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Community Based Booster Seat Promotion Programs: Baseline Results of a Direct Observation Survey

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16. Abstract

This study reports the results of a baseline survey of restraint use by 4 to 8 year old children in Grand Rapids, Kalamazoo, Sturgis, and Coldwater, Michigan. The study, conducted between June 19 and July 1, 2005, focused on low income areas of Grand Rapids and the Hispanic population of Sturgis. Two control cities were chosen to observe booster seat use in cities similar to the experimental cities. Kalamazoo was the control city for Grand Rapids, and Coldwater was the control city for Sturgis. A follow-up survey to be conducted next year will provide comparison data and will be discussed in a separate report. Together, these survey waves will provide an assessment of the booster seat promotion programs implemented in Grand Rapids and Sturgis, Michigan. In this study, 4 to 8 year old children were observed traveling in passenger cars, vans/minivans, sport-utility vehicles, and pickup trucks. Each city was analyzed separately to obtain a booster seat use rate for each sample area. Booster seat use rates were: Grand Rapids 19.0 ± 10.3 percent, Kalamazoo 9.7 ± 11.3 percent, Sturgis 9.7 ± 5.0 percent, and Coldwater 18.2 ± 5.2 percent.

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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yard	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
		NOTE: volumes greater than 1000 L shall be shown in m^3		
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
		TEMPERATURE (exact degrees)		
^oF	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	^oC
		ILLUMINATION		
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	$candela/m^2$	cd/m^2
		FORCE and PRESSURE or STRESS		
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	square kilometers	0.386	square miles	mi^2
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	cubic meters	35.314	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2000 lb)	T
		TEMPERATURE (exact degrees)		
^oC	Celsius	1.8C+32	Fahrenheit	^oF
		ILLUMINATION		
lx	lux	0.0929	foot-candles	fc
cd/m^2	$candela/m^2$	0.2919	foot-Lamberts	fl
		FORCE and PRESSURE or STRESS		
N	newtons	0.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in^2

*SI is the symbol for the International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380.
(Revised March 2003)

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Introduction

Until the mid 1990s, research about child passenger safety mostly focused on children under 3 years of age, but recently the need for age appropriate restraint use for older children has emerged as a critical component of occupant protection. According to recent research, the use of age appropriate restraints declines dramatically among children ages 3 to 8. Rather than graduating from a child safety seat to a booster seat, many children skip the booster seat and use only a safety belt. In fact, the Children's Hospital of Philadelphia (2003) found that 62 percent of 4 to 8 year olds were inappropriately restrained in only a safety belt. Research has shown that premature graduation to a safety belt puts children at risk for serious injuries because adult safety belts do not fit young children properly. The National Highway Traffic Administration (NHTSA, 2004) recommends that children that have outgrown child safety seats with internal harnesses be properly restrained in a belt positioning booster seat until they are at least 8 years old or 4'9" tall.

As of July 5, 2005, 33 states and the District of Columbia have ratified laws that require the use of booster seats (Advocates for Highway and Auto Safety, 2005). Despite the growing amount of research highlighting the benefits of using booster seats, Michigan does not require their use. The current law requires children from birth through age three to be properly restrained in a child safety seat. Once a child reaches age 4, they are only required to wear a safety belt (Michigan Office of Highway Safety Planning, OHSP, 2005). In 2004, overall booster seat use in Michigan was 8.6 percent while the rate of children restrained in a safety belt was 48.8 percent (Eby, Bingham, Vivoda, & Ragunathan, 2005). The very low rate of booster seat use in Michigan is cause for concern, especially when considering the fact that the odds of injury for children ages 4 to 7 involved in a car crash are 59 percent lower when the child is placed in a belt positioning booster seat rather than a safety belt (Durbin, Elliott, & Winston, 2003). It is clear that Michigan children are not as well protected as they could be while riding in motor vehicles.

The purpose of the current study is to provide baseline booster seat use rates for the cities of Grand Rapids and Sturgis, Michigan prior to the implementation of

community based interventions. The purpose of the interventions is to increase booster seat use and prevent motor vehicle related injuries to children. The survey will also provide baseline data for comparison. The University of Michigan Transportation Research Institute (UMTRI) will also conduct a post program direct observation survey to track trends of booster seat use in each city.

Methods

Sample Design

The goal of this sample design was to select observation sites that represent locations visited by children 4 to 8 years of age (target age) in areas where the community based interventions would be taking place. Two control cities were chosen to observe trends in booster seat use in places that are very similar to the experimental cities, but are not receiving the interventions. The control cities were chosen based on several factors including: population, race, number of target age children, education, and median family income (U.S. Census Bureau, 2005). The control city for Grand Rapids was Kalamazoo. The control city for Sturgis was Coldwater.

The intervention in Grand Rapids was designed to focus on the low income community. Therefore, information containing the median family income of each census block group in Grand Rapids was gathered and analyzed. Areas with a median family income of $9,464 - $25,188 were outlined on a map of Grand Rapids and served as our sampling area. The same procedure was used to determine the sampling area in Kalamazoo. Sites within these areas were determined by analysis of travel patterns of 4 to 8 year old children provided in the National Household Travel Survey, NHTS, (Bureau of Transportation Statistics, 2005) and previous direct observation surveys of booster seat use conducted by UMTRI (Eby et al., 2005). In Grand Rapids and Kalamazoo, site types were: day care centers, pediatric clinics, grocery stores/shopping centers, and McDonald’s restaurants.

