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A DESCRIPTIVE ANALYSIS OF CHILD OBESITY AND ITS AFFECT ON PROPER RESTRAINT USAGE FOR CHILDREN AGES TWO AND THREE

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CHILD OBESITY AND ITS AFFECT ON PROPER RESTRAINT USAGE FOR CHILDREN AGES TWO AND THREE

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ABSTRACT

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The purpose of this article is to address how obesity is affecting the proper use of child restraints. Child passenger safety advocates recommend that a child be secured in a 5-point harness restraint until at least the age of four. Unfortunately, high obesity rates in toddlers are creating a problem because most standard restraints only allow a weight maximum of 40 pounds. Overweight children are being improperly secured during travel. Weights and BMI's were analyzed from children two and three years old enrolled in WIC to determine how many children do not fit in a standard harness weight child restraint. The study found that 7.5% (49) children from the population sampled, weighed greater than 40 pounds; thus would not fit in a standard weight child restraint. In addition, 20% of the sample fell into either the "overweight" or "obese" category based on their BMI. The information found can shed light on the need for parent and law enforcement education on high-weight harness restraints, affordable and accessible high-weight harness restraints, and vehicle LATCH systems engineered to handle higher weight limits on restraints.

Keywords: child passenger safety; obesity; child restraint; car seats; child safety seat

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INTRODUCTION

Motor vehicle crashes remain the number one cause of unintentional injury death for children ages 1-4, accounting for 29.3% of all deaths in this age group (Centers for Disease Control, 2006). National Highway Traffic Safety Administration (NHTSA) reported during 2006, that an average of five children ages 14 and younger were killed and 568 were injured in motor vehicle crashes every day in the United States. NHTSA also reported that in 2006, in cases where child restraint use was known, 25% were unrestrained and among those who were killed, 45% were unrestrained. These are deeply saddening statistics, when we know that child safety seats reduce the risk of fatal injury by 71% for infants and by 54% for toddlers in passenger cars (NHTSA's National Center for Statistics and Analysis, 2006).

Child passenger safety advocates recommend that children stay in a 5-point harness restraint at least until the age of four and 40 pounds, at which time they can graduate to a booster seat. Unfortunately, despite these recommendations, many parents move their children into belt-positioning booster seats (BPB) too early (Winston, Durbin, Kallan & Moll, 2000). One study found that more than one-third of children ages 2-5 were improperly restrained, which resulted in a 3.5 times increased risk of serious injury and more than 4 times increased risk of head injury (Winston et al., 2000). Another study

that examined the effectiveness of a forward-facing child restraint versus a child in a seatbelt only, found that the use of a forward-facing child restraint reduced hospitalization by 82% and serious injury by 80% (Arbogast, Durbin, Cornejo, Kallan & Winston, 2004).

Childhood obesity is a growing problem in our nation. According to the National Center for Health Statistics, the number of children ages 2-5 deemed overweight almost doubled from 7.2% in 1988-94 to 13.9% in 2003-2004. Children and teen BMI's are rated differently than adult BMI's. According to the Centers for Disease Control and Prevention (CDC), there are four weight categories for children and teens (Table 1). The CDC and the American Academy of Pediatrics (AAP) recommend the use of BMI to screen for overweight and obesity in children beginning at two years of age.

Table 1. Definitions of Children and Teen Weight Status

Weight Status Category	Percentile Range
Underweight	Less than the 5th percentile
Healthy weight	5th percentile to less than the 85th percentile
Overweight	85th to less than the 95th percentile
Obese	Equal to or greater than the 95th percentile

It has been demonstrated that childhood obesity is creating a negative effect on parents' knowledge and skill to properly restrain their children. National Health and Nutrition Examination Survey (NHANES) data from 1999 to 2000, found that 8,683

children two years of age, 182,661 children three years of age, and 91,927 children four to six years of age in the United States may have an extremely difficult time finding an appropriate child restraint for their weight and age (Trifiletti, Shields, Bishai, McDonald, Reynaud & Gielen, 2006).

In addition, obese children have a 2.5 greater risk of injury in a crash than normal weight children (Pollack, Xie, Arbogast, Durbin, 2008). Researchers hypothesized that this may be due to a combination of physiology, biomechanical forces, and vehicle design (Pollack et al., 2008).

