PK, Mahdavi J, Carvalho M, et al. Cyberbullying: Its nature and impact in secondary school pupils. *J Child Psychol Psych*. 2008; *49*(4):376-85.
13. Williams KR, Guerra NG. Prevalence and predictors of Internet bullying. *J Adolesc Heal*. 2007; 41(6):S14-S21.
14. Shariff S. *Cyber-Bullying: Issues and Solutions for the School, the Classroom and the Home*. 2008. London: Routledge.
15. Ramirez A, Eastin MS, Chakroff J, et al. 2008. Towards a communication-based approach to cyber-bullying. In: Kelsey, S., & St. Amant, K. (eds.), *Handbook of Research on Computer Mediated Communications (Vols 1-2).* Hershey, PA: Information Science Reference/IGI Global, pp. 339-52.
16. Ybarra ML, Mitchell KJ. Youth engaging in online harassment: Associations with caregiver-child relationships, Internet use, and personal characteristics. *J Adolesc*. 2004; *27*(3):319-36.
17. Lincoln YS, Guba EG. *Naturalistic inquiry.* Thousands Oaks, CA: Sage; 1985.
18. Schensul JJ, LeCompte MD., Nastasi BK, et al. 1999. *Ethnographers' toolkit, Book 3: Enhanced ethnographic methods.* Walnut Creek, CA: AltaMira Press.
19. LeCompte MD. *Ethnographers' toolkit, Book 3: Analyzing and interpreting ethnographic data.* Walnut Creek, CA: AltaMira Press; 1999.
20. Strauss A, Corbin J. *Basics of qualitative research: Grounded theory procedures and techniques.* Newbury Park, CA: Sage Publications, Inc; 1999.
21. Creswell JW. *Qualitative inquiry and research design: Choosing among five traditions.* Thousand Oaks, CA: Sage Publications; 1998.
22. Nastasi BK. Advances in qualitative research. In T. B. Gutkin, & Reynolds, C. R. *The Handbook of School Psychology* (4th ed.). Hoboken, NJ: John Wiley & Sons; 2009.
23. LeCompte MD, Schensul JJ. Ethnographers' toolkits, Book 5: Analyzing and interpreting ethnographic data. Walnut Creek, CA: AltaMira Press;1999.

Feasibility of Identifying Eligible Trauma Patients for Posttraumatic Stress Disorder Intervention

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Objective: This research report examines the feasibility of identifying eligible trauma patients for a study providing an early therapeutic intervention for the prevention of posttraumatic stress disorder (PTSD), and identifies reasons around participation.

Methods: This prospective observational study used a convenience sample of acute trauma victims presenting to a university-affiliated Level One trauma center in a large southeastern city. Patients eligible to participate in the early intervention study were adults (18- 65) who experienced a traumatic event within 72 hours of presentation, feared that they might be killed or seriously injured during the event, and were able to return for follow-up appointments. Patients were excluded if they were non-English speaking; experienced a loss of consciousness greater than five minutes; had a history of a serious mental illness or were currently suicidal; or endorsed current substance dependence. Descriptive statistics were conducted to determine differences in ineligible, eligible, and consenting trauma patients who enrolled in the intervention study.

Results: Over a six-month period, *n* =1961 patients presented for treatment of a traumatic injury during study hours. Results showed that eligible patients were significantly younger than ineligible patients. Survivors of assaults (physical and sexual), younger patients, and women were generally more likely to participate in a study offering a psychological intervention in the immediate aftermath of a traumatic event.

Conclusion: Fourteen percent of trauma patients were eligible and entered a study offering an early psychological intervention for the prevention of PTSD. Trauma type, age and gender may play a role in determining preference for receiving psychological services immediately after experiencing a traumatic event. [West J Emerg Med. 2010; 11(3): 274-278.]

INTRODUCTION

Posttraumatic stress disorder (PTSD) is an anxiety disorder that develops after the experience of a serious traumatic event.[1] While a number of events qualify as serious and traumatic, injury has been cited as a leading cause of PTSD.[2] Rape in general leads to more PTSD than other traumatic injuries.[3] Motor vehicle collisions (MVCs) have been found to cause 28 out of 1000 cases of PTSD, but its psychological impact on survivors is understudied.[3] In 2005, 32 million people in the U.S. visited an emergency department (ED) for an injury.[4] An estimated 10% to 40% of trauma survivors could potentially develop PTSD.[5-7] Understanding who needs treatment, who is likely to receive it, and reasons why some patients choose treatment while others do not is

necessary to develop effective intervention programs that could prevent the development of PTSD after an injury.

A great deal of research on the prevention of PTSD has been undertaken during the past two decades.[8] While several types of treatment have been studied and recommended, cognitive behavioral therapy has been found to be the most effective approach to reducing PTSD symptoms.[9-12] Early interventions delivered individually, in a limited number of sessions incorporating cognitive behavioral and exposure techniques specifically, have typically been effective at reducing the incidence of PTSD.[12-15] In order to determine if exposure therapy in the immediate aftermath of trauma can prevent the development of PTSD, we are conducting a study in the emergency department (ED) of a large, urban university-affiliated public healthcare system in the U.S.

The information provided in this brief research report stems from our on-going intervention study and serves as the first documentation of the feasibility of providing an early therapeutic intervention to individuals presenting in the ED for treatment of a traumatic injury with the hope of preventing PTSD sequelae after an injury. This report estimated the number and identifies who is likely to receive psychological treatment immediately following a traumatic event, and reasons patients enter the study or decline participation. We believe this information will be helpful to clinicians working in an ED setting by helping to identify likely candidates for intervention and to uncover possible roadblocks to patient enrollment.

METHODS

Setting

This prospective observational study used a convenience sample of acutely injured trauma patients presenting to the ED at a public hospital in a large southeastern city, with 105,000 patient visits annually. This is the only Level One trauma center in the city; thus, major traumas are routed to this hospital when possible. The hospital research oversight committee and university institutional review board approved this investigation.

Screening and enrollment procedure

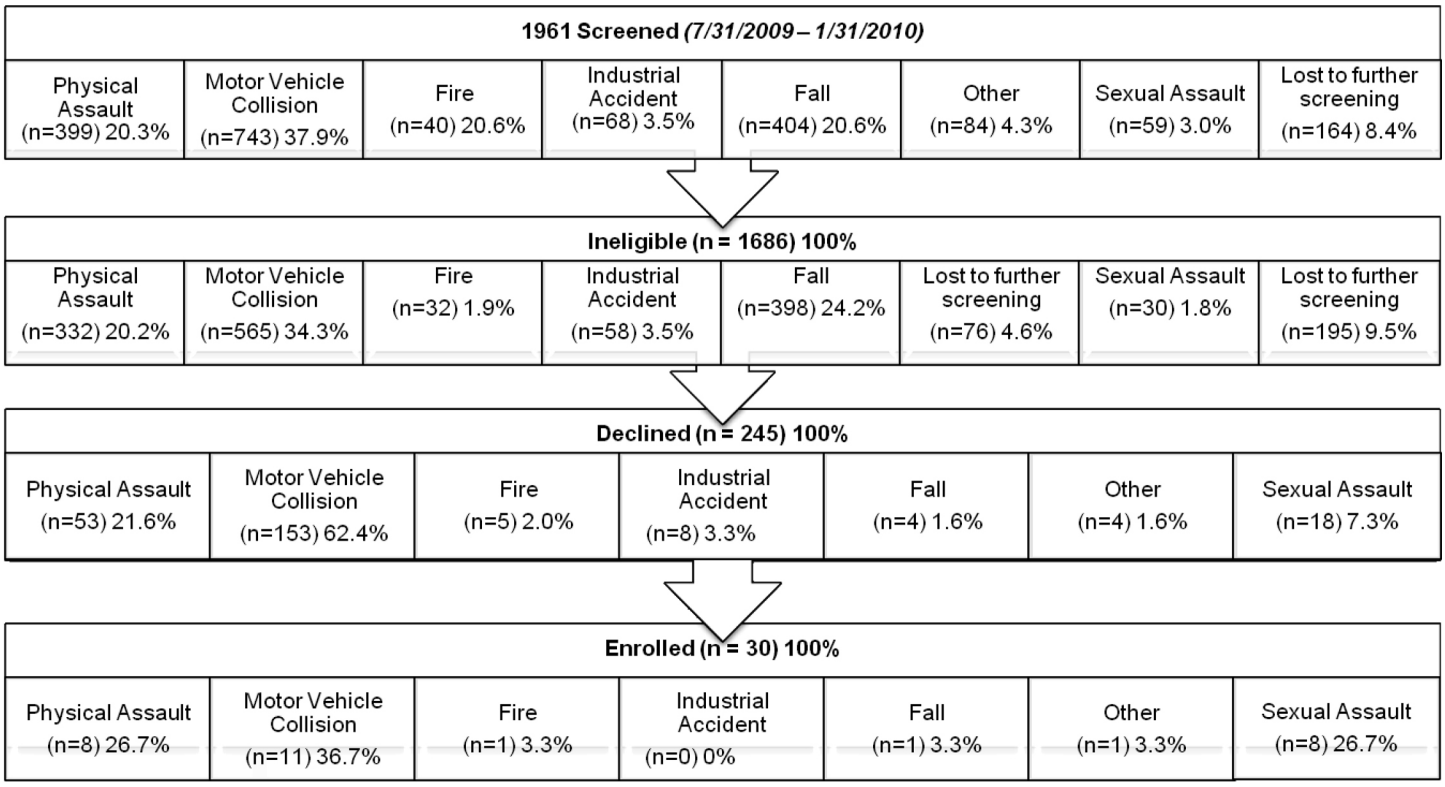
Patients were screened by one of three trained assessors, all with a minimum of a master's degree in psychology or social work, to determine whether they met criteria for participation in an on-going study examining the efficacy of an early intervention for the prevention of PTSD. Screening and enrollment data were collected for consecutive patients presenting to the ED during study staff coverage, typically six to 12 hour shifts during daylight hours seven days per week. Individuals coded as trauma patients by the medical staff in the ED were selected for screening. Assessors identified potential participants using the patient tracking board listing codes for general trauma ("8") and sexual assault survivors ("49") located in the trauma section of the ED. Patients were initially screened based on a review of demographic, medical and social history information recorded in their medical records. Criteria used from the medical records included age, mechanism of injury; whether they experienced loss of consciousness; whether they had current alcohol or drug intoxication; history of serious mental illness, and current substance dependence. Patients who appeared eligible based on this review, and who were medically able to participate in the early intervention study, were approached and provided an explanation of the early intervention study. Patients who expressed interest in participating were interviewed to determine whether they met all eligibility criteria, including criteria not listed in their medical records.

Table. Demographics of screening groups

	Age	Gender		Ethnicity			
	Mean *SD*	Male *n = 1205*	Female *n = 724*	African American *n = 1229*	White *n = 353*	Hispanic *n = 146*	Other Ethnicities *n = 22*
Total Screened *n=1961*	40.76 *17.09*	1205 *61.4%*	724 *36.9%*	1229 *62.7%*	353 *18.0%*	146 *7.4%*	29 *1.5%*
Ineligible *n =1686*	41.77 *17.65*	1059 *62.8%*	560 *33.2%*	999 *60.7%*	300 *18.2%*	141 *8.6%*	21 *1.3%*
Eligible							
Declined *n = 245*	36.34 *12.94*	119 *48.6%*	126 *51.4%*	193 *78.8%*	36 *14.7 %*	5 *2%*	5 *2%*
Enrolled *n = 30*	29.3 *12.24*	7 *23.3%*	23 *76.7%*	22 *73.3%*	6 *20%*	0 *0%*	2 *6.7%*

SD, standard deviation
Transgender (n = 1), 0.1%
*Ineligible sample missing data: a*ge (n = 274) 16.3%, gender (n = 66) 3.9%, ethnicity (n = 225) 11.0%.
*Declined sample missing data: a*ge (n = 7) 2.9%, gender (n = 0) 0%, ethnicity (n = 6) 2.2%.

Figure 1. Screened Trauma to Enrolled Trauma



Note. Other types of traumatic events included animal attacks, sports injuries and bicycle accidents.

Eligible patients who expressed interest in participating in the early intervention study were screened in their assigned location for inclusion and exclusion criteria. Eligible participants were 1) adults (18-65) who experienced a traumatic event within 72 hours of presentation in the ED; 2) afraid that they might be killed or seriously injured during the event; 3) able to be contacted following discharge and to return for follow-up appointments; and 4) alert and oriented and able to provide informed consent. Patients were excluded if they: 1) were non-English speaking; 2) lost consciousness longer than five minutes during the event; 3) reported a history of a serious mental illness; 4) were currently suicidal; or 5) reported current substance dependence.

Data collection

Outcome measures included the number of patients who entered the early intervention study, reasons for exclusion, and reasons for declining participation. The outcome measures were gathered using a Screening and Enrollment Log that tracked demographic information, traumatic event type, and reason for exclusion or refusal if the patient declined participation. Patients who expressed interest in participating in the early intervention study were further screened using an Inclusion/Exclusion Criteria Form on which the assessor checked a box indicating whether the patient met eligibility criteria. Information entered into the database was cross-checked by a second rater to ensure consistency of coding and accuracy.

Data analysis

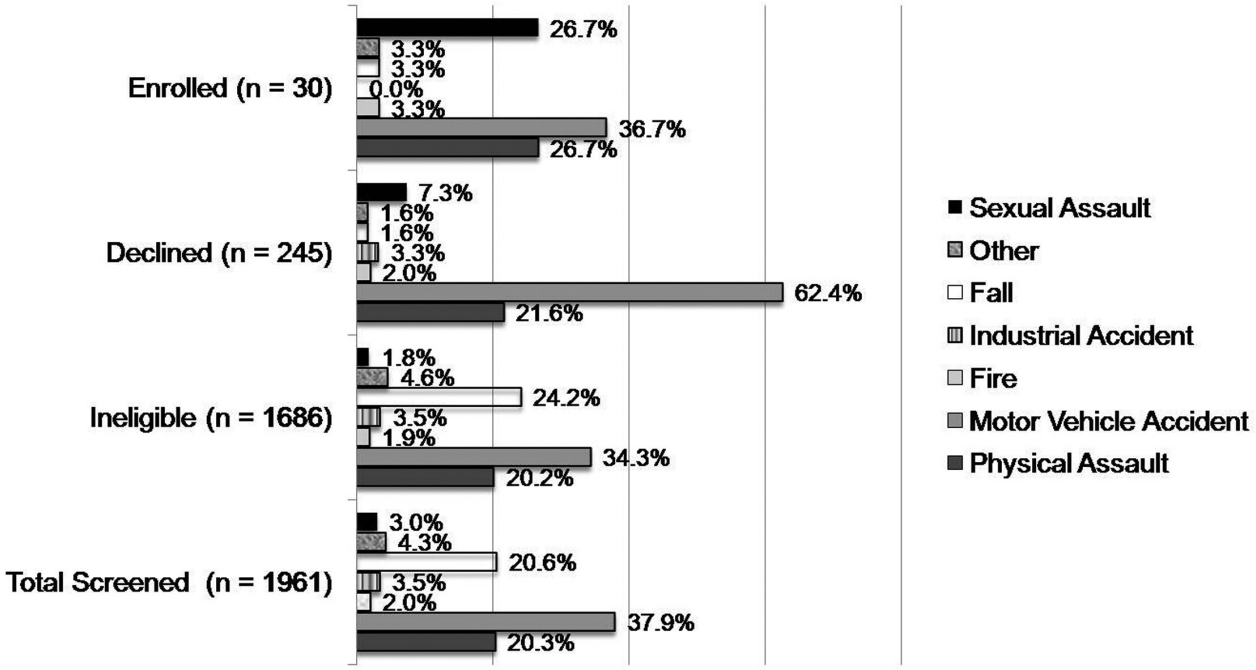
Summary statistics of demographic characteristics, including trauma type and reasons for exclusion and decline were computed. We ran t-tests of independent means and Chi square goodness-of-fit tests to determine whether any groups were significantly over-represented in our eligibility and enrollment samples.

RESULTS

Demographic statistics for the study sample (n= 1961) and subgroups are presented in the Table. Figures 1 and 2 display the frequency of each traumatic event type in the overall sample and each screening group. Among the 1,686 patients who were excluded, the most common reasons were not afraid of death or serious injury (23.4%, n= 394) and loss of consciousness (12.9%, n=218). Among patients who declined participation, 88.6% provided a reason, with the most frequently reported reasons including: not being interested in counseling (25.3%, n= 62), wanting to go home (20.8%, n= 51), and being in pain (19.0%, n= 48).

Independent samples t-tests were conducted to examine whether eligible participants differed from ineligible patients, and whether enrolled patients differed from those who

Figure 2. Screening Group by Trauma Type



declined in terms of age. Eligible patients were significantly younger (35.6+/- 13.03) than ineligible patients (41.77+/- 17.65 , p< .001), and enrolled participants (29.30+/- 12.24) were significantly younger than those who declined (36.34+/- 12.94, p< .01).

Chi-square analyses were conducted to compare gender, race, and trauma type among enrolled and declined patients. Due to statistical power limitations, only the two most frequently occurring events were compared (MVC versus both physical and sexual assaults combined). Women were more likely to be eligible and to enroll than men (21.0 % of females were eligible, 15.4% of eligible females enrolled, and 10.6% of males were eligible, 5.6% of males enrolled, p = .02). Female assault victims were more likely to enroll (31.9% of eligible female assault victims enrolled) than were male assault victims (2.5% of eligible male assault victims enrolled, p<.01); however, male (6.0%) and female (7.2%) motor vehicle survivors were equally likely to enroll (p= .99).

There was also a significant difference among African-Americans, Caucasians, and members of "Other" racial groups in terms of eligibility (p< .01). Post-hoc analyses using a Bonferroni correction revealed that African-Americans (17.7%) were more likely to be eligible than "Other" patients (6.9%, p< .01), but were equally likely to be eligible as Caucasians (12.3%, p= .02). No significant differences were found among racial groups in terms of enrollment.

There were no differences in trauma type between eligible and ineligible patients). However, assault victims (18.4%) were more likely to enroll than MVC survivors (6.7%, p<.01).

DISCUSSION

This research examined factors related to participation (eligibility and enrollment) in a study investigating an early intervention to prevent PTSD. Eligible patients were significantly younger than ineligible patients, but they did not differ in trauma type. Younger patients were more likely to meet inclusion criteria and may have been more receptive to new therapies and more likely to return for follow-up appointments. Older individuals, due to their age and the likelihood of incurring more medical problems over time, may have been more likely to meet exclusion criteria. First, individuals over age 65 were excluded from participation in the subsequent early intervention study. Second, the traumatic event may have resulted in a greater level of medical care in older adults than in younger patients, resulting in older patients being more likely to be medically unable to participate.

An examination of enrollment rates revealed that assault victims (physical and sexual) were more likely to enroll than were survivors of MVC's, as were younger patients and women. Since a majority of enrolled assault victims were female (100% of sexual assault survivors, 87.5% of physical assault survivors), reasons for higher enrollment rates among assault victims and women are most likely related. One possible reason for higher enrollment rates of assault victims may be that this type of event is more likely to cause both physical injury and a sense of personal violation among victims, resulting in an increased receptiveness to psychological assistance. It is also possible that female patients were more receptive to counseling.

LIMITATIONS

First, assessors were female, which may have influenced the relationship between enrollment rate and gender. Second, the time lapse between arrival in the ED and screening, and the timing of screening in relation to medical procedures varied and was uncontrolled. It is possible that the use of convenience sampling and systematic differences between arrival and screening time and other unavoidable procedural variations may have resulted in selection bias. Third, results are generalizable to low-income, medically indigent, African-American trauma patients presenting during daylight hours. The finding that African-American were more likely to be eligible than members of other races may be explained by the high rate of presentation of this group at this hospital, and the fact that the majority of Latinos were non-English speaking. Lastly, the fact that a majority of participants were from low-income households and were paid to participate in this research may have inflated enrollment rates.

CONCLUSION

Our findings suggest that young adults, assault survivors and women are willing to accept psychological assistance in the immediate aftermath of trauma. Such individuals may benefit from systematic integration of an early intervention for the prevention of PTSD into routine ED treatment.

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REFERENCES

1. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision*. Washington, DC: American Psychiatric Association; 2000.
2. Kessler RC, Sonnega A, Bromet E, et al. Posttraumatic stress disorder in the national comorbidity survey. *Arch Gen Psychiatry*. 1995: 1048-60.
3. Norris FH. Epidemiology of trauma: Frequency and impact of different potentially traumatic events on different demographic groups. *J Consulting and Clinical Psychology.* 1992; 60:409-18.
4. National Center for Health Statistics. Data on Injuries. 2009. Available at: www.cdc.gov/nchs/faststats/injury.htm.
5. O'Donnell ML, Creamer M, Holmes ACN, et al. Posttraumatic stress disorder after injury: Does admission to intensive care unit increase risk? *The Journal of TRAUMA Injury, Infection and Critical Care*. 2010; 10:1-6
6. O'Donnell ML, Creamer M, Pattison P, et al. Psychiatric morbidity following injury. *Am J Psychiatry*. 2004; 161: 507-14.
7. Zatzick DF, Jurkovich GJ, Gentilello L, et al. Posttraumatic stress, problem drinking, and functional outcomes after injury. *Arch Surg*. 2002; 137: 200-5.
8. Foa EB, Hembree EA, Rothbaum BO. *Prolonged exposure therapy for PTSD: Emotional processing of traumatic experiences, Therapist guide*. New York: Oxford University Press, 2007.
9. Hembree EA, Foa EB. Posttraumatic stress disorder: Psychological factors and psychosocial interventions. *J Clin Psychiatry*. 2000; 61: 33-9.
10. Harvey AG, Bryant RA, Tarrier N. Cognitive behaviour therapy for posttraumatic stress disorder. *Clin Psych Rev*. 2003; 23: 501-22.
11. Bryant RA, Mastrodomenico J, Flemingham KL, Hopwood S, Kenny L, Kandris E, Cahill C, Creamer M. Treatment of acute stress disorder. *Arch Gen Psychiatry*. 2008; 65: 659-67.
12. Bisson J, Andrew, M. Psychological treatment of posttraumatic stress disorder (PTSD). *Cochrane Database Systematic Review.* 2007: CD00338.
13. Bryant R. Early intervention for post-traumatic stress disorder. *Early Interven in Psychiatry*. 2007; 1:19-26.
14. Bryant, RA, Harvey, AG, Dang, ST, Sackville, T, Basten, C. Treatment of acute stress disorder: A comparison of cognitive-behavioral therapy and supportive counseling. *J of Consult and Clini Psych*; 1998; 66:862-6.
15. Jaycox LH, Zoellner L, Foa EB. Cognitive-behavior therapy for PTSD in rape survivors. *J of Clin Psych*. 2002; 58:891-906.

Drive Alive: Teen Seat Belt Survey Program

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Objective: To increase teen seat belt use among drivers at a rural high school by implementing the Drive Alive Pilot Program (DAPP), a theory-driven intervention built on highway safety best practices.

Methods: The first component of the program was 20 observational teen seat belt surveys conducted by volunteer students in a high school parking lot over a 38-month period before and after the month-long intervention. The survey results were published in the newspaper. The second component was the use of incentives, such as gift cards, to promote teen seat belt use. The third component involved disincentives, such as increased police patrol and school policies. The fourth component was a programmatic intervention that focused on education and media coverage of the DAPP program.

Results: Eleven pre-intervention surveys and nine post-intervention surveys were conducted before and after the intervention. The pre- and post-intervention seat belt usage showed significant differences ($p<0.0001$). The average pre-intervention seat belt usage rate was 51.2%, while the average post-intervention rate was 74.5%. This represents a percentage point increase of 23.3 in seat belt use after the DAPP intervention.

Conclusion: Based on seat belt observational surveys, the DAPP was effective in increasing seat belt use among rural high school teenagers. Utilizing a theory-based program that builds on existing best practices can increase the observed seat belt usage among rural high school students. [West J Emerg Med. 2010; 11(3): 279-282.]

INTRODUCTION

Because motor vehicle crashes are a leading cause of death for children aged 15-19 in the United States,[1-3] many states have passed teen driving laws, including those stipulating graduated driver's licensing. These laws provide young drivers a controlled driving experience before unrestricted driving privileges are granted. Also, primary seat belt laws were introduced to improve the safety of both teens and adults. In one such state with teen driver and primary seat belt laws, crash data from the Fatality Analysis Reporting System (FARS) shows that legislation from 2006 to 2008 was effective in reducing teen fatalities. In this state, the fatal crash rate for teen drivers fell 25.9% from 1.58 fatal crashes per 10,000 license drivers in 2006 to 1.17 in 2008. Despite this success, teens continue to die in preventable crashes, warranting additional improvement in the safety of teen drivers.

Teens in rural areas are at greater risk of motor vehicle collision death than their urban counterparts. The National Highway Traffic Safety Administration (NHTSA) reported 56% of the fatal crashes and 57% of the fatalities involving teen drivers occurred on rural roadways in 2008.[4] Higher fatality rates on rural roads result from several factors. Design elements often result in crashes more severe than in urban

areas. Narrower lanes, lack of guardrails or shoulders, non-graded curves, and tree lined roadways may increase crash risks.[5-6] Such road hazards can be treacherous for new and inexperienced drivers.[7-8] Speed limits on rural roads are often set at higher limits than in urban areas. Additionally, rural drivers frequently commute longer distances than urban drivers.[9] The increased distances allow greater exposure to the risk of crashing from lack of attention to driving or from simple fatigue.[10-11] Such distances also can delay the detection of an accident and the administration of medical care.[8-11]

Rural and teen drivers share several driving habits that contribute to an increased risk of injuries and fatalities.[6] These high risk groups are more likely to speed and to drive unrestrained than urban drivers.[12-13] In 2007, 33% of motor vehicle collision fatalities in rural areas were due to speed, compared to 31% in urban areas.[14] Seat belt usage among urban residents in 2009 was 83%, while rural residents wore seat belts at a slightly lower rate of 81%.[15] National seat belt use was 80% among 16- to 24- year olds in 2008, the lowest rate of any age group.[16]

As part of a Rural Roads Initiative, the Drive Alive Pilot Program (DAPP), a theory-based program building on highway safety best practices, was developed and implemented to increase seat belt use among teen motor vehicle occupants. This report focuses on the results of the DAPP at a high school in a small town in southeastern Georgia, and discusses how DAPP has increased seat belt use among the high school's students.

The DAPP model derived from three theories (Theory of Reasoned Action, Social Cognitive Theory, and Fuzzy-trace Theory) described by Dr. Robert Foss as they pertain to altering individual behavior.[17] DAPP is accomplished through four steps: 1) high visibility surveys, 2) incentives, 3) disincentives (enforcement), and 4) programmatic interventions (education/media).

METHODS

Surveys

Observational seat belt surveys were conducted at the entrance to the student parking lot of the studied high school by a student observer over a 38-month period from February 2006 to April 2009. The student was a volunteer. Over this time period, 11 pre-intervention surveys were conducted from February 2006 to April 2007. After the education/awareness intervention (termed the intervention period, although other aspects of intervention continued throughout the project) in October 2007, nine post-intervention surveys were conducted from November 2007 to April 2009. The goal for each observational survey was to record seat belt use of teen drivers and front seat passengers in 100 vehicles entering the parking lot. The pre-surveys were conducted by a different student than the post-surveys. The results of the surveys were published in the local newspaper to give the results high visibility. Individual student permission from parents was not sought as participants were randomly observed in the public domain; however, permission from school administrators was obtained. SAS 9.2.1 was utilized as the analysis tool for this study, and the procedure used to measure significant differences was proc logistic.

Incentives

After the education/awareness intervention in October 2007, incentives were used to promote teen seat belt use. Wal-Mart gift cards were awarded during the program to students who were observed using seat belts. At least five $10 Wal-Mart gift cards and one fast food gift card were given away. Pictures of teens receiving incentives were placed in the local newspaper.

Disincentives (Enforcement)

As evidenced by Click-it-or-Ticket programs, high visibility enforcement measures are effective in increasing actual seat belt usage.[18-19] During the DAPP education/awareness intervention in October 2007, students were informed through morning announcements over the public announcement system that there would be increased enforcement. The local police department increased patrols near the school during the education/awareness intervention month and placed a decoy car near the high school all day for three straight days. Though the police department did not make any stops for seat belt violations, they did increase the perception of enforcement. In addition, the school principal announced over the school public announcement system a policy that student drivers caught unbuckled by teachers or the principal would lose their parking privileges. Although this policy was never enforced, this non-police/non-traditional enforcement intervention further increased the perception of enforcement.

Programmatic Interventions (Education/Media)

Education and media interventions were implemented to increase seat belt usage and were tailored to the community. A specific week was chosen to conduct the programmatic intervention in October 2007. During this education/awareness week intervention, activities included a high school safety day with safety displays, daily highway safety videos played over the high school video system, seat belt public service announcements played over the public announcement system in the high school, buckle up messages scrolled on the electronic sign outside the high school, and a clearly visible crashed car was placed near the school. As part of the community efforts, calls were made to local youth ministers encouraging them to incorporate seat belt use into their message, and they were provided educational materials for use during meetings. During the week, the local newspaper carried a full page of pictures and narratives detailing how local "celebrities" had been saved by wearing seat belts.

RESULTS

The first observational survey revealed a seat belt usage rate of 47%. The average seat belt use during 11 pre-intervention (February 2006 to April 2007) observational surveys was 51.2% with 1,097 vehicles observed, 753 persons wearing seat belts, and 717 not wearing seat belts. The average seat belt use during nine post-intervention (November 2007 to April 2009) observational surveys was 74.5% with 897 vehicles observed, 887 persons wearing seat belts, and 304 not wearing seat belts (Figure 1). Therefore, the average seat belt use at the high school increased 23.3 percentage points after the DAPP education/awareness intervention ($p<0.0001$; odds ratio 2.806; confidence interval 2.32-3.40).

DISCUSSION

From 2006 to 2009, overall seat belt usage in the studied high school's state was 89.4%, and seat belt usage in rural areas of the state was 82.9% over the same period.[3] The results of the initial survey at the rural high school of 47.0% seat belt use by teen vehicle occupants confirmed the need for intervention. The DAPP replicated methods theorized by Foss[17] that altering driver behavior could be accomplished through the employment of the Theory of Reasoned Action, Social Cognitive Theory, and Fuzzy-trace Theory. The program affected reasoned action by creating a culture of seat belt use through high visibility efforts, including observational seat belt surveys, incentives, enforcement and programmatic interventions. High visibility media was employed through traditional (newspaper articles) and non-traditional (electronic signs and public school announcements) means. The goal of this exposure was to create a perception to teens that important others (police officers, school officials, peers and parents) possessed raised expectations of seat belt use. The goal of the incentive/disincentive component was to further reinforce these raised expectations. Newspaper stories about seat belt use were intended to mimic Foss' use of the Fuzzy-trace Theory, which theorizes an anecdotal approach to traffic safety intervention, rather than statistics.

