The Epidemic of Pediatric Traffic Injuries in South Florida: A Review of the Problem and Initial Results of a Prospective Surveillance Strategy

S. Morad Hameed, MD, MPH, Charles A. Popkin BA, Stephen M. Cohn, MD, E. William Johnson, MPH, and the Miami Pediatric Traffic Injury Task Force

This study identified specific regional risk factors for the high rate of pediatric pedestrian trauma in Florida. Of the 29 cases studied prospectively, 3 (10%) occurred near ice cream trucks and 13 (45%) involved "dart-outs"; mean hospital charges were $24 478 ±$43 939. Recommendations included an engineering change for a dangerous intersection, and a population-based recommendation was to equip ice cream trucks with extending stop signs. (*Am J Public Health*. 2004;94:554–556)

Approximately 30 000 children are struck by cars each year in the United States.[1] Florida is home to 4 of the 5 most dangerous cities for pedestrians in this country, and the mortality rate after pedestrian trauma (3.9 per 100 000) is higher than the national average (2.3 per 100 000).[2] Pediatric pedestrian injuries are frequently encountered at our trauma referral center in Miami, Florida.

Efforts to reduce the rates of pedestrian injury previously centered primarily on education programs and met with little success.[3] This may be partly due to an absence of data from prospective studies. Broad demographic trends and socioeconomic and geographic risk factors identified in the literature are often either region-specific or too generalized to be useful in the creation of practical, site-specific prevention strategies.

The purpose of this study was to outline the distribution, determinants, and effects of pediatric pedestrian trauma (PPT) in our community. We hypothesized that careful data collection would uncover community-specific PPT risk factors and suggest avenues for prevention and resource allocation.

METHODS

This study, set at the Jackson Memorial Hospital/University of Miami Ryder Trauma Center (the sole trauma center for approximately 3 million Miami-Dade County residents), was performed in 2 phases.

Phase 1—Retrospective Review

Medical records of pediatric pedestrians (younger than age 16 years) who presented to our institution between January 1994 and December 1996 were reviewed. Demographic parameters were defined and analyzed to assess the impact of PPT in our communities.

Phase 2—Prospective Data Collection

Recommendations from a multidisciplinary task force (including local medical, police, and government agencies) were incorporated into a design of a 4-month prospective cohort study. Detailed information from hospital records, crash scene visits, patients, families, and police interviews was compiled on consecutive cases of PPT treated at our center (July 1 through October 31, 2000). Injury scene conditions were systematically assessed and especially emphasized in the analysis.

RESULTS

Retrospective Review

A total of 235 PPT cases were evaluated. Grade school children were most often (53%) injured, usually in the vicinity of schools. Boys predominated, and African American children accounted for 60% of the cases. High mean hospital charges ($16 553) resulted from the high incidence rates (32%) of head injuries.

Prospective Data Collection

Population, scene, environmental, and cost issues were explored in 29 consecutive cases of PPT. Many children (69%) were from single-parent homes. Although Miami is ethnically diverse, a disproportionate number of PPT events occurred in predominantly African American neighborhoods. Thirty-five percent of children came from homes where at least 1 parent had some postsecondary education.

At most sites, intervals between marked intersections were long, allowing vehicle acceleration and predisposing random pedestrian crossing patterns. Some intersections (Figure 1) were observed to be poorly regulated by misplaced traffic lights and were a source of long-standing community apprehension. Mechanisms involving obstruction of view ("dart-outs")[4] were common (46%), although most PPT incidents (64%) occurred in clear daylight conditions. Site visits provided insight into situational dynamics. For example, 3 events (10%) resulted from traffic disruption by ice cream trucks.

Hospital charges ranged from $336 to $172 283, and at the time of the site visit (25 ±13 days post-PPT), 44% of children had not returned to school.

DISCUSSION

Previous studies (Table 1) have characterized region-specific risk factors for PPT, which may not be completely generalizable to Miami, with its unique cultural and geographic milieu. As indicated by our review, South Florida is fertile ground for a comprehensive PPT prevention strategy. Groups such as the North Miami Crash Traffic Safety Team and the Safe Kids prevention programs have taken an active role in pedestrian education, but to date, prevention initiatives have not been designed with specific references to objectively measured risk factors.