METHODS

The Wisconsin Women, Infants, and Children (WIC) program requires the heights and weights of children enrolled to be measured every 6 months and entered into the WIC database, Real-time Online Statistical Information Environment (ROSIE). In Wood County, this is done by WIC nutritionists using a digital scale. The database automatically calculates the child's Body Mass Index (BMI). For this study, age, weight, and BMI's were gathered from ROSIE on all Wood County children ages two and three enrolled in the WIC program between the years 2004–2008. Each child was only counted once in the five year period. ROSIE automatically transferred the data into a Microsoft Excel file. The data was then analyzed using the software program, PASW Statistics 17.0. A descriptive analysis was done.

According to child passenger safety experts, children ages two and three should ride in a 5-point harness restraint. The majority of these restraints have a weight limit of 40 pounds. For the purpose of this study, we examined how many children in this age group exceeded 40 pounds, thus are unable to properly fit in a standard child restraint.

BMI's were also examined to determine children who may not yet weigh over 40 pounds, but are at risk for being overweight or already are overweight for their age and may exceed 40 pounds before the age of four. BMI's were also examined to determine if some of the children were exceptionally large for their size, or if they were overweight. Children are deemed "overweight" if they have a body mass index at or above the 85th percentile through the 94th percentile and are said to be "obese" if their body mass index is at or above the 95th percentile (CDC, 2008). Growth charts from 2000, developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion were used to calculate what BMI's registered as overweight and obese.

RESULTS

The data sample consisted of 655 children and included 337 2-year-olds and 318 3-year-olds. Weights and BMI's were broken down by age and gender (Figure 1). Of the total sample, 7.5% (49) exceeded 40 pounds.

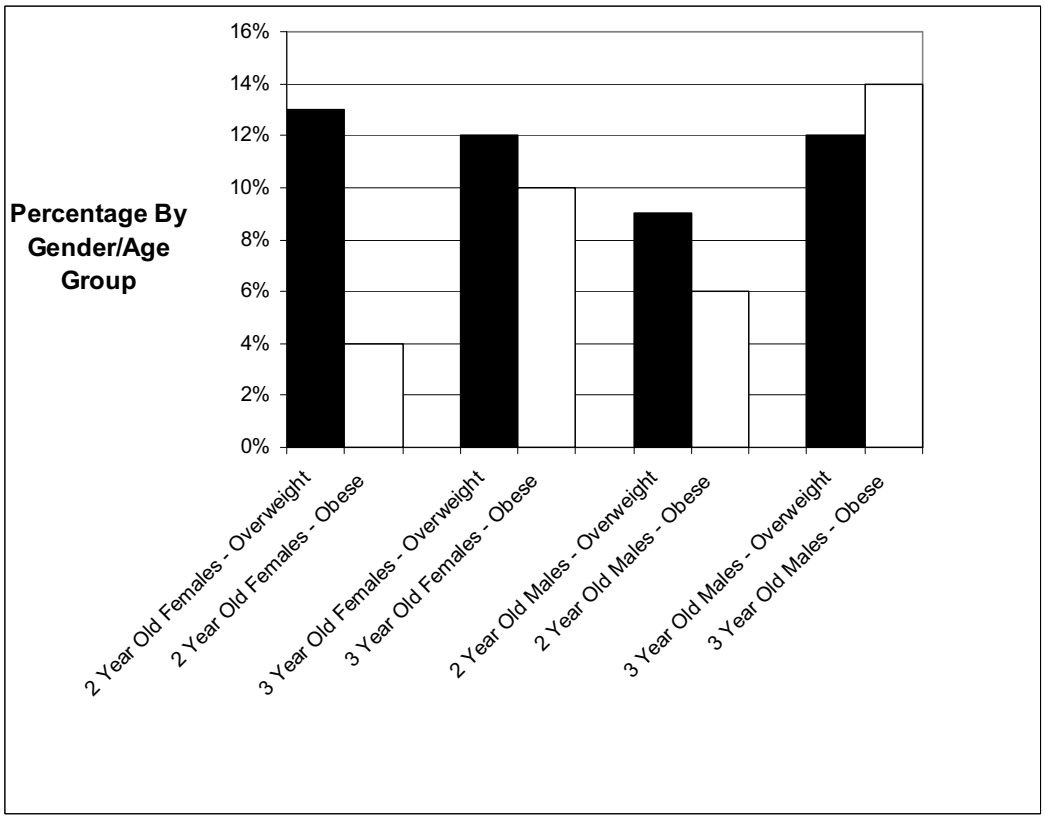

Figure 1. Wood County WIC Children 2004 - 2008 (N=655)

The average weight for 2-year-old females was 29.36 pounds with a maximum weight of 44 pounds. One 2-year-old female weighed over 40 pounds. The average weight for 2-year-old males was 30.32 pounds with a maximum weight of 47 pounds. Three 2-year-old males weighed over 40 pounds.