In Sturgis, the purpose of the survey was to target locations that are most often frequented by the Hispanic population, so sites were chosen to represent this population. UMTRI contacted a local expert that was able to provide many of these site locations for the study. Site types were also chosen according to the NHTS as described earlier. The types of sites used in Coldwater were matched with the types used in Sturgis. The types of sites used in Sturgis and Coldwater were: pediatric clinics, restaurants, and grocery stores/shopping centers.

Within each city, fifteen observation sites were selected randomly from lists of potential sites. A list of all day care centers in Grand Rapids and Kalamazoo was obtained from the Michigan Family Independence Agency. The lists of grocery stores/shopping centers, pediatric clinics, and restaurants were downloaded from www.SMARTPages.com. The distribution of sites throughout each day was based upon scheduling considerations. Day care centers were observed during the morning drop off period (7:45 - 9:15 a.m.), restaurants during high traffic times (lunch and dinner), and pediatric clinics and grocery store/shopping center sites at any time throughout the day. Restaurants, pediatric clinics, and grocery store/shopping centers were observed for one hour.

As just discussed, scheduling of sites was constrained by the need to observe day care sites in the morning, and restaurant sites during meal times. Therefore, we could not randomize by time of day. In addition, day care sites could not be observed during the weekend. Within this constraint, the day of week for site observation was randomly selected using a clustering procedure. A cluster was made up of spatially adjacent sites that were observed during a single day. Clusters were randomly assigned to a day of week.

Data Collection Procedures

All data was collected using personal digital assistants (PDAs). During data collection, trained field staff observed the restraint use and sex of 4 to 8 year old motor vehicle occupants traveling in passenger cars, vans/minivans, sport-utility vehicles, and

pickup trucks. Restraint use, sex, and age of the driver was also observed and recorded. Observations were conducted as vehicles entered the parking areas of businesses frequented by children of this age group.

Observer training

Prior to data collection, field observers participated in 4 days of intensive training. After thorough review of the manual and a training session about common types of child restraint devices, observers conducted practice observations at locations that would represent the types of sites encountered during data collection. Training at practice sites focused on identifying vehicles containing target age children, recording restraint use and sex of target age children, using the PDA for data collection, determining where to stand, and estimating and recording the safety belt use, sex, and age of the vehicle driver. Some of this training involved asking the driver the age of child passengers to increase the accuracy of the visual judgment of age. Formal validation of the visual assessment of ages was not conducted due to time and budget constraints. Other research, however, has shown that the visual assessment of age can be nearly 90 percent accurate with well-trained observers who have experience working with children (Moeller, Berger, Salvador, & Helitzer, 2002).

Results and Discussion

Table 1 shows the restraint use of 4 to 8 year old children in Grand Rapids and Kalamazoo. As shown in this table, use of booster seats by target aged children was 19.0 percent in Grand Rapids. The "±" value following the use rate indicates a 95 percent confidence interval around the percentage. The value should be interpreted to mean that if the same study was repeated multiple times, the actual booster seat use rate in low income areas of Grand Rapids will fall somewhere between 8.7 and 29.3 percent 95 percent of the time. The unrestrained use rate falls somewhere between 18.1 and 47.5 percent. The table also shows booster seat use at 9.7 percent in Kalamazoo with 28.0 percent unrestrained. The rates are adjusted for the clustering of multiple children in the same car and also for the ratio of observed children to the total population of target aged children in each of the cities. Both Grand Rapids and

Kalamazoo had very high rates of 4 to 8 year olds inappropriately restrained by a safety belt with 48.3 and 62.3 percent, respectively.

Table 2 shows the restraint use of children ages 4 to 8 in Sturgis and Coldwater. Booster seat use in Sturgis was 9.7 percent while 25.5 percent of target age children remain unrestrained. Coldwater had a booster seat use rate of 18.2 percent with 23.5 percent completely unrestrained. In Sturgis, 64.8 percent of target aged children were restrained by a safety belt compared to 58.3 percent of children in Coldwater. As can be seen, both Sturgis and Coldwater had a very high rate of children advancing to safety belts more quickly than is recommended. Rates have been adjusted just as they were for Grand Rapids and Kalamazoo.

Table 1. 4 to 8 Year Old Restraint Use in Low Income Areas of Grand Rapids and Kalamazoo

Variable	N	Percent Use
Grand Rapids	174	
Booster Seat		19.0 ± 10.3
Belted		48.3 ± 8.8
Unrestrained		32.8 ± 14.7
Kalamazoo	175	
Booster Seat		9.7 ± 11.3
Belted		62.3 ± 5.7
Unrestrained		28.0 ± 11.8

Table 2. 4 to 8 Year Old Restraint Use in Sturgis and Coldwater

Variable	N	Percent Use
Sturgis	165	
Booster Seat		9.7 ± 5.0
Belted		64.8 ± 14.3
Unrestrained		25.5 ± 19.3
Coldwater	132	
Booster Seat		18.2 ± 5.2
Belted		58.3 ± 9.4
Unrestrained		23.5 ± 13.5

These findings indicate that the vast majority of target age children in each city are at greater risk of death and injury from an automobile crash than if they were properly restrained in booster seats. Ramsey, Simpson, and Rivara (2000) found that parental misconceptions about size and safety of regular restraint equipment are the most common reasons that children are not appropriately restrained. It has also been found that many parents do not place their children in booster seats because the law does not require them to do so (Bingham, Eby, Hockanson, & Greenspan, 2005). Michigan has proposed legislation that would require the use of booster seats for children ages 4 to 8 years old who weigh between 40 and 80 pounds and are less than 4’9” tall (Michigan Legislature, 2005). If the bill passes, the number of lives lost and injuries incurred could be greatly reduced. However, until a law is enacted that mandates the use of booster seats, it is important to create public awareness and to educate others on the importance of booster seats.

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