Available information sources, including police reports and hospital records, lacked sufficient detail to clarify the causes of PPT. The second phase of this study was designed to provide useful information for development of directed multidisciplinary prevention policy.

All 29 cases studied during our surveillance period had implications for the design of high-risk or population-based prevention strategies. Miami's uninhibited westward growth has resulted in the creation of communities with high volumes of rapid commuter traffic and long residential streets without sidewalks. Situations such as that summarized in Figure 1 will require innova-

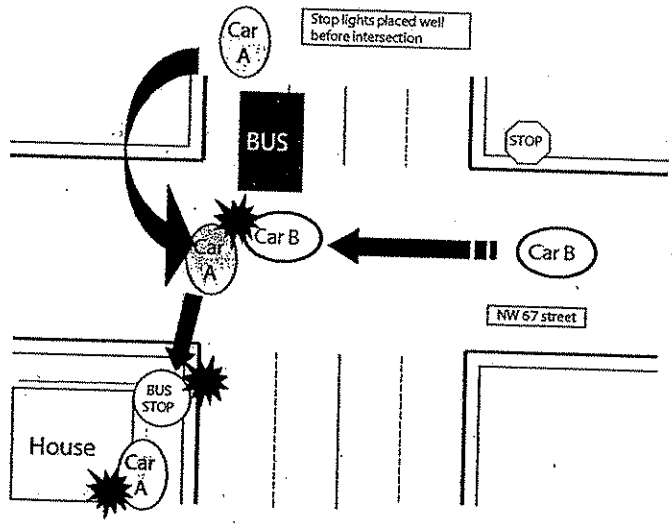

FIGURE 1—Problematic intersection at 2nd Ave and NW 67th St, Miami, Fla. During this site visit, numerous bystanders approached the investigators to find out when the city was planning to modify the control of this dangerous intersection. The visit was prompted by the injuries of a 5-year-old African American boy who had been holding his mother's hand at the bus stop on the corner. The driver of car A, after waiting behind a bus ahead of the traffic lights, swerved onto the shoulder area at a high rate of speed and entered the intersection unaware that the light had changed. The ensuing events are depicted. After the collision with car B, the driver of car A lost control, striking the boy, his sister, and their mother. The car then struck a fence at the corner and proceeded toward the wall of a nearby house with the child still trapped underneath.

tive engineering approaches to eliminate high-risk scenarios. Other high-risk situations, such as those involving ice cream trucks, will require legislation mandating the use of safety measures such as extending stop signs on these vehicles to help reduce the impact of the frequently observed dart-outs. Conscientious regulation of school bus access and pickup and drop-off practices would reduce the incidence of injuries observed during school hours.

Although this study was performed without external funding, a grant from the Florida Department of Transportation will allow us to address some of the limitations of this initial surveillance. Information will be collected over a school year along with an economic evaluation, and more objective scene measurements will be made. We hope to delineate a cost-effective surveillance-based prevention plan that reduces the incidence of children struck by motor vehicles. ■

About the Authors

S. Morad Hameed, Charles A. Popkin, Stephen M. Cohn, and E. William Johnson are with the Divisions of Trauma and Surgical Critical Care, Daughtry Family Department of Surgery, University of Miami School of Medicine Miami, Florida.