The average weight for 3-year-old females was 34.48 pounds, with a maximum weight of 62 pounds. The average weight for 3-year-old males was 36.46 pounds, with a maximum weight of 63 pounds. There were twenty 3-year-old females and twenty-five 3-year-old males that weighed over 40 pounds.

BMI analysis results can be found in Table 2. Any 2-year-old female with a BMI at or between 18.0 – 19.0 and any 2-year-old male with a BMI of 18.2 – 19.2 was deemed

overweight. Thirteen percent (21) of the 2-year-old females and 9% (15) of the 2-year-old males were overweight. Three-year-old females and males were categorized as overweight if they had BMI's at or between 17.2 – 18.2 and 17.4 – 18.2, respectively. Twelve percent (21) of 3-year-old females and 12% (17) of 3-year-old males were overweight.

Two-year-old females were identified obese if they had a BMI of 19.1 or greater and the 2-year-old males fell into the obese category with a BMI at or above 19.3. Four percent (7) of 2-year-old females and 6% (11) of 2-year-old males were considered obese. Ten percent (17) of 3-year-old females had BMI's at or above 18.3, thus fell in the obese category. Three-year-old males who were cited as obese had BMI's at or above 18.3, and 14% (21) of them aligned in the obese category.

Table 2. BMI's of 2 and 3-Year-Old Wood County WIC Children 2004-2008 (N=655)

	Overweight		Obese	
	n	Percent	n	Percent
2-Year-Old Females	21	13%	7	4%
2-Year-Old Males	15	9%	11	6%
3-Year Old Females	21	12%	17	10%
3-Year-Old Males	17	12%	21	14%

Based off of BMI's, 20% (66) of the females and 20% (64) of the males were overweight or obese, equaling 20% of the entire group sampled.

It is important to note those children that classify as outliers. These are the children that are most at risk for having difficulty finding an appropriate restraint to fit them properly. Table 3 displays the outliers by their age, weight, and BMI

Table 3. Outlier Data for 2 and 3-Year-Old Wood County WIC Children 2004-2008 (N=655)

2-Year-Old				3-Year-Old			
Females		Males		Females		Males	
Weight	BMI	Weight	BMI	Weight	BMI	Weight	BMI
44	44.4	33	20.5	45	21.8	63	24.9
		43	20.0	48	26.5	54	22.1
		36	20.0	58	26.2	50	20.5
		47	23.9	50	21.4	45	21.7
		30	20.0	45	21.5	54	22.2
		43	19.4	62	26.4	46	20.1
						51	20.1
						63	23.7
						47	20.1

DISCUSSION

From the results, the number of Wood County WIC children who weigh over 40 pounds is not staggering. However, it does demonstrate that a least 49 children in Wood

County do not fit in the appropriate child restraint with the standard weight restrictions of 40 pounds. In addition, these numbers only reflect children participating in WIC, and do not include those not enrolled in the program. Also noted, 20% of the sample is considered overweight or obese according to their BMI. Overweight and obesity is generally assumed to be a long-term health problem. This can lead us to presume that it is possible that some of the 2 and 3-year-olds may not yet weigh 40 pounds, but have factors that may lead them to gain that weight before the age of four.

A child under the age of four who weighs at or above 40 pounds has the potential to experience two problems regarding child restraint use. The first concern is that parents may leave the child in the standard 5-point harness with a weight limit of 40 pounds, not paying attention to the restraint weight restrictions or perhaps notice the weight restrictions, yet feel the harness is still better protection than the seatbelt, even if they exceed the maximum weight limit of the restraint. Exceeding the restraint weight limits would be problematic according to the 2009 LATCH (Using Lower Anchors and Tethers for Child Restraints) manual which states, "a child restraint with a harness should not be used above the maximum weight specified by its instructions and labels" (2009, p. 8). Restraint harnesses have been crash tested by their manufacturers at their designated harness weight maximum and it is unknown how the harness would perform in a crash if the restraint was holding a child weighing over that maximum (Tech Manual, 2007).

The second concern is that parents may notice the restraint weight limit and then move the child into a BPB before the age of four. The use of a BPB before the age of four is not recommended because developmentally most children under 4 are not ready to sit appropriately in a vehicle seat belt. Children who are under about four years old or are

very active may not stay put without a 5-point harness system that holds them in place. "Most 2-year-olds and many 3-year-olds are too immature to sit still in a booster with a lap and shoulder belt, which allows them to lean forward or sideways" (Safety Belt Safe USA, Does Your Child Need a Booster Seat?, 2009). In addition, even with the use of a BPB, a vehicle lap and shoulder belt may not fit properly across the child's hips and chest, thus not offering appropriate protection in a crash.

Child passenger safety experts recommend that children weighing over 40 pounds, but who are less than four years old be placed in a high-weight 5-point harness restraint (Safety Belt Safe USA, 2009). These restraints are typically available with weight maximums of 50, 65, and 80 pound limits.

Parent education regarding why the use of a high-weight harness (HWH) restraint is preferred rather than a BPB seat is lacking. Many parents are not knowledgeable of the importance of keeping their child in a 5-point harness. In addition, there is a lot of confusion legally. Current Wisconsin law states that a child can be placed in a BPB at four years of age and 40 pounds (Safety and Consumer Protection, 2006). Many parents and law enforcement personnel misinterpret this law and place the child in a BPB at four years of age *or* 40 pounds. Legally, children over 40 pounds, but younger than four years old need to be restrained in a HWH restraint.

There is often difficulty for parents in obtaining HWH restraints. Manufacturers have improved their availability in the last few years by slightly increasing the number of HWH restraints offered; however the problem is not yet fully resolved. Increasing the restraint's weight capacity can become challenging to manage forward head excursion (S. Tilton, personal communication, August 6, 2009). The higher the weight capacity equals

higher forces applied in a crash, which means the materials used in constructing the restraint need to be stronger than a standard restraint and can add extra cost in manufacturing (S. Tilton, personal communication, August 6, 2009).

While some manufacturers have created lower-cost, HWH restraints, they are still more expensive than the standard restraints. As of 2008, the lowest priced HWH restraint is the Evenflo Titan Elite, which has a harness weight limit of 50 pounds and starts at approximately $99 (Colella, 2008). Most other HWH restraints range from $150 - $300 (Colella, 2008). Parents are able to purchase a standard 40-pound weight-limit restraint for approximately $55, which is significantly cheaper. BPB's can be even less expensive, which may be enticing to parents to buy, rather than the more expensive HWH restraint. This is of special concern for the population sampled for this study; as WIC clients, these families are low-income and often do not have the means to purchase HWH restraints. Unfortunately, studies have found that children of low-income status have an increased risk for obesity (Ploeg, 2009). Essentially, these children have a higher probability of not properly fitting in a standard restraint, while their parents are least likely to afford the HWH restraint that may fit them.

The cost of the HWH restraints also affects child restraint programs. These programs are often found at agencies such as local health departments, hospitals, and police departments and provide families with low-cost or free restraints while educating parents and caregivers on proper use. Many child passenger safety programs do not have the funding to purchase HWH restraints or prefer to buy the less expensive, standard 40-pound restraints so they are able to purchase more in order to service more families.

It is also important to consider the availability of these HWH restraints. In rural areas, it is difficult to find HWH restraints on store shelves. Often families need to travel considerable distances to cities with larger stores and this requires a reliable vehicle and money for gas. They may also purchase them online; however, this can add additional shipping and handling charges and requires internet access, which is not always easily accessible for families.

Child passenger safety technicians have also been finding that the lower-priced HWH restraints may offer the extended weight limit, however they do not always compensate in the often needed extended height of the harness straps. A forward-facing restraint requires the harness straps to be at or above the child's shoulders. When restraints are advertised to fit higher-weight children, they need to be designed to fit height, as well as weight. This can cause confusion for parents. If parents do purchase the HWH restraint, they do not always realize they need to check the height on the harness straps as well. The height and weight requirements go hand-in-hand and both must fit the child properly in order to reach maximum protection.

One more added issue in relation to HWH restraints is that most vehicle manufacturers do not design their Lower Anchors and Tethers for