LIMITATIONS

This project was carried out as a pilot program funded to increase seat belt usage, not as a study. Although observational seat belt surveys were intended to be conducted on a monthly basis, school schedules, summer months, illness and other commitments constrained student observers to 20 surveys over a period of 38 months. Seat belt surveys were conducted primarily by students who were oriented to collecting the data on a standardized form but did not go through other training. The program lacked a second set of observers to derive a measure of observer reliability. Data were only taken

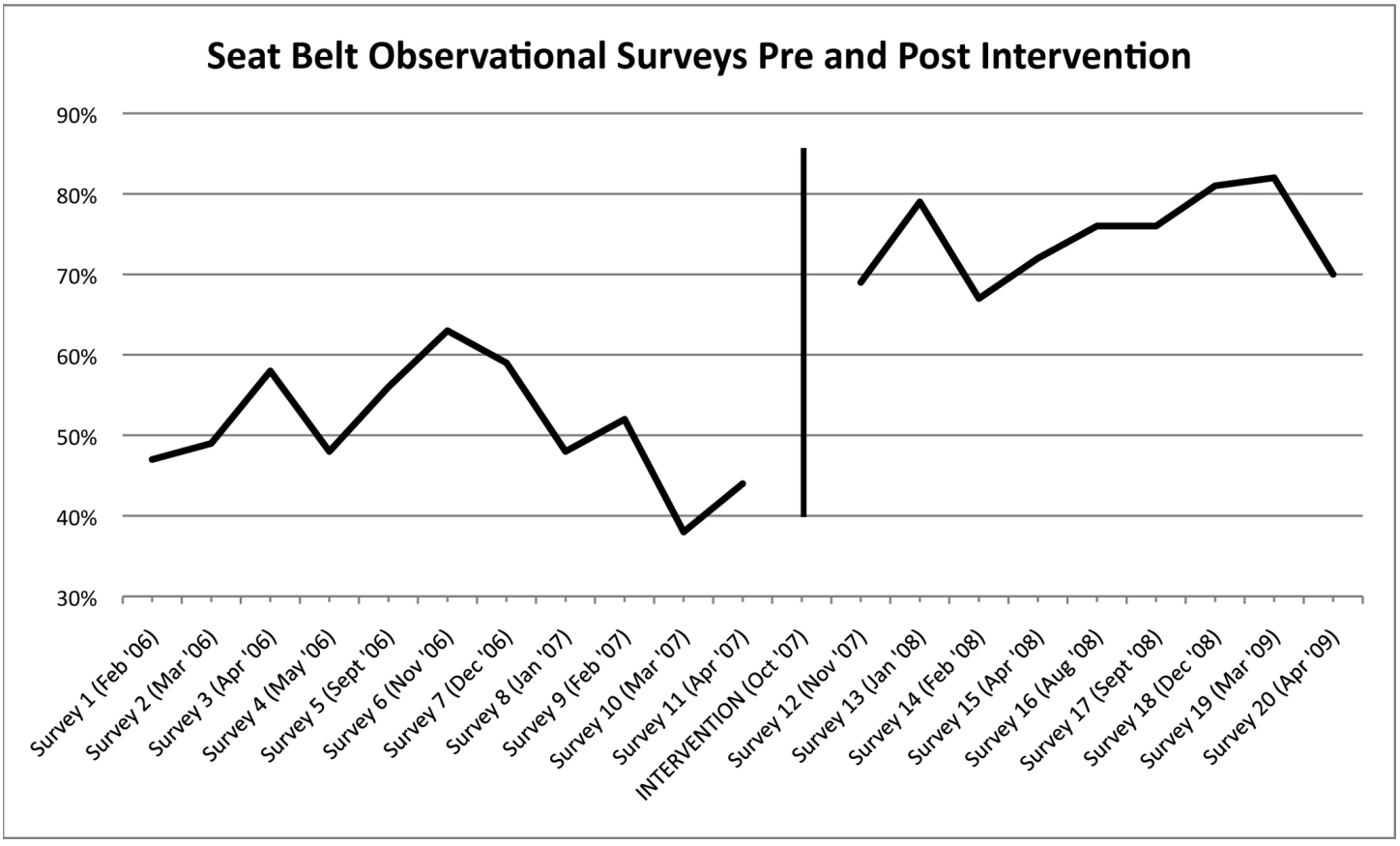

Figure 1. Seat belt observational surveys pre and post intervention

from one entrance to the high school. The publishing of the observational surveys may have affected the behavior of student drivers entering the school by creating a confrontation bias. Students could have buckled up just prior to entering the school grounds only on days when there were observers. The fact that the observations are used as part of the intervention (they were routinely published), as well as part of the evaluation, could lead to confounding of the data. Last, given that observational surveys were used for evaluation, there is the potential for a Hawthorne effect with a reduction in seat belt rates when observations end.

CONCLUSION

Based on seat belt observational surveys, the DAPP was effective in increasing seat belt use among rural high school teenagers during the time period measured. Using a theory-based program that builds on existing best practices can increase the observed seat belt usage in rural high school age drivers. Based on subsequent seat belt surveys at area high schools, the student population affected by the DAPP appears to be representative of other rural teen populations; therefore, the program is being implemented in other rural high schools using the methodology and results of the pilot program. Further study is needed to confirm the maintenance of teen behavior over time.

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REFERENCES

1. Borse NN, Gilchrist J, Dellinger AM, et al. CDC Childhood Injury Report: Patterns of Unintentional Injuries among 0-19 Year Olds in the United States, 2000-2006. Atlanta (GA): Centers for Disease Control and Prevention, National Center for Injury Prevention and Control; 2008.
2. Xu J, Kochanek KD, Tejada-Vera B. Deaths: Preliminary Data for 2007. National Vital Statistics Reports; Vol 58: no 1. Hyattsville, MD: National Center for Health Statistics; 2009.
3. Young drivers. Governor's Office of Highway Safety Web Site. Available at: http://www.gahighwaysafety.org/statistics/youngdrivers.html. Accessed February, 2010.
4. National Highway Traffic Safety Administration. *Traffic Safety Facts – Fatal Crashes Involving Young Drivers,* DOT HS 811 100. Washington, DC: National Highway Traffic Safety Administration, November; 2009.
5. Blatt J, Furman SM. Residence location of drivers involved in fatal crashes. *Accid Anal Prev*. 1998; 30(6):705-11.
6. Zwerling C, Peek-Asa C, Whitten PS, et al. Fatal motor vehicle crashes in rural and urban areas: decomposing rates into contributing factors. *Inj Prev*. 2005; 11:24-8.
7. Fisher DL, Laurie NE, Claser R, et al. Use of a fixed-base driving simulator to evaluate the effects of experience and PC-based risk awareness training on drivers' decisions. *Hum Factors*. 2002; 44:287-302.
8. Lee SE, Klauer SG, Olsen EC, et al. Detection of road hazards by novice teen and experienced adult drivers. *Transp Res Rec*. 2008; 2078:26-32.
9. Kmet L, Macarthur C. Urban-rural differences in motor vehicle crash fatality and hospitalization rates among children and youth. *Accid Ana Prev*. 2006; 38:122-127.
10. Donaldson AE, Cook LJ, Hutchings CB, et al. Crossing county lines: The impact of crash location and driver's residence on motor vehicle crash fatality. *Accid Anal Prev*. 2006; 38:723-7.
11. Ward NJ, Smith L. Shift work and driver fatigue. Proceedings of International Conference on Traffic and Transport Psychology, Berne, Switzerland, September; 2000.
12. Gonzalez RP, Cummings G, Mulekar M, et al. Increased mortality in rural vehicular trauma: Identifying contributing factors through data linkage. *J Trauma*. 2006; 61:404-9.
13. Gonzalez RP, Cummings G, Phelan HA, et al. Increased rural vehicular mortality rates: Roadways with higher speed limits or excessive vehicular speed? *J Trauma*. 2007; 6:1360-3.
14. National Highway Traffic Safety Administration, *Traffic Safety Facts – Rural/Urban Comparison,* DOT HS 810 996. Washington, DC: National Highway Traffic Safety Administration; 2007.
15. National Highway Traffic Safety Administration, *Traffic Safety Facts – Seat Belt Use in 2009 – Overall Results,* DOT HS 811 100. Washington, DC: National Highway Traffic Safety Administration; 2009.
16. National Highway Traffic Safety Administration, *Traffic Safety Facts – Seat Belt Use in 2008 – Demographic Results,* DOT HS 811 183. Washington, DC: National Highway Traffic Safety Administration; 2009.
17. Foss R. Addressing behavioral elements in traffic safety: A recommended approach. AAA Web site. Available at: www.aaafoundation.org/pdf/Foss.pdf. Accessed February, 2010.
18. Bason J. 2009 Governor's Office of Highway Safety Click-it-or-Ticket Safety Belt Initiative Telephone Survey. University of Georgia Survey Research Center.
19. Community Guide to Preventive Services. Centers for Disease Control and Prevention web site. Available at: www.thecommunityguide.org/mvoi/Motor-Vehicles.pdf. Accessed February, 2010.

Alcohol Outlets and Violent Crime in Washington D.C.

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Objective: Alcohol is more likely than any other drug to be involved in substance-related violence. In 2000 violence-related and self-directed injuries accounted for an estimated $37 billion and $33 billion in productivity losses and medical treatment, respectively. A review of emergency department data revealed violence and clinically identified trauma-related injuries have the strongest correlation among alcohol-dependent injuries. At the environmental level there is a relationship between alcohol outlet density and violent crime. A limited number of studies have examined the relationship between alcohol outlet type and the components of violent crime. The aim of this study is to examine the relationship between the aggregate components of violent crime and alcohol outlet density by type of outlet.

Methods: For this study we used Washington, D.C. census tract data from the 2000 census to examine neighborhood characteristics. Alcohol outlet, violent crime, and population-level data for Washington, D.C. were drawn from various official yetpublicly available sources. We developed an analytic database to examine the relationship between alcohol outlet category and four types of violent crime. After estimating spatial correlation and determining spatial dependence, we used a negative binomial regression analysis to assess the alcohol availability-violent crime association, while controlling for structural correlates of violence.

Results: Independent of alternative structural correlates of violent crime, including the prevalence of weapons and illicit drugs, community-level alcohol outlet density is significantly associated with assaultive violence. Outlets were significantly related to robbery, assault, and sexual offenses. In addition, the relationship among on-premise and off-premise outlets varied across violent crime categories.

Conclusion: In Washington, D.C., alcohol outlet density is significantly associated with the violent crimes. The science regarding alcohol outlet density and alcohol-related harms has clearly identified the use of limiting outlet density to reduce the associated adverse health consequences. Moreover, the disproportionate burden among poor urban and minority communities underscores the urgency to develop context-appropriate policies to regulate the functioning of current alcohol outlet establishments and to prevent the proliferation of future outlets. [West J Emerg Med. 2010; 11(3):283-290.]

INTRODUCTION

Data from the National Crime Victimization Survey (NCVS) indicate that alcohol is more likely than any other drug to be involved in substance-related violence. In 1998 approximately 25% of the victims of violent crime reported that their offender had been consuming alcohol prior to

committing a violent act.[1] In 2006 approximately one third of the victims perceived an offender who had been drinking.[2] Compared to other categories of violent crime, alcohol-related violence is most prevalent in homicidal violence.[3] From an economic perspective, in 2000 violence-related and self-directed injuries accounted for an estimated $37 billion and $33 billion in productivity losses and medical treatment, respectively.[4] A review of emergency department data revealed violence and clinically identified trauma-related injuries have the strongest correlation among alcohol-dependent injuries.[5]

Although studies have identified the positive association between alcohol consumption and the perpetration of violent crime, the underlying mechanisms behind the alcohol-violence relationship are not fully understood.[6,7] At the individual level, research suggests the alcohol-violence connection results from an interaction between an individual's natural personality trait, such as impulsiveness or aggression, and the situational context.[8-10] Accordingly, the selective nature of an individual's disinhibition (i.e., lack of constraint) is also dependent upon contextual factors and, all other factors being equal, situational norms with the least institutional support are more apt to become disinhibited.[10]

At the environmental level, research has identified an association between outlet densities and the geographical distribution of assaultive violence.[6,7,11-17] Outlet densities have also been associated with drinking norms, cirrhosis-related mortality, fatal and severe traffic crashes, and alcoholism.[15,18] Compared to communities with lower densities of alcohol outlets, communities with higher densities of outlets experience higher rates of alcohol-related problems.[19] The degree of alcohol availability in a community impacts the social, physical, and economic well being of its residents.[20]

Empirical evidence shows that both alcohol outlets and violent crime are disproportionately concentrated in poor urban minority neighborhoods.[20-23] Compared to race, ethnicity or other community characteristics, among racially segregated communities alcohol outlets are a stronger predictor of homicide and assaultive violence.[20] A descriptive study characterizing the spatial patterns of alcohol outlets in Washington, D.C. found a heavy concentration of off-premise outlets distributed among African-American communities.[3] Violence and alcohol use significantly contribute to the leading causes of death between the ages of 1-35.[24,25] Given the disproportionate levels of alcohol outlet densities and violence among urban racial/ethnic communities, spikes in violent crime, and the substantial social and economic burden associated with the alcohol availability-violent crime relationship, a further examination of this association is warranted.

The present research adds to the literature by examining the alcohol outlet density type-assaultive violence association across categories of violent crime and among a predominantly racial/ethnic urban population distribution. Previous studies, with a similar premise, have done so with either a limited number of African-Americans or have identified results contrary to the larger body of work in this area.[14,26] The goal of this study is to assess the relationship between alcohol outlet density and violent crime among communities with a predominant racial/ethnic urban population distribution; examine the types of assaultive violence included in the alcohol availability-violent crime association; and explore the alcohol outlet-violent crime relationship between alcohol outlet types (i.e., off-premise vs. on-premise).

METHODS

Study Site

Data used for this study pertain to the city of Washington, D.C. Based on the 2000 decennial census, Washington, D.C. had a total population of 572,059. The District of Columbia consisted of 188 census tracts and 5,674 census blocks. Citywide 16.7% of the families and 20.2% of the individuals lived below the poverty level. The median household income was $40,127 and 78% of the population was a high school graduate or higher. The population was 30.8% white, 60% African-American, 7.9% Hispanic or Latino, .3% American Indian and Alaska Native and 0.1% Native Hawaiian and Other Pacific Islander.

In this study, the unit of analysis is the census tract, which serves as a proxy for community neighborhoods.[27-30] The population in a census tract ranges from 1000-4000 persons. The research draws on population data from various secondary sources to develop an analytic database. We constructed indicators of community structural characteristics using 2000 decennial census data and used municipal-level population data to identify alcohol outlets and violent crime events.

Data Collection and Measures

Dependent Variables. Violent crime is composed of four offenses: murder and non-negligent manslaughter (i.e., homicide), sexual assault (i.e., sexual offenses), robbery, and assault (i.e., aggravated assault). Overall or "violent crime" was an aggregate of all four offenses. We obtained crime and arrest data for the city of Washington D.C. from the Metropolitan Police Department for 2006.

Independent Variables. For 2006, the Alcohol Beverage Regulation Administration (ABRA) provided the identification and physical location of alcohol outlets. In Washington, D.C., there are four primary types of alcoholic licenses: class "A" licenses are for package stores, which permit the sale of beer, wine, and liquor for consumption off the premises; class "B" licenses are generally reserved for grocery stores to sell only beer and wines for consumption off the premises; class "C" licenses are for the consumption of beer, wine, and liquor on the premises; and class "D" licenses function the same as class "C" licenses, except for sale of liquor. In this study we grouped alcohol outlets into the categories of on-premise outlets, off-premise outlets, and overall, or total, number of outlets.

Structural Covariates. Social disorganization theories suggest that socioeconomic conditions, minority composition,

and the physical environment characterize a community's structural ecology and its influence on violent crime.[6,31,32] In accord with the theoretical literature regarding the structural correlates of violence, the measures considered for characterizing community features were taken from census-based indicators.[6,7,13,33,34] We constructed approximately seven census-based correlates of crime using Census 2000 Data Engine Software. To avoid issues of multicollinearity among census-based indicators of economic distress, we used the index of objective neighborhood disadvantage to avoid collinear overlap. Similar indexes have been used in violence and neighborhood research.[14,35,36] Of the seven community structural variables, an index of objective neighborhood disadvantage[35,36] (mother-only households, homeownership, college-educated residents, and household poverty) was used. The index of neighborhood disadvantage divides each of the four component percentages by 10, adds the prevalence of poverty and of mother-only households, and subtracts the prevalence of home ownership and college-educated residents among the census tracts; and then divides by four. Therefore, a unit increase in the scale is equivalent to an increase of 10 percentage points in each of the components: the prevalence of poor households, mother-only households, onon-owner occupied units, and adults without a college degree. The index ranges from advantaged neighborhoods in which many adults have college degrees and own their homes and few households are poor or mother-only, on the low end, to disadvantaged neighborhoods in which few adults have college degrees, many rent rather than own their homes, and many households are poor and female-headed, on the high end. Two indicators of population density (household crowding or occupancy per room and person per square mile) and an indicator of racial / ethnic composition (i.e., African-American) were included in the model. Disorder was assessed as the number of occupied households.[36-38] Because of the connection between hand guns, illicit drugs, and violent crimes, weapons-related and illicit drug-related arrests were included as community indicators of gun and drug violence.[39] Except where expressed as percentages, all variables are population-based rates geocoded to their respective census tract location.

Analytic Strategy

We conducted pairwise correlations between community structural characteristics, alcohol outlet density, and violent crime. To avoid the risk of a type I error or a multiple comparison fallacy, the Sidak correction method was used for adjusting significance levels to take multiple comparisons into account.[40,41] Moran's Index (Moran's I) was used to estimate spatial correlation among violent crime outcome variables.[42,43] The spatial correlation was modestly positive (0.267); however, diagnostics of full models for spatial dependence (i.e., spatial lag and spatial error estimates) did not identify significant spatial dependence in either of the likelihood estimations.

We used studentized deleted residuals to determine if any observations had an undue influence on the coefficient estimates because of an extreme discrepant value or outlier. An additional indication of undue influenced was employed using Cook's Distance, which estimates leverage and discrepancy combined. After adjusting for outlying and influential observations and small total population counts (i.e., population <100), the data used in this study included an analytic sample of 80% of the census tracts. The population of the census tract is used as an offset variable. By using the offset, the study models the effects of the predictors on the count of violence (or any outcome) per population. This neutralizes the potential impact of the different scales and the differences in the populations at risk of violence.

Because of the skewed distribution of the data, the study's analytical framework is premised on a Poisson probability distribution.[44] Consequently, we used a negative binomial multivariate regression analysis to assess the relationship between alcohol outlet density and violent crime among urban communities to examine the types of assaultive violence included in the alcohol availability-violent crime associationm and explore the alcohol outlet-violent crime association between alcohol outlet types (i.e., off-premise vs. on-premise). To develop the most parsimonious model, we removed population characteristics that were either statistically insignificant or marginally contributed to improving model fit from the final model.

RESULTS

Table 1 presents descriptive statistics for the outcome variable of violent crime, alcohol outlets, and the structural covariates of violent crime. In 2006 there were approximately 1,400 alcohol outlets in Washington, D.C, 30% of them off-premise outlets. On average, there were 26 crimes and 4.64 outlets per census tract.

Table 1. Descriptive statistics for outcome and exposure variables

Variable	Mean	Min	Max	SD
Violent crime	26	0	69	5.7
Alcohol outlets	4.64	0	30	16.3
College education	58.2	0	648	93.2
Mother-Only households	142	0	747	126.3
Home ownership	557.8	0	1,988	403.3
Household poverty	214	0	891	143.7
Africa-American	1,975	7	5,815	1212.7
Occupied households	1,286	1	4,632	639.1
Population density	13,654	531	38,375	8006.6
Crowded households	83	0	328	63.6
Illicit drugs	32	0	179	33.6
Weapons arrest	6	0	23	5.5

Table 2. Correlations between neighborhood structural characteristics, alcohol outlets and violent crime in Washington, D.C., 2006

Variable	Violent Crime
Violent crime	1.00
Alcohol outlets	0.250*
Neighborhood disadvantage	0.472*
African American	0.571*
Occupied households	0.031
Population density	0.257*
Crowded households	0.604*
Illicit drugs	0.555*
Weapon arrest	0.621*

* Significant at the p≤0.05 level (two-tailed)

Table 3. Negative Binomial Regression of Violent Crime Regressed on Alcohol Outlets

Variable	Exp (b)	Z-Test	p Value (two-tailed)
Alcohol outlets	1.04	4.63	0.0001*
Disadvantage	1.03	1.55	0.120
African American[a]	1.25	4.40	0.0001*
Occupied households[a]	0.478	-7.23	0.0001*
Population density[b]	1.26	3.74	0.0001*
Crowded households[c]	1.01	0.89	0.372
Illicit drug arrests[c]	1.03	1.74	0.082
Weapons arrests[d]	1.13	1.17	0.241

*Significant at the p<0.05 level (two-tailed)
a) Per 1,000 persons; 1,000 households
b) Per 10,000 persons
c) Per 100 households 100 arrests
d) Per 10 arrests.

Positive correlations between community structural characteristics, alcohol outlet density and violent crime in Washington, D.C. are in Table 2. Alcohol outlets are significantly correlated with violent crime, (0.250;p<0.05). Other notable community features strongly correlated with violent crime include neighborhood disadvantage (0.472;p<0.05) and racial composition (i.e., African-American), (0.571;p<0.05), which suggests that race and class may independently impact the alcohol availability-assaultive violence association.

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The results from the negative binomial multivariate regression analysis are in Table 3. The findings demonstrate a significantly positive association between assaultive violence and the physical availability of alcohol. Interpretation of the outlet coefficient (e^b=1.04;p<0.05) indicates that for every additional alcohol outlet, assaultive violence increases by a factor of 4.0% while holding all other variables in the model constant. Notable structural indicators significantly associated with violent crime include African-American population (e^b=1.25;p<0.05); population density (e^b=1.26;p<0.05); and the number of occupied households (e^b=0.478;p<0.05). Although neighborhood disadvantage is significantly correlated with violent crime, in the complete model it remains positively associated; yet it is insignificant. After controlling for economic disadvantage and additional structural correlates of violent crime, the physical availability of alcohol is consistently and significantly associated with assaultive violence. The relationship between weapons and illicit drug-related arrests and assaultive violence is in the positive direction. However, neither illicit drugs nor weapons (i.e., gun availability) are significantly associated with violent crime.

Table 4 shows the results of the category of assaultive violence included in the positive alcohol availability-violent crime association. Alcohol outlet density is significantly related to robbery (e^b=1.05p<0.05) and its relationship with homicide is in the positive direction (e^b=1.02;p=0.543), although statistically insignificant. Neither illicit drug-related arrests nor weapons-related arrests are significantly associated with homicide, robbery, or sexual offenses. However, illicit drugs are significantly related to violent assaults (e^b=1.06;p<0.05). Alcohol outlets are significantly and positively associated with assaults (e^b=1.03;p<0.05) and sexual offenses (e^b=1.04;p<0.05). After calculating the effect size, the difference in effect of alcohol outlets between the violent outcomes of robbery, assault, and sexual offenses is minimal, approximately (~1%).

Table 5 shows the results of assaultive violence categories across on-premise and off-premise alcohol outlets. The results are similar to the effects of the total number of outlets. Neither on-premise nor off-premise outlets were significantly related to violent homicide. Although, in the comparison, the direction of the relationship between off-premise outlets and homicidal violence is positive (e^b=1.07;p=0.312) and, alternatively, the direction of the relationship between on-premise outlets and homicide is in the negative (e^b=0.958;p=0.253) direction. Both types of outlets, on-premise (e^b=1.04;p<0.05) and off-premise (e^b=1.09;p=0.05), are significantly and positively related to robbery. Neither type of outlet is significantly associated with assaults or sexual offenses. The lack of a significant association with sexual offenses may be a result of a limited

Table 4. Negative Binomial Regression of Homicide, Robbery, Assault, and Sexual Offenses Regressed on Alcohol Outlets

	Homicide			Robbery			Assault			Sexual Offenses		
Variable	*Exp(b)*	*Z*	*P*	*Exp(b)*	*Z*	*P*	*Exp(b)*	*Z*	*P*	*Exp(b)*	*Z*	*P*
Alcohol outlets	1.02	0.60	0.543	1.05	4.19	0.001*	1.03	3.25	0.001*	1.04	2.41	0.015*
Disadvantage	1.08	1.64	0.101	.999	-0.03	0.974	1.06	2.70	0.007*	0.974	-0.68	0.493
African American[a]	1.50	2.52	0.012*	1.22	3.05	0.002*	1.29	4.63	0.000*	1.32	2.96	0.003*
Occupied households[a]	.314	-3.00	0.003*	.517	-4.93	0.001*	.421	-7.11	0.001*	0.375	-4.08	0.001*
Population density[b]	.827	-1.02	0.308	.359	3.79	0.001*	.197	2.65	0.008*	0.927	-0.64	0.519
Crowded households[c]	1.01	.259	0.796	.998	-0.08	0.936	.019	1.66	0.097	0.059	2.86	0.004*
Illicit drug arrests[c]	1.04	1.07	0.281	.997	-0.09	0.924	1.06	3.02	0.002*	0.021	0.71	0.475
Weapons arrests[d]	.966	-.135	0.893	1.22	1.46	0.148	.100	0.826	0.409	0.897	-0.57	0.564

*Significant at the p<0.05 level (two-tailed)
a) Per 1,000 persons; 1, 000 households
b) Per 10,000 persons
c) Per 100 households; 100 arrests
d) Per 10 arrests.

Table 5. Negative Binomial Regression of Homicide, Robbery, Assault, and Sexual Offenses Regressed on On-Premise and Off-Premise Alcohol Outlets

	Homicide			Robbery			Assault			Sexual Offenses		
Variable	*Exp(b)*	*Z*	*P*	*Exp(b)*	*Z*	*P*	*Exp(b)*	*Z*	*P*	*Exp(b)*	*Z*	*P*
On-Premise	.958	-1.14	0.253	1.04	2.73	0.006*	1.02	1.78	0.074	1.03	1.15	0.247
Off-Premise	1.07	1.01	0.312	1.09	2.82	0.005*	1.03	1.40	0.161	1.07	1.93	0.053
Disadvantage	1.09	1.83	0.066	1.00	.048	0.961	1.06	2.78	0.005*	.980	-0.53	0.596
African American[a]	1.34	1.68	0.091	1.19	2.50	0.012*	1.28	4.05	0.001*	1.27	2.30	0.022*
Occupied households[a]	0.385	-2.25	0.011*	0.514	-5.01	0.001*	.435	-6.74	0.001*	.384	-3.98	0.001*
Population density[b]	0.834	-0.98	0.325	1.36	3.88	0.001*	1.21	2.84	0.004*	.929	-0.62	0.536
Crowded households[c]	1.00	0.19	0.849	0.999	-0.04	0.964	1.01	1.39	0.162	1.06	2.92	0.003*
Illicit drug arrests[c]	1.04	1.12	0.263	0.993	-0.27	0.780	1.05	2.88	0.004*	1.01	0.615	0.538
Weapon arrests[d]	.970	0.12	0.901	1.22	1.46	0.144	1.10	.834	0.404	.896	-0.57	0.562

*Significant at the p<0.05 level (two-tailed)
a) Per 1,000 persons; 1, 000 households
b) Per 10,000 persons
c) Per 100 households; 100 arrests
d) Per 10 arrests.

number of observations specific to this category.

Illicit drug arrests are significantly associated with violent assaults (e^b=1.05;p<0.05). Independent of the varying strengths of association across the on-premise off-premise outlet comparison, a calculation of effect size demonstrated a minimal difference (~1%) between the total outlet and the on/off-premise categories.

DISCUSSION

Independent of alternative structural correlates of violent crime, including the prevalence of weapons and illicit drugs, the number of alcohol outlets in a community is significantly associated with assaultive violence. The number of alcohol outlets in a census tract was significantly related to robbery, assault, and sexual offenses. The relationship with alcohol outlets and homicide is in a positive direction, but statistically insignificant. A comparison between on-premise outlets and off-premise outlets and violent crime revealed significant association between both types of outlets and robbery. On premise and off-premise outlets are positively, but non-significantly, associated with assault, homicide, and sexual offenses. The minimal difference in effect of on-premise outlets between robberies and assaults may be a consequence of the limited number of observations.

In context of the alcohol outlet density-violent crime association literature,[6,7,11-17] the findings from this current

study are in accord with the fundamental association between alcohol outlet density and violent crime. Unlike the larger body of work, yet similar to a limited number of studies,[3,14,26] the results from this study engage a focus on the aggregate components of violent crime (i.e. homicide, robbery, assault, and sexual offense) across alcohol outlet type (i..e on-premise and off-premise).The initial work done on this topic, and in the same study site, provided a descriptive study characterizing the spatial patterns of alcohol outlets and found that off-premise consumption outlets were heavily concentrated among African-American communities.[3] A second study, in Miami, Florida, focused on the relationship between alcohol outlet density and the violent crimes of robbery and assault among racial/ethnic populations (i.e. African-American and Latino).[14] This study found a significant association between outlet density and the violent crimes of robbery and assault among the Latino population, but not the African-American population. The latter finding was likely a consequence of the predominate Latino study site. A final study, also in the District of Columbia, examined the stratified relationship of on-premise and off-premise outlets with assaults and found a significant association between on-premise outlets and assaults.[26] The lack of an association between off-premise outlets and assaults is contrary to the literature.[6,45,46]

In comparison to the latter two studies, the findings from the current research either identified a relationship between total outlets (i.e. on-premise and off-premise) and the violent crimes of robbery and assault[14] or identified a significant association between on-premise outlets and a violent crime component, yet a lack of an association between off-premise outlets and a violent crime component.[26] In contrast yet complementary, the current research found a significant association between alcohol outlet density and the violent crimes of robbery and assault among a predominantly African-American population.[14] A similarly distinguishable finding is the association between on-premise outlets and the violent crime of robbery.[26] The lack of an association between off-premise outlets and assault is likely a result of a large proportion (i.e. 70%) of the observations consisting of on-premise outlets. Given that total outlets are consistently associated with assaults and past research has found the same,[6,45,46] this relationship may be a reflection of the location characteristics of the facility, regardless of outlet type. More severe types of violent crime, such as assault and homicide, tend to occur in more socially deprived communities.[30,33,47]

The findings pose unique and dangerous implications for minority concentrated or economically disadvantaged communities,unique because the most deprived communities have substantially higher densities of alcohol outlets, compared to the least deprived communities; yet the least deprived communities are associated with the heaviest alcohol consumption.[22] As indicated in the results of this study, net of additional correlates of crime, alcohol outlet density is significantly associated with violent outcomes.[13,48,49] Although violence is a dangerous outcome for any community, the results suggest that the effects may differ depending on the socioeconomic context and the type of alcohol outlet facility. The magnitude and sustainability of alcohol-related effects, such as violence, tend to be disproportionately greater among economically disadvantaged populations,[30,33,46,47] which may ultimately result in dangerous outcomes of an equivalent magnitude.[50,51]

LIMITATIONS

The study findings should be considered in light of the following limitations. The cross-sectional nature of the study design precludes any insight to the causal direction of the alcohol availability-violent crime relationship. The number of observations (i.e., census tracts) limits an extensive characterization of the dependent and independent variables, which impedes a further specification of the alcohol assaultive violence dynamic. Although less of a concern for frequently occurring crimes such as assault and robbery, violent crime outcomes were aggregated over a one-year period and the stratified associations should be viewed with caution. The violent crime outcomes were aggregated over a one-year period. The latter is further challenged by the use of secondary data, which, in many instances, has been collected for administrative purposes and not basic research. Although individual outcomes cannot be inferred from group-level measures, alcohol-related outcomes are an independent by-product of the structural context and the individual.[18]

CONCLUSION

In Washington, D.C., alcohol outlet density is significantly associated with the violent crimes of assault and robbery. Arguably, the established science regarding the disproportionate exposure to and consequences of alcohol outlet densities among poor urban and minority communities underscores the urgency for and utility of effective policies designed to regulate outlet densities. Notwithstanding the urgency, it is equally important to understand that policies designed to regulate outlet densities cannot treat all communities as if the alcohol outlet density-violent crime relationship has an equivalent effect across all communities. The findings compel further research to examine community structural characteristics and their differential translation of effective and accommodating policy prescriptions.

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REFERENCES

1. Greenfeld LA. Alcohol and Crime: An Analysis of National Data on the Prevalence of Alcohol Involvement in Crime. Washington, D.C.: U.S. Department of Justice; 1998.
2. Bureau of Justice Statistics. Criminal Victimization in the United States, 2006 Statistical Tables. Washington, D.C.: US Department of Justice, Office of Justice Programs, BJS; 2010. Report No.: NCJ 223436. (Criminal Victimization in the Unite States Series;vol.
3. Dawkins MP, Farrell WC, and Johnson JH. Spatial Patterns of Alcohol Outlets in the Washington, D.C. Black Coummunity. Proceedings of the Pennsylvania Academy of Science 1979;53:89-97.
4. Corso PS, Mercy JA, Simon TR, Finkelstein EA, and Miller TR. Medical Costs and Productive Losses Due to Interpersonal and Self-Directed Violence in the United States. *Am J of Preven Med.* 2007;32(6):474-82.
5. Cherpitel CJ. Alcohol and Injuries Resulting From Violence: a Comparison of Emergency Room Samples From Two Regions of the U.S. *J Addict.Dis.* 1997;16(1):25-40.
6. Gorman DM, Speer PW, Labouvie EW, and Subaiya AP. Risk of Assaultive Violence and Alcohol Availability in New Jersey. *Am.J Pub Heal.* 1998;88(1):97-100.
7. Gorman DM, Speer PW, Gruenewald PJ, and Labouvie EW. Spatial Dynamics of Alcohol Availability, Neighborhood Structure and Violent Crime. *J Stud Alcohol.* 2001;62(5):628-36.
8. Zhang L, Wieczorek WF, and Welte JW. The Nexus Between Alcohol and Violenct Crime. *Alcohol Clin Exp Res.* 1997;21:1264-71.
9. Parker RN and Auerhah K. Alcohol, Drugs, and Violence. *Ann Rev of Socio.* 1998;24:291-311.
10. Parker RN; Auerhah K. Drugs, Alcohol, and Homicide: Issues in Theory and Research. Smith, M. D. and Zahn, M. A. A Sourcebook of Social Research. Thousand Oaks, CA: Sage; 1999. pp.176-91.
11. Escobedo, L. G. and Ortiz, M. The Relationship Between Liquor Outlet Density and Injury and Violence in New Mexico. *Accid Anal Prev.* 2002;34(5):689-94.
12. Gyimah-Brempong, Kwabena. Alcohol Availability and Crime: Evidence From Census Tract Data. *Southern Economic J*;68(1):2-21.
13. Lipton R and Gruenewald P. The Spatial Dynamics of Violence and Alcohol Outlets. *J Stud Alcohol.* 2002;63(2):187-95.
14. Nielsen, A. L., Martinez, R., and Lee, M. T. Alcohol, Ethnicity, and Violence: The Role of Alcohol Availability for Latino and Black Aggravated Assaults and Robberies. *Sociol Quarterly* 2005;46(3):479-502.
15. Scribner R, Cohen D, Kaplan S, and Allen SH. Alcohol Availability and Homicide in New Orleans: Conceptual Considerations for Small Area Analysis of the Effect of Alcohol Outlet Density. *J Stud Alcohol* 1999;60:310-6.
16. Scribner RA, Mackinnon DP, and Dwyer JH. The Risk of Assaultive Violence and Alcohol Availability in Los-Angeles-County. *Am J of Pub Heal.* 1995;85(3):335-40.
17. Speer, P. W., Gorman, D. M., Labouvie, E. W., and Ontkush, M. J. Violent Crime and Alcohol Availability: Relationships in an Urban Community. *J Pub Heal Policy.* 1998;19(3):303-18.
18. Scribner RA, Cohen DA, and Fisher W. Evidence of a Structural Effect for Alcohol Outlet Density: a Multilevel Analysis. *Alcohol Clin Exp Res.* 2000;24(2):188-95.
19. Watts RK and Rabow J. Alcohol Availability and Alcohol Related Problems in 213 California Cities. *Alcoholism: Clinical and Experimental Research* 1983;7(1):47-58.
20. Alaniz ML. Alcohol Availability and Targeted Advertising in Racial/ Ethnic Minority Communities. *Alcohol Health and Research World* 1998;22(4):286-9.
21. Gorman DM and Speer PW. The Concentration of Liquor Outlets in an Economically Disadvantaged City in the Northeastern United States. *Subst Use Misuse.* 1997;32(14):2033-46.
22. Pollack CE, Cubbin C, Ahn D, and Winkleby M. Neighbourhood Deprivation and Alcohol Consumption: Does the Availability of Alcohol Play a Role? *Internat J of Epidemi.* 2005;34:772-80.
23. LaVeist TA and Wallace JM, Jr. Health Risk and Inequitable Distribution of Liquor Stores in African American Neighborhood. *SocSci Med.* 2000;51(4):613-7.
24. NCHS (National Center for Health Statistics). Health, United States. Public Health Service; 2000.
25. Toomey TL and Wagenaar AC. Policy Options for Prevention: The Case of Alcohol. *J of Pub Heal Policy.* 1999;20(2):192-213.
26. Roman, CG, Reid, SE, Bhati, AS, and Tereshchenko, B. Alcohol Outlets as Attractors of Violence and Disorder. Washington, D.C.: The Urban Institute; 2008(Research for Safer Communities;vol.
27. Krivo LJ and Peterson RD. Extremely Disadvantaged Neighborhoods and Urban Crimes. *Social Forces.* 1996;75:619-50.
28. Livingston, M. A Longitudinal Analysis of Alcohol Outlet Density and Assault. *Alcohol-Clini and Experi Research.* 2008;32(6):1074-9.
29. Gruenewald, P. J. The Spatial Ecology of Alcohol Problems: Niche Theory and Assortative Drinking. *Addiction.* 2007;102(6):870-8.
30. Peterson RD, Krivo LJ, and Harris MA. Disadvantage and Neighborhood Violent Crime: Do Local Institutions Matter? *J of Research in Crime and Delinquency.* 2000;37(No. 1):31-63.
31. Sampson RJ and Groves WB. Community Structure and Crime: Testing Social-Disorganization Theory. *Am J of Sociol.* 1989;94:774-802.
32. Stark R. Deviant Places: A Theory of the Ecology of Crime. Criminology 1987;25(No 4.):893-909.
33. Sampson RJ, Raudenbush SW, and Earls F. Neighborhoods and Violent Crime: a Multilevel Study of Collective Efficacy. Science 8-15-1997;277(5328):918-24.
34. Wilson WJ, The Truly Disadvantaged: The Inner City, The Underclass, and Public Policy. Chicago, IL: University of Chicago Press; 1987.
35. Mincy RB, Sawhill IV, and Wolf DA. The Underclass: Definition and Measurement. Science. 1990;248:450-3.

36. Ross CE and Mirowsky J. Neighborhood Disadvantage, Disorder, and Health. *J Health Soc.Behav.* 2001;42(3):258-76.
37. Hill TD and Angel RJ. Neighborhood Disorder, Psycholoical Distress, and Heavy Drinking. Social Science and Medicine 2005;61:965-75.
38. Ross CE and Jang SJ. Neighborhood Disorder, Fear, and Mistrust: the Buffering Role of Social Ties With Neighbors. *Am J Community Psychol.* 2000;28(4):401-20.
39. Parker KF and Maggard SR. Structural Theories and Race-Specific Drug Arrests: What Structural Factors Account for the Rise in Race-Specific Drug Arrests Over Time? *Crime & Deliquency.* 2005;51(4):521-47.
40. Feise RJ. Do Multiple Outcome Measures Require P-Value Adjustment? *BMC Medical Research Methodology.* 2002;2(8).
41. Sidak Z. Rectangular Confidence Region for the Means of Multivariate Normal Distributions. *J of the Am Statis Assoc.* 1967;62(626):633.
42. Anselin L. Local Indicators of Spatial Association-LISA. *Geographical Analysis.* 1995;27(2):93-115.
43. Moran P. The Interpretation of Statistical Maps. J *Royal Statistical Society.* 1948;10(Series B):243-51.
44. Gardner W, Mulvey EP, and Shaw EC. Regression Analyses of Counts and Rates: Poisson, Overdispersed Poisson, and Negative Binomial Models. *Psychological Bulletin.* 1995;118(3):392-404.
45. Alaniz ML, Cartmill RS, and Parker RN. Immigrants and Violence: The Importance of Neighborhood Context. *Hispanic J of Behavi Sci.* 1998;20:155-74.
46. Gruenewald, P. J., Freisthler, B., Remer, L., LaScala, E. A., and Treno, A. Ecological Models of Alcohol Outlets and Violent Assaults: Crime Potentials and Geospatial Analysis. *Addiction.* 2006;101(5):666-77.
47. Kawachi I, Kennedy BP, and Wilkinson RG. Crime: Social Disorganization and Relative Deprivation. *Soc Sci Med.* 1999;48(6):719-31.
48. Gorman DM, Zhu L, and Horel S. Drug "Hot-Spots', Alcohol Availability and Violence. *Drug and Alcohol Rev.* 2005;(24):507-13.
49. Tatlow JR, Clapp J., and Hohman MM. The Relationship Between the Geographic Density of Alcohol Outlets and Alcohol-Related Hospital Admissions in San Diego County. *J Com Heal* 2000;25(1):79-88.
50. Caetano R and Clark CL. Trends in Alcohol-Related Problems Amon Whites, Blacks, and Hispanics: 1984-1995. *Alcohl: Clini and Experi Research* 1998;22:534-8.
51. Jones-Webb R. Alcohol-Related Problems Among Black, Hispanic and White Men: The Contribution of Neighborhood Poverty. *J of Studies on Alcohol.* 1997;58(5):539-45.

Review of Multi-Person Exposure Calls to a Regional Poison Control Center

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Objective: Poisoning events, including exposures to hazardous materials, can involve multiple victims. Regional poison centers often are contacted in such events involving multiple victims.

Methods: We searched our poison center database over a nine-year time period for all calls involving a poisoning event in which more than two people were exposed to the same substance. We then matched each product to the generic category used by the National Poison Data System. We analyzed this data to find the most frequent substances reported as primary substances in the multiple exposures.

Results: We identified 6,695 calls between 2000 and 2008 that had more than two people exposed to the same substance. In these calls, 25,926 people were exposed (3.6% of the 715,701 human exposure calls for this period). These calls involved 64 of the 67 NPDS substance group codes. Some substances were much more commonly involved than others. The top three categories causing the most exposures were Fumes/Gases/Vapors, Food Products/Food Poisoning and Pesticides. Of the patients exposed, 69.4 % were not followed due to minimal effects possible or judged as nontoxic, 0.3% had major effects, 8.6% had no effects, and 9.3% had minimal to moderate effects. Eight people expired.

Conclusion: Fumes, gases, and vapors make up the majority of multi-exposure calls. The overall mortality from multi-exposures, based on our data, is low. Analysis of these calls can help poison centers better understand these events and direct training. [West J Emerg Med. 2010; 11(3):291-293.]

INTRODUCTION

The United States has 60 poison centers serving its citizens.[1] Poison centers provide medical advice to the lay public and healthcare personnel, most frequently following exposure to a drug or chemical or following a bite from an animal. In addition, poison centers gather information about the substance involved in the poisoning event as well as patient information. Some poisoning events can involve multiple patients.

Poisoning events that involve more than one person are categorized as multi-exposure incidents in our regional poison center data system (Call Tracking System, Jacksonville FL). The 2008 Annual Report of the American Association of Poison Control Centers reported that 9.7% of human exposures involved multiple patients.[2] However, details about these exposures, such as substances and outcome, are not included in the annual report. The Duke Poison Control Center published a study about multi-exposure incidents in 1982.[3] This study evaluated calls from one year (1977), only included patients less than 10 years old, and had 40 incidents, which limits what conclusion can be drawn. We undertook this study to help us understand the nature and epidemiology of multi-exposure incidents as reported to our regional poison center.

METHODS

The Georgia Poison Center keeps track of call data in an electronic database that is uploaded in near real-time to the National Poison Data System (NPDS). Data fields collected from each call include caller name, date, exposure substance, dose, circumstances, therapies received and outcome among others. We queried this dataset from Jan 1, 2000 to Dec 31, 2009 (n=715,701) for all events that were classified as multi-exposure. We excluded calls in which a substance could not be identified, and calls in which the exposure victims were non-human (such as pets or farm animals).

We defined a multi-exposure poisoning event as two or more victims exposed to the same substance at the same location over the same time period. For example, chemical fumes in building that affected three victims would qualify as a multi-exposure event. We analyzed these events using descriptive and categorical statistics to gain better understanding of these events. NPDS Medical Outcome categories were used to describe medical outcomes of the exposures.[4] Minor effect: The patient developed some signs or symptoms as a result of the exposure, but they were minimally bothersome and generally resolved with no residual disability or disfigurement. Moderate effect: The patient exhibited signs or symptoms as a result of the exposure that were more pronounced, more prolonged or more systemic in nature than minor symptoms. Usually, some form of treatment is indicated. Symptoms were not life threatening, and the patient had no residual disability or disfigurement. Major effect: The patient exhibited signs or symptoms as a result of the exposure that were life threatening or resulted in significant residual or disfigurement. This study received approval from the local institutional review committee.

Table 1. Multi-Exposure cases by age

Age in Years	Number of Cases	Percent
≤ 2	1169	7.2
3-5	2842	17.4
6-11	3402	20.8
12-17	2038	12.5
18-34	3602	22.0
35-64	3041	18.6
≥65	251	1.5

Table 2. Outcomes of Multi-Exposure Patients

	Frequency	Percent
Followed – Death	6	0
Followed – Major effect	50	0.2
Followed – Moderate effect	898	3.5
Followed – Minor Effect	1510	5.8
Followed – No Effect	2229	8.6
Indirect report – Death	2	0.0
Unrelated effect	1286	5.0
Not followed – Judged as nontoxic exposure	4217	16.3
Not followed – Minimal clinical effects possible	13,775	53.1
Unable to follow – Judged as a potentially toxic exposure	1953	7.5
Total	25,926	100.0

RESULTS

Over the nine-year period, our regional Poison Center received 715,701 exposure calls, of which 6,695 (0.9%) were classified as multi-exposure. The multiple exposure calls involved 25,962 patients, or a mean of 3.8 patients per multi-exposure event; 58%were female. Table 1 reports the age of the multi-exposure patients. Only 16,345 (63%) of the patients had definite ages documented; of these, 58% were less than 18 years of age. Seventy-nine percent of exposures occurred at residencies, 6% at workplaces, 5% public areas, 5% schools, 2% vehicles, 1% medical facilities, and in 2% unknown.

Table 2 shows the outcome of the multi-exposure patients. Of the patients exposed, 69.4 % were not followed because the poison center staff judged their exposure as at most minimal severity (either "minimal effects possible" or "nontoxic"), 8.6% had no effects, 9.3% had minimal to moderate effects, and 0.3% had major effects. There were eight fatalities, in which six involved a poisonous gas: three were from carbon monoxide, two from ammonia and one fatality from hydrogen sulfide. The deaths not related to gases were caused by hydrofluoric acid and an alleged malicious poisoning with ethylene glycol. The hydrogen sulfide and hydrofluoric acid deaths were occupationally related. The two ammonia fatalities occurred from a single event in which an accidental release occurred while the individuals were transporting anhydrous ammonia allegedly for illicit methamphetamine production.

The poisoning events involved 64 of the 67 NPDS substance group codes. Table 3 lists the top 10 most common substances involved. The NPDS substance category gas/fumes/vapor was the number one substance involved in multi-exposure calls, involved in 22% of all calls.

DISCUSSION

The majority of multi-exposure calls to our poison center resulted in minimal or no health effects, and the overall mortality was low. The data suggests that the majority of these exposures can be safely managed without visiting a healthcare facility. Awareness or education about the safe handling of the substances in the gas/fumes/vapor category could make a significant contribution to injury prevention, since more victims potentially are involved in these cases.[5,6]

Table 3. National Poison Data System substance categories involved in multi-exposure calls

Call/Substance	Frequency (%)
Fumes/Gases/Vapors	22
Food Products/Food Poisoning	9
Pesticides	9
Bites/Envenomations	7
Chemicals	6
Hydrocarbons	5
Cleaning Substances (Household)	5
Information Calls	5
Foreign Bodies/Toys/Miscellaneous	4
Plants	4

We found that the most common substance involved were gases, fumes or vapors. Gases have a variable volume and shape. Since they expand to fill available space, they potentially expose large numbers of people. This well-known property of gases/fumes/vapors is one of the reasons they are chosen as terrorist weapons.[7] Analysis of the events that led to the release of the gas/fumes/vapor calls can help poison centers better understand these events and direct educational efforts for prevention. In addition, since these exposures were the most common sources of multi-person exposures, educational efforts should be directed to train healthcare providers in the medical care of patients exposed to these substances.

Our regional poison center has a close working relationship with our state government and performs several services (rabies triage and public health line) not typically associated with a poison center. These additional services may explain our relatively high percentage of calls involving food poisoning and bites/envenomations. An example of a multi-exposure event from the rabies triage line would be a family that found a bat in their residence. Poison centers performing these services can provide valuable information to the public and healthcare professionals, and could prevent an unnecessary healthcare provider visit. Preventive educational materials can also be developed in an attempt to decrease the incidents of these exposures.

LIMITATIONS

Our study only includes data from one poison center. Our specialized rabies triage and public health line may have influenced our data, making these results different from the experience of other populations.

CONCLUSION

Patients from multi-exposure poisoning events were more likely to be female and under 18 years of age. The most common substance category in multi-exposure poisoning events was Fumes/Gases/Vapors. Mortality and morbidity from these events was low.

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REFERENCES

1. Data from American Association of Poison Control Centers. Downloaded from www.aapcc.org on February 23, 2010.
2. Bronstein AC, Spyker DA, Cantilena LR, et al. 2008 Annual Report of the American Association of Poison Control Centers' National Poison Data System (NPDS): 26th Annual Report. *Clin Tox.* 2009; 47(10):911-1084.
3. Greenberg RS, Osterhout SK: Reported Multiple Victim Poisonings of Children. *Clin Tox.* 1982; 19(10):1073-80.
4. Bronstein AC, Spyker DA, Cantilena LR, et al. 2007 Annual Report of the American Association of Poison Control Centers' National Poison Data System (NPDS): 25th Annual Report. *Clin Tox.* 2008; 46(10):927-1057.
5. Heron RJ. Worker education in the primary prevention of occupational dermatoses. *Occup Med*. 1997; 47 (7):407-10.
6. Nixon J, Spinks A, Turner C, et al. Community based programs to prevent poisoning in children 0-15 years. *Inj Prev*. 2004; 10(1):43-6.
7. Okumura T, Takasu N, Ishimatsu S, et al. Report on 640 victims of the Tokyo subway sarin attack. *Ann Emerg Med*. 1996; 28:129-35.

The Impact of Built Environment on Pedestrian Crashes andthe Identification of Crash Clusters on an Urban University Campus

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Objectives: Motor vehicle-pedestrian crash is a significant public health concern. The urban campus of Georgia State University poses unique challenges due to a large number of students and university employees. The objectives of this study are twofold: 1) to examine the correlation between specific features of the built environment on and around the University campus and pedestrian crashes; and 2) to identify crash clusters in the study area using network-based geospatial techniques.

Methods: We obtained pedestrian crash data (n=119) from 2003 to 2007 from Georgia Department of Transportation and evaluated environmental features pertaining to the road infrastructure, pedestrian infrastructure and streetscape for each road segment and intersection. Prevalence rate of each feature with pedestrian crashes present was calculated. We used network-based Kernel Density Estimation to identify the high density road segments and intersections, then used network-based K-function to examine the clustering of pedestrian crashes.

Results: Over 50% of the crosswalk signs, pedestrian signals, public transit, and location branding signs (more than three) at intersections involved pedestrian crashes. More than half of wider streets (greater than 29 feet), two-way streets, and streets in good condition had pedestrian crashes present. Crashes occurred more frequently in road segments with strong street compactness and mixed land use present and were significantly ($p<0.05$) clustered in these high-density zones.

Conclusion: Findings can be used to understand the correlation between built environment and pedestrian safety, to prioritize the high-density zones for intervention efforts, and to formulate research hypotheses for investigating pedestrian crashes. [West J Emerg Med. 2010; 11(3): 294-301.]

INTRODUCTION

Motor vehicle-pedestrian crash is a serious public health problem. According to the National Highway Traffic Safety Administration (NHTSA), it is estimated that 4,600 to 5,300 pedestrians are killed by motorists, and 80,000 to 120,000 more are injured each year.[1] Urban environments, although rich with many unique resources and opportunities, are often "black spots" for pedestrian crashes. The nature of urban design contributes to highly condensed and heavily trafficked areas, as they are usually the business centers of the surrounding area, as well as hubs for entertainment and residence. Downtown areas are dense with pedestrian foot traffic, which raises the issue of pedestrian crashes; Atlanta is no different. Between the years 2000 and 2005, metropolitan Atlanta has seen a growth rate of 15% and was ranked one of the worst places for pedestrian injury and fatality.[2,3]

Urban university campuses face unique challenges when dealing with pedestrian safety issues. Densely packed

street networks, combined with the assemblages of student pedestrians that navigate them, create corridors for pedestrian crashes. As an urban university in the heart of downtown, Georgia State University (GSU) has over 31,000 students and university employees.[4] This large vulnerable population is forced to navigate around the fast-moving, high-volume traffic of downtown Atlanta every day. Many hazards are associated with crossing campus streets—motor vehicle traffic volume, speed, and street design, all of which are present on the GSU campus. For example, the surveys from Georgia Department of Transportation (GDOT) indicate the traffic volume around the GSU campus averages 14,000 vehicles daily.[5] Besides factors of pedestrians and motorists, it is necessary to evaluate the built environment contributing to pedestrian crashes and identify high density zones of crashes before any interventions take place.

The built environment, including road infrastructure, pedestrian infrastructure and streetscape, has a strong influence on pedestrian safety. It can provide buffers between pedestrians and motorists, such as refuge islands.[6] It can also encourage motorists to keep a safe speed through the inclusion of traffic calming measures, such as speed humps, traffic circles, and road narrowing.[7] The built environment, such as crosswalk signs,[8] may provide pedestrians with more visibility as well. Additionally, street width may have an influence on pedestrian safety. Some studies found a concentration of crashes on major arterial streets, which tend to be wider than small streets and put pedestrians at greater risk for a longer period of time while crossing the road.[9,10] Lightstone et al.[11] reported that the majority of midblock crashes occurred in streets less than 35 feet in width, while the majority of intersection crashes occurred on streets greater than 70 feet in width.[11] These results suggest that there are confounding factors that might affect crash patterns at certain sites, for instance, block length and presence of crosswalks and crosswalk signals. Studies found that for both midblock and intersection crash locations, long block length was a contributing factor.[10,12] Lastly, mixed land use, such as a mixture of commercial and retail businesses with residential areas,[8,10,13,14] often plays an influential role in pedestrian safety, as they attract foot traffic around the businesses.

Besides the identification of the environmental features correlated with pedestrian crashes, detecting the high-density zones, which refers to the number of pedestrian crashes per unit of road segment, is critical for an intervention program.[2,15] These zones have a high prevalence of pedestrian crashes. Therefore, although pedestrian safety in a motorized urban environment, such as Atlanta, is important throughout a city, public health interventions prioritized at these high-density zones are paramount to make accident reduction efforts more effective.[16] The development of Geographic Information Systems (GIS) and spatial analysis techniques allows for density estimation and clustering of crashes, which helps to identify the high-density zones.

Ordinary Kernel Density Estimation (KDE) and K-function in GIS have been used to address the issue of traffic accidents,[17-19] but questions remain as to whether or not the methods can be directly applied to street- related events. Both methods are conventionally applied to an unbounded homogeneous plane using Euclidian distance measure;[20] they are, however, limited in analyzing traffic accidents that are constrained in a one-dimensional linear space along a street network.[16,21] Studies show that ordinary KDE and K-function are likely to provide misleading conclusions when they are used to study events (e.g., crime or traffic accident) distributed along streets.[16,22,23] One possible reason is that the streets themselves exhibit high-density and clustering tendencies in cities.[16] Studies extend the ordinary KDE and K-function on network, that is, network-based KDE[16,22] and network-based K-function[23] that can effectively investigate events distributed along streets.[16,22,23] Among these extended methods, the network versions of KDE and K-function (referred to as NKDE and NK-function in this study) developed by Okabe et al.[24] receive growing attention and have been effectively used in studies.[20,23,25] To our knowledge, neither approach has been used yet to address pedestrian crashes.

This study aims to identify modifiable environmental features correlated with pedestrian crashes and detect high-density crash zones through statistical analyses and network-based spatial analyses, respectively. We first examined a few environmental features (e.g., street width, public transits including bus stops and train stations, and corner radius) on and around the GSU campus. We then used the NKDE to identify the high-density road segments. Finally, the NK-function was used to test the statistical significance of the spatial clustering of the pedestrian crashes in these high-density zones. This research makes a twofold contribution. First, it identified environmental features that could be correlated with pedestrian crashes. Once identified, they may be modified to improve the walking environment for pedestrian safety, thus enhancing the feasibility of creating appropriate interventions. Second, this study detected high-density zones for pedestrian crashes. These zones shall be a higher priority for intervention efforts. Findings can also be used to formulate hypotheses for investigating pedestrian crashes in future.

METHODS

The study area is approximate 0.35 square miles located in downtown Atlanta, Georgia (Figure 1). It includes the GSU campus with its offices, classrooms, and parking garages, which are mixed with business and government buildings. Little residential land use is present. Because the mixture of GSU with other land uses makes it difficult to determine the percentage of GSU space, the study area is carefully selected based on what constitute the campus and any surrounding area where the students and university employees would be likely to traverse for university-related activities. A large commuting population and high traffic volume make this

study area appropriate to examine pedestrian safety related to university lives. As a densely populated urban university, GSU has over 31,000 students and employees,[4] and the majority commute either by driving or taking Atlanta public transits, thus constituting a large vulnerable population. Several arterial roads, such as Peachtree Center Avenue and Piedmont Avenue, cross the campus.

This study obtained 5-year (2003-2007) crash data (n=119) from the GDOT. The GDOT compiled the data from the police reports that provide detailed documents used for legal purposes and identifying traffic safety hazards. For each accident, the police recorded the road type and name, as well as the distance from the accident spot to the nearest intersection or to the nearest hundredth mile log, which allows the GDOT to map the accident in GIS. Police officers also classified the injuries following an accident report instruction.[26] The 119 crash data include no injury (n=21), fatalities (n=2), serious injuries (n=11), visible injuries (n=25), and complaints (n=60). Based on the instruction, serious injuries mean injured persons cannot walk, drive, or continue their normal activities, and complaints indicate pedestrians complain of being hurt without any visible wounds. Pedestrian health records for detailed severity scores and injured body parts evaluated by on-scene healthcare providers are not available due to privacy protection. Given the small number in each category, we grouped all in the same "crash" category, as investigating them separately may introduce a "small population" problem—rare events tend to have high rates due to the large variation.[27] We obtained street network data in the study area from the Environmental Systems Research Institute (ESRI; Redlands, California) and used it for geocoding the built environment features, the subsequent built environment evaluation, and spatial analyses.

From June to August of 2009, a research assistant collected the built environment data pertaining to the road infrastructure, pedestrian infrastructure, and streetscape for each intersection and road segment in the study area through environmental audits. Two separate audit forms were created, one for intersections and the other for segments. Intersection audits included measures in four categories: crosswalk signs, pedestrian signals, transit, location branding signs, and vehicle instruction signs. Coordinates for all intersections were collected using a handheld Global Positioning System (GPS) unit. Each segment was defined as the discrete section of a road between two adjacent intersections. Segment audits included measures in five categories: lanes, sidewalks, environment, signage, and streetscape. The selection of these features is based on literature[10,14,28-30] showing their correlations with pedestrian crashes. Additionally, several features related to pedestrian crashes were left out of the study due to their ubiquitous presence (e.g., crosswalk, sidewalk, and lighting) or absence (e.g., speed limit sign) in the study area. The audit results were geocoded in ArcGIS 9.3 (ESRI; Redlands, California).

We conducted descriptive analysis after the overlay of pedestrian crash locations on each environmental feature in GIS. Each incident was characterized by the environmental features present. After summarizing the total incidences associated with each environmental feature, we calculated the prevalence rates for each environmental feature by dividing the number of a particular feature associated with pedestrian crash present by the total number of that particular feature in the study area. One may also calculate the prevalence rate for each feature via dividing the number of pedestrian crashes with an environmental feature present by the total number of crashes in the study area, yet this approach may be subject to the significant variation in the number of features present. That is, some features are overrepresented (e.g., 53 locations with a street width between 36 and 40 feet) or underrepresented (e.g., only four locations with a street width between 21 and 25 feet). The method employed in this study thus may reduce such bias, which from a public health point of view, is important to understand the correlation of each feature with crashes while accounting for the unequal number of features. Features associated with the segments were determined by gross numbers, and the varied size of the segments (Figure 1) was not accounted for. Admittedly, this weakness might affect the prevalence rate and shall be addressed in future.

The NKDE[22] and the NK-function,[23] implemented in SANET[24] coupled with ArcGIS 9.3, were employed to identify the zones with high density and to test the clustering of the pedestrian crashes, respectively. We used these two methods as studies[22,23,25] demonstrate both are effective and reliable to investigate spatial patterns of point events (e.g., traffic accidents) along a street network. For comparison, this study also tested the ordinary KDE and K-function.

The first step is to estimate the density of crashes along the street network using the NKDE. The ordinary KDE calculates density within a circular window (i.e., kernel) that moves across the study area.[31] Events (pedestrian crashes) within the kernels are weighted based on their Euclidean distance from the kernel center, and the resulting density value is assigned to that center. The distance is weighted according to a kernel function. Okabe and his colleagues argued[22,23] that the application of ordinary KDE to density estimation on a network produces biased estimates. They proposed a NKDE[22] that constraints the kernel on a network. Crashes within the kernels are weighted based on their network distance from the kernel center following street lines using an unbiased kernel function. This study uses the equal-split continuous kernel method because it is unbiased.[22] See Okabe et al.[22] for more detailed discussion on NKDE. The choice of kernel bandwidth (i.e., the size of the window) is important in density estimation as the estimated density varies according to the bandwidth. Studies[22,32] suggest 100-300 meter bandwidth because these values are widely employed in urban studies to model pedestrian catchment areas at the scale of a block or street. Given the high street density in the study area, this research

utilized a 100-meter bandwidth, which is within the range. The resulting density is expressed as the number of pedestrian crashes per meter. The ordinary KDE used 100-meter bandwidth too. It results in a density showing the number of pedestrian crashes per square kilometers given that the kernel is not restricted on the network.

The second step is to evaluate the clustering of the observed crash distribution from the NKDE. The ordinary K-function[33] draws circular windows, whose radii range from the smallest to a size covering the entire study area, around each crash spot. It then compares the cumulative numbers of crashes (i.e., K value) up to certain radii in the observed distribution with the cumulative numbers of crashes to the same radii in random distributions. If the accumulated number of crashes in the observation at a radius is more than the accumulated number of crashes in a random distribution at the same radius, the observed crashes are believed to be clustered at the distance of the radius. Yet the ordinary K-function using Euclidean distance dramatically underestimates the actual network distance in cities.[34] On the contrary, the NK-function proposed by Okabe and Yamada[23] uses the distance along street network and simulates the crashes in random distributions on the street network, which is more accurate than the ordinary K-function.[23,25,34] For both K-function and NK-function, this study conducted 999 times of Monte Carlo simulations to derive the statistical significance of the observed distribution. If the observed K value is to the left side of the random envelope (the highest and lowest K based on the simulations) at a distance, then the pedestrian crashes are clustered at that distance.

Ideally, the analysis shall include both pedestrian and motor vehicle volumes. Unfortunately, no survey on pedestrian count has been done so far and the traffic-count surveys from the GDOT only sample a couple of intersections in the study area; the sparsity of sampling locations prevents us from interpolating the traffic counts in the entire area. Given the influence of University enrollment, calendar, and budget on the volumes of students and employees, surveying pedestrians and motorists shall be a long-term effort reflecting the yearly, seasonal, and daily variations. Such surveys shall be included in the future once available.

RESULTS

Among the 119 pedestrian crashes, nearly 70% occurred at intersections and over 30% occurred in midblocks. Table 1 is based on the total crashes that occurred at intersections, whereas the following percentages in Table 2 are based on all crashes that occurred within the study area. As Table 1 displays, nearly 54% of crosswalk signs, 55% of pedestrian signals, and over 57% public transits had pedestrian crashes present. Results also show that the locations having over three location branding signs had much higher prevalence (nearly 71%), compared with locations having less than three location branding signs (33.3%). Additionally, half of the locations with 5-6 vehicle instruction signs had experienced pedestrian crashes. Interpreting these results takes caution as these environmental features, such as location branding signs and vehicle instruction signs, may appear more in higher volumes of pedestrians and motor vehicles, yet this study was unable to account for the volumes given the shortage of such information.

Table 1. Presence of environmental features at intersections where pedestrian crashes occurred

Variables	Total No. of locations with feature present	No. of features with pedestrian crash present	Prevalence Rate
Crosswalk sign			
	13	7	0.538
Pedestrian signal			
	40	22	0.550
Public transit*			
	28	16	0.571
Location branding sign**			
Over 3	17	12	0.706
1 – 3	33	11	0.333
0	14	4	0.286
Vehicle instruction sign			
0 – 2	6	2	0.333
3 – 4	18	6	0.333
5 – 6	14	7	0.500
7 – 9	22	10	0.455
10 – 12	5	2	0.400

*Transit includes both train stations and bus stops.
**Location branding signs include any signage that indicates the presence of a commercial or residential establishment.

Table 2 shows that street width, street condition, furniture zone, and street furniture are positively associated with pedestrian crashes. First, wider streets had a higher prevalence of pedestrian crashes, and the highest prevalence existed at locations with a street width greater than 60 feet (100%). No pedestrian crashes occurred at a location where the street width is 18 feet or less. Second, the prevalence of two-way streets having pedestrian crashes (61.2%) was higher than that of one-way streets (43.1%). Third, locations with a street in good condition showed a prevalence of 56.3% with pedestrian crashes, compared to 48% locations with a street in fair condition and 13% locations with a street in poor condition. Fourth, over 52% locations with a furniture zone were associated with crashes compared to 35.7% of locations without a furniture zone. In addition, over 55% of locations with a sidewalk containing a good amount of street furniture (characterized as "many") had pedestrian crash events, compared with 53% at locations with a sidewalk containing

Table 2. Presence of environmental features at segments where pedestrian crashes occurred

Variables	Total No. of locations with feature present	No. of features with pedestrian crash present	Prevalence rate
Street width (feet)			
10 – 18	8	0	0.000
19 – 20	13	6	0.462
21 – 25	4	1	0.250
26 – 28	1	0	0.000
29 – 35	11	6	0.545
36 – 40	53	29	0.547
41 – 60	11	9	0.818
61 – 80	3	3	1.000
One-way streets			
	58	25	0.431
Two-way streets			
	49	30	0.612
Street condition*			
good	32	18	0.563
fair	67	32	0.478
poor	8	1	0.125
Furniture zone			
yes	73	38	0.521
no	28	10	0.357
Street furniture**			
many	58	32	0.552
Few	70	37	0.529
None	5	1	0.200
Driveways			
0	69	33	0.478
1	37	21	0.568
2	32	14	0.438
3 – 4	14	6	0.429
5 – 6	4	1	0.250

*Street condition including good (smooth and free of hazards), fair (minor bumps, dips, or rough pavement), and poor (serious potholes or other hazards) conditions.
**Street furniture measures include many (highly visible feature/presence which adds to the overall streetscape environment), few (small presence which does not contribute to the streetscape environment), and none (no feature/presence).

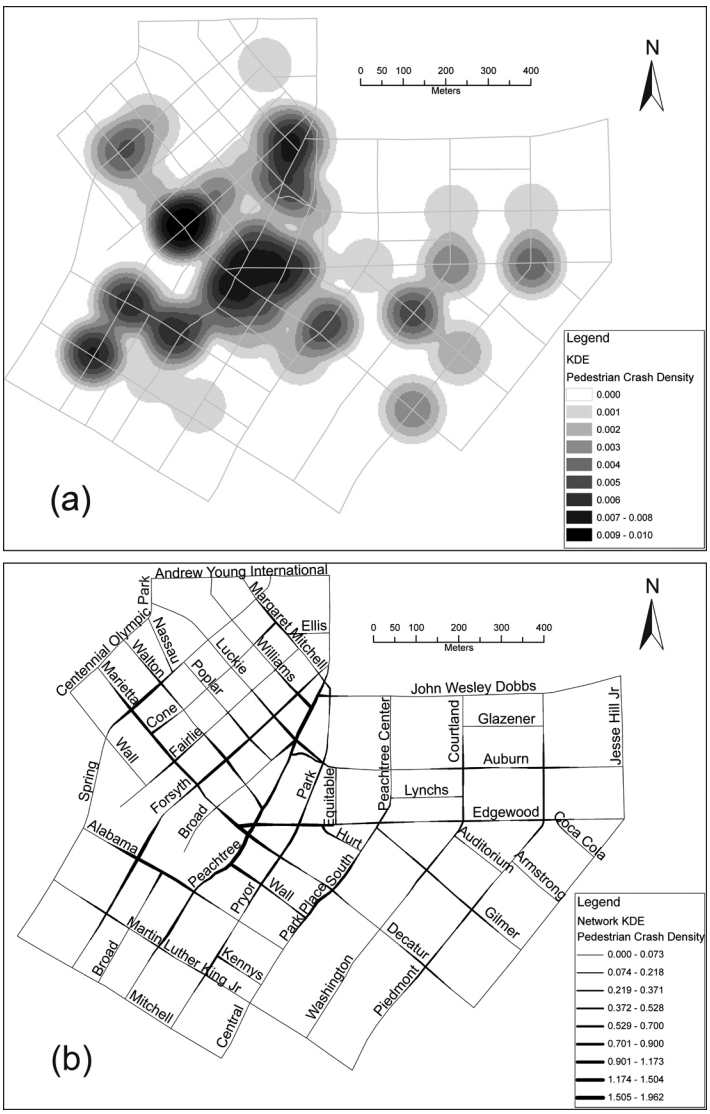
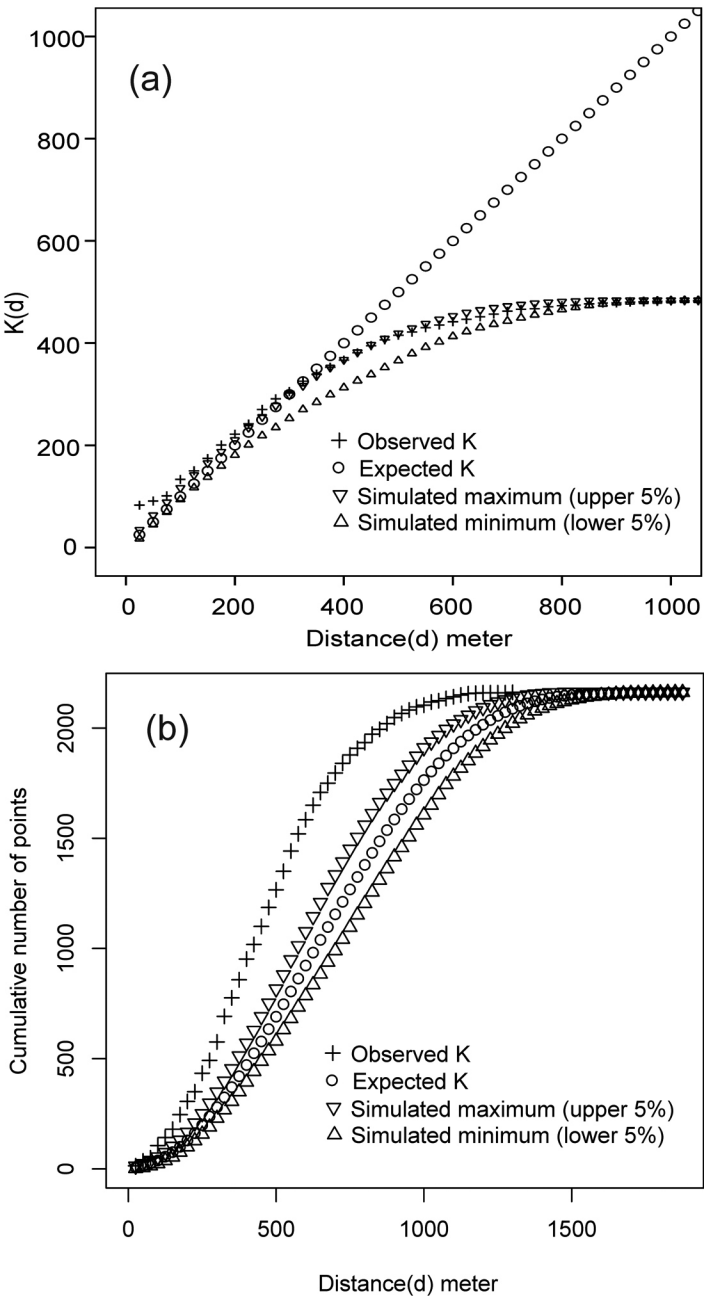


Figure 1. Pedestrian crash density: (a) ordinary Kernel Density Estimation with search radius of 100 m and cell size of 3 m; and (b) Network Versions of Kernel Density Estimation with search radius of 100 m and cell size of 3 m.

a small amount of street furniture (characterized as "few"). Lastly, locations with more than five driveways had a very low prevalence (25%) of pedestrian crashes, compared to locations with less than five driveways.

Figure 1 shows an estimation of pedestrian-crash density using both the ordinary KDE (Figure 1a) and the NKDE (Figure 1b). The planar KDE extended the estimation to areas where no streets are present. On the contrary, the NKDE clearly delineated high crash-density segments by showing the number of pedestrian crashes per meter of road segment. These high-density segments can be seen on streets such as Spring, Forsyth, Peachtree, Park, Park Place South, Alabama, Decatur, among others. These zones have mixed commercial and retail use. For example, there is a high-density triangle formulated by Peachtree, Marietta, and Edgewood, where GSU Andrew Young School of Public Policy, GSU Department of Computer Science, and the Georgia State Government building are mixed with Five Point (the transit station linking all four subway lines), restaurants, and retailers.

The NK-function revealed the statistically significant clustering of pedestrian crashes (Figure 2). The planar K-function suggested that the pedestrian crashes were



clustered up to approximately 300 meters because the observed K values are to the left side of the envelope (Figure 2a) up to this distance. Yet the NK-function revealed the crashes were clustered up to 1,200 meters (Figure 2b), given that the observed K values are always to the left of the upper 5% curve up to this distance. Therefore, pedestrian crashes in the study area present strong clustering on the street network. This confirms the observation from the NKDE that crashes are dense in certain segments.

DISCUSSION

This research shows built environmental features at intersections expose certain correlations with pedestrian crashes. More than half of the locations with five vehicle instruction signs or more than three location branding signs experience pedestrian crashes. One study suggested that motorists might be affected by too many visual stimuli on the road.[35] Other factors, however, cannot be ruled out; for example, the number of signs present may correlate with traffic density (e.g., higher volume of motor vehicles), thereby increasing exposure to pedestrian crashes. In addition, more than half of the locations with crosswalk signs present had pedestrian crashes, which is contrary to some studies that show the presence of crosswalk signs is protective.[29,36,37] Yet we cannot conclude this unambiguously because some prevention interventions after these crashes occurred might have been taken before the environment audit, which had changed the pedestrian risk at these intersections. Besides, the absence of speed limit signs in the area and possible fast speed may prevent one from timely stopping the vehicle to avoid crashes, which necessitates a survey in the future of actual traveling speed.

Road infrastructure is also correlated with pedestrian crashes. First, street widths are positively correlated with pedestrian crashes, which is consistent with the literature.[9-11] Street width is the main indicator for crossing distance—crossing wider streets requires staying in the road for a longer period of time, thus increasing a pedestrian's chance of being hit by a motorist. This correlation, however, warrants further investigation as densities of pedestrians and vehicles were not taken into account. Second, two-way streets have higher prevalence rates than one-way streets. This can be contributed to the fact that these roads are wider than most others in our study area, which confirms the positive correlation between street widths and pedestrian crashes. Besides, compared to one-way streets, two-way streets are more difficult for pedestrians to navigate as they must cross against two directions of traffic. The addition of a refuge island could be protective for crossing wider or two-way streets.[6] Third, the prevalence rates of fair and good road conditions where crashes occurred are higher than that of poor road conditions. One study[38] explained that the fewer potholes and defects a road has, the more likely the motorist will travel at a high speed, which makes them less likely to have a timely response to a pedestrian crossing the street. Fourth, areas with street furniture are more likely to have pedestrian crashes than areas without furniture and more than half of locations with furniture zones experience pedestrian crashes. One possible reason is that areas with more street furniture and with furniture zones may also be more populated, which increases the probability of crashes because of the higher pedestrian density. This requires taking into account pedestrian and motor vehicle counts in future research.

The spatial analysis reveals the high density zones and the strong clustering of the pedestrian crashes in these zones. Major GSU classroom and administration buildings are along these high-density zones, such as Park Place South between Hurt and Wall, where students and university employees have

to interact with vehicles, thus formulating hazardous corridors on these streets. In addition, these zones consist of mixed land use including GSU buildings, government buildings, restaurants, and recreational sites (e.g., Underground and Hurt Park), among others. These zones have strong street compactness, which is in line with previous studies reporting that areas with high retail density, neighborhood compactness, great land use mix, and high employment density increase crash risk.[8-10] This study, in addition to exploring the geographic distribution of pedestrian crashes, shows the network-based spatial techniques are effective for investigating the spatial patterns of street-related point events. Results suggest both NKDE and NK-function perform better than the ordinary KDE and K-function, which confirms previous findings.[16,22,25]

LIMITATIONS

This study is subject to several limitations. The first is the small number of pedestrian crashes and environmental features in the study area. For example, only three streets are wider than 60 feet, which may result in significant variations in the calculation of prevalence rate. Moreover, the small population problem prevents this study from evaluating statistical significance of the association between environmental features and pedestrian crashes. Second, the correlations between environmental features and crashes warrant further investigation as this study did not differentiate the severity of injuries and did not take into account the volumes of pedestrians and motor vehicles. One may argue that injuries that are not severe might be seen as a success of the protective characteristics of some environmental features compared to severe injury or fatality. Given that less than 30% of the crashes in this study resulted in severe injuries or fatalities, excluding these non-severe crashes will worsen the small population problem, which increases the sensitivity of estimating the correlation between environmental features and pedestrian crashes. In addition, traffic and pedestrian counts are necessary to enhance this study so that the correlation of built environment with pedestrian crashes can be better understood. Third, findings of the correlations are further subject to the time lag between the crashes and the environmental audit. The environment might have been modified prior to the audit, which might bias the correlations. More recent crash data would be more appropriate when they are available. Last but not least, surveys of both motorist and pedestrian behaviors may provide insights into the high-density zones besides the environmental audit.

CONCLUSION

This research was designed to evaluate the role of the built environment on pedestrian crashes and to explore the spatial variation in pedestrian crashes using network-based spatial analysis techniques within an urban university campus. It has important implications for pedestrian safety on urban campuses. GSU has seen a growing student population[4] in recent years. This, along with the growing trend of using mass transit, is creating a wave of new pedestrians on and around the campus. The growing trends could cause an increase in pedestrian crashes as more people are put at risk. It is imperative that research look at the ways in which the environment can improve the pedestrian conditions around these urban centers and heighten interventions at the high-density zones, thus improving pedestrian safety. Through the inclusion of the results presented here into the larger matrix of injury prevention, appropriate countermeasures can be applied to the issue of pedestrian safety on urban university campuses.

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REFERENCES

1. National Highway Traffic Safety Administration. National Pedestrian Crash Report. Available at: http://www-nrd.nhtsa.dot.gov/Pubs/810968.PDF. Accessed January 30, 2010.
2. Beck LF, Paulozzi LJ, Davidson SC. Pedestrian fatalities, Atlanta metropolitan statistical area and United States, 2000-2004. *J of Safety Research.* 2007; 38:613-16.
3. Ewing R, Schieber RA, Zegeer CV. Urban sprawl as a risk factor in motor vehicle occupant and pedestrian fatalities. *Am J of Publ Heal.* Sep 2003; 93:1541-45.
4. Georgia State University. Georgia State University Fact Sheet. Available at: http://www.gsu.edu/factsheet.html. Accessed February 20, 2010.
5. Georgia Department of Transportation. Georgia Traffic Count Database. Available at: http://www.dot.state.ga.us/statistics/TrafficData/Pages/TrafficCounts.aspx. Accessed March 1, 2010.
6. Garder P. Pedestrian safety at traffic signals: a study carried out with the help of a traffic conflict technique. *Accident Analysis and Prevention.* 1989; 21:435-44.
7. Garder PE. The impact of speed and other variables on pedestrian safety in Maine. *Accident Analysis and Prevention.* Jul 2004; 36:533-42.
8. Loukaitou-Sideris A, Liggett R, Sung HG. Death on the Crosswalk: A study of pedestrian-automobile collisions in Los Angeles. *Journal of Planning Education and Research.* 2007; 26:338.
9. Morency P, Cloutier M-S. From targeted "black spots" to area-wide pedestrian safety. *Injury Prevention.* 2006; 12:360-64.
10. Schuurman N, Cinnamon J, Crooks VA, et al. Pedestrian injury and the built environment: an environmental scan of hotspots. *BioMedCentral Public Health.* 2009; 9.

11. Lightstone AS, Dhillon PK, Peek-Asa C, et al. A geographic analysis of motor vehicle collisions with child pedestrians in Long Beach, California: comparing intersection and midblock incident locations. *Injury Prevention.* 2001; 7:155-60.
12. Schuurman N, Hameed SM, Fiedler R, et al. The spatial epidemiology of trauma: the potential of geographic information science to organize data and reveal patterns of injury and services. *Canadian Journal of Surgery.* 2008; 51:389-95.
13. Clifton KJ, Kreamer-Fults K. An examination of the environmental attributes associated with pedestrian-vehicular crashes near public schools. *Accident Analysis and Prevention.* 2007; 39:708-15.
14. Cho G, Rodriguez DA, Khattak AJ. The role of the built environment in explaining relationships between perceived and actual pedestrian and bicyclist safety. *Accident Analysis and Prevention.* 2009; 41:692-702.
15. Warden CR. Comparison of Poisson and Bernoulli spatial cluster analyses of pediatric injuries in a fire district. *International Journal of Health Geographics.* 2008; 7:1-17.
16. Xie Z, Yan J. Kernel density estimation of traffic accidents in a network space. *Computers, Environment and Urban Systems.* 2008; 32:396-406.
17. Erdogan S, Yilmaz I, Baybura T, et al. Geographic information system aided traffic accident analysis system case study: city of Afyonkarahisar. *Accident Analysis and Prevention.* 2008; 40:174-81.
18. Krisp JM, Durot S. Segmentation of lines based on point density - An optimisation of wildlife warning sign placement in southern Finland. *Accident Analysis and Prevention.* 2007; 39:38-46.
19. Pulugurtha SS, Krishnakumar VK, Nambisan SS. New methods to identify and rank high pedestrian crash zones: An illustration. *Accident Analysis and Prevention.* 2007; 39:800-11.
20. Okabe A. A theme issue on spatial analysis and GIScience in honor of Atsuyuki Okabe Preface. *J of Geograph Syst.* 2009; 11:107-12.
21. Okabe A, Satoh T. Uniform network transformation for point pattern analysis on a non-uniform network. *Journal of Geographical Systems.* 2006; 8:25-37.
22. Okabe A, Satoh T, Sugihara K. A kernel density estimation method for networks, its computational method and a GIS-based tool. *International Journal of Geographical Information Science.* 2009; 23:7-32.
23. Okabe A, Yamada I. The K-function method on a network and its computational implementation. *Geographical Analysis.* 2001; 33:271-90.
24. Okabe A, Okunuki K, Shiode S. SANET: A toolbox for spatial analysis on a network. *Geographical Analysis.* 2006; 38:57-66.
25. Yamada I, Thill J-C. Comparison of planar and network K-function in traffic accident analysis. *Journal of Transport Geography.* 2004; 12:149-58.
26. Georgia Department of Transportation. Georgia uniform vehicle accident report instruction guide. Available at: http://www.nhtsa-tsis.net. Accessed February 20, 2010.
27. Mu L, Wang F. A scale-space clustering method: Mitigating the effect of scale in the analysis of zone-based data. *Ann of the Associa of Am Geographers.* 2008; 98:85-101.
28. Lee JY. A three-dimensional navigable data model to support emergency response in microspatial built-environments. *Ann of the Associa of Am Geographers.* 2007; 97:512-29.
29. Clifton KJ, Burnier CV, Akar G. Severity of injury resulting from pedestrian-vehicle crashes: What can we learn from examining the built environment. *Transportation Research Part D.* 2009; 14:425-36.
30. Li F, Harmer P, Cardinal BJ, et al. Built environment and changes in blood pressure in middle aged and older adults. *Preven Med.* 2009; 48:237-41.
31. Parzen E. On estimation of a probability density function. *Annals of Mathematical Statistics.* 1962; 33:1065-76.
32. Porta S, Latora V, Wang F, et al. Street centrality and densities of retails and services in Bologna, Italy. *Environment and Planning, B, Planning and Design.* 2009; 36:450-65.
33. Ripley BD. The second-order analysis of stationary point processes. *Journal of Applied Probability.* 1976; 13:255-66.
34. Spielman S. Appropriate use of the K-function in urban environments *American Journal of Public Health.* 2006; 96:205.
35. Dixon MA, Jacko JA. An investigation of tactile and visual stimuli in the roadway environment. *Perceptual and Motor Skills.* 1998; 87:387-94.
36. Van-Houten R, Malenfant L. The influence of signs prompting motorists to yield before marked crosswalks on motor vehicle-pedestrian conflicts at crosswalks with flashing amber. *Accident Analysis and Prevention.* 1992; 24:217-25.
37. Nassar JL. Promoting drivers to stop for crossing pedestrians. *Transportation Research Part F.* 2003; 6:175-82.
38. Retting RA, Ferguson SA, McCartt AT. Review of evidence-based traffic engineering measures designed to reduce pedestrian-motor vehicle crashes. *Am J of Publ Heal.* 2003; 93:1456-63.

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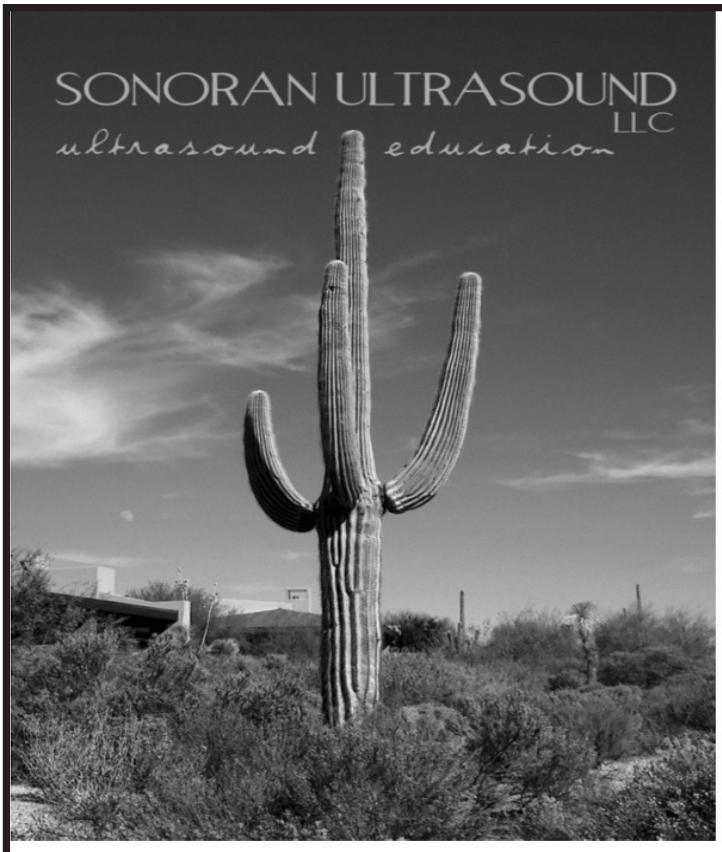

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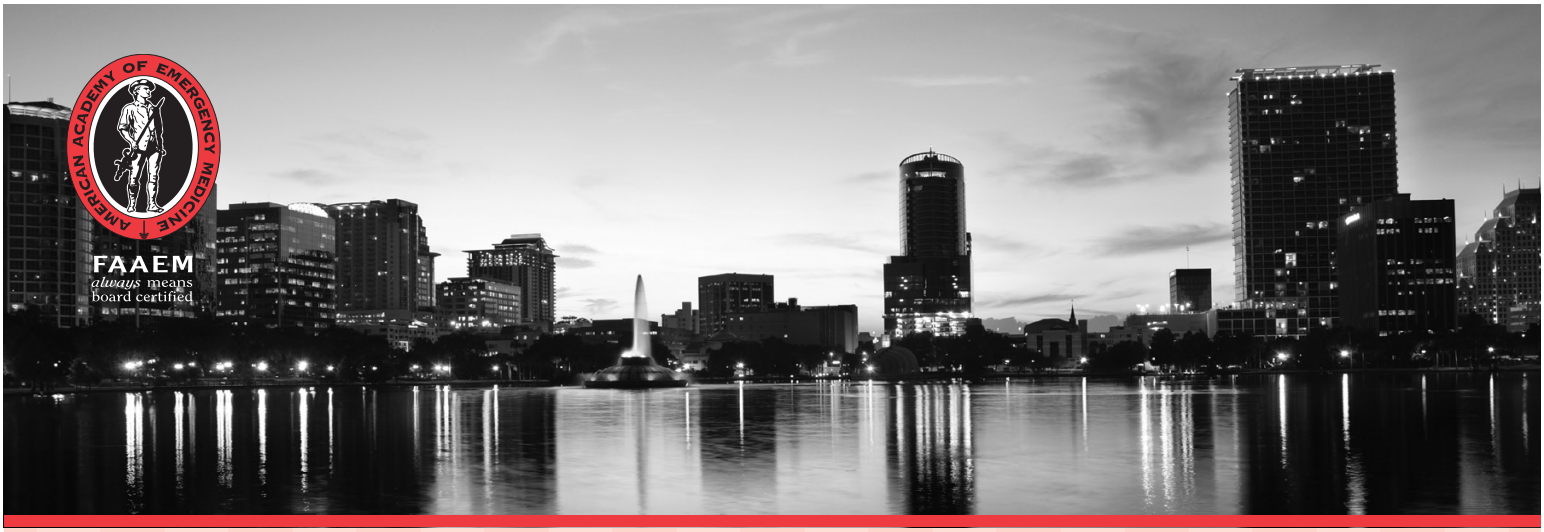

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