Requests for reprints should be sent to Stephen M. Cohn, MD, Medical Director, Ryder Trauma Center, Daughtry Family Department of Surgery, University of Miami School of Medicine, 1800 NW 10th Ave, Suite

TABLE 1—A Summary of the Pediatric Pedestrian Traffic Injury Literature

Authors	Type of Study	No. of injuries	Location	Main Conclusion
Rivara and Barber, 1985[5]	Retrospective	210	Memphis, Tenn	Traffic engineering modifications are practical solution
Brison et al., 1988[4]	Retrospective	71	Washington State	Prevention strategies must be age-specific
Mueller et al., 1990[6]	Case-control	98	King County, Washington	Busy streets, multifamily homes are strong risk factors
Braddock et al., 1991[7]	Retrospective	198	Hartford, Conn	High-density areas are problematic
Roberts et al., 1995[3]	Case-control	190	Auckland, New Zealand	High traffic volume in urban areas should be reduced
Agran et al., 1996[8]	Case-control	39	Orange County, California	Parked cars and reduced speed would decrease injuries
Calhoun et al., 1998[9]	Retrospective	91	Jefferson County, Alabama	Manageable environmental risk factors were identified; education should be targeted toward grade school children
Durkin et al., 1999[10]	Retrospective review of newly implemented intervention	Incidence study of all injuries (n=981) in Harlem, New York, NY	Harlem, New York, NY	Community interventions (play areas, education) may be helpful in preventing injury
Miami Pediatric Traffic Injury Task Force, 2001*	Retrospective review	235	Miami-Dade County, Florida	Ongoing surveillance is required for continued development of focused prevention strategies
	Prospective surveillance	29		

*Unpublished data.

227, Miami, FL 33136 (e-mail: stephen.cohn@miami.edu).

This brief was accepted June 30, 2002.

Contributors

S.M. Hameed contributed to the study design, data collection, data analysis, and manuscript preparation. C.A. Popkin contributed to the data collection and manuscript preparation. S.M. Cohn contributed to the study design, data analysis, and manuscript preparation. W.M. Johnson contributed to the study design and data collection.

Acknowledgments

The members of the Miami Pediatric Traffic Injury Task Force are Frank Pernas, BA, David Henderson, AICP, Mimi Sutherland, RN, MS, Margaret Brown, MSN, J. Esteban Varela, MD, Dimeter Hristov, MD, Kimberly Schwartz, MD, Officer Luis Taborda, BA, Julie Jackowski, RN, Tracy Byrd, BA, Gilian Hotz, PhD, Lewis Saye, BA, and Jose Guerrier, MD.

Human Participant Protection

Institutional review board approval was obtained from the University of Miami before this study was initiated.

References

1. *Accident Facts—1996 Edition.* Ithasca, Ill: National Safety Council; 1996.

2. McCann B, DeLille B. Mean Streets 2000 report. Surface Transportation Policy Project June 2000. Available at: http://www.transact.org/FCC/Reports/ms2000/natpress.htm2000. Accessed May 15, 2002.

3. Roberts I, Norton R, Jackson R, Dunn R, Hassall I. Effect of environmental factors on risk of injury of child pedestrians by motor vehicles: a case-control study. *BMJ.* 1995;310:91-94.

4. Brison RJ, Wicklund K, Mueller BA. Fatal pedestrian injuries to young children: a different pattern of injury. *Am J Public Health.* 1988;78:793-795.

5. Rivara FP, Barber M. Demographic analysis of childhood pedestrian injuries. *Pediatrics.* 1985;76:375-381.

6. Mueller BA, Rivara FP, Lü SM, Weiss NS. Environmental factors and the risk for childhood pedestrian-motor vehicle collision occurrence. *Am J Epidemiol.* 1990; 132:550-560.

7. Braddock M, Lapidus G, Gregorio D, Kapp M, Banco L. Population, income, and ecological correlates of child pedestrian injury. *Pediatrics.* 1991;88:1242-1247.

8. Agran PF, Winn DG, Anderson CL, Tran C, Del Valle CP. The role of the physical and traffic environment in child pedestrian injuries. *Pediatrics.* 1996;98:1096-1103.

9. Calhoun AD, McGwin G Jr, King WD, Rousculp MD. Pediatric pedestrian injuries: a community assessment using a hospital surveillance system. *Acad Emerg Med.* 1998;5:685-690.

10. Durkin MS, Laraque D, Lubman I, Barlow B. Epidemiology and prevention of traffic injuries to urban children and adolescents. *Pediatrics.* 1999;103(6):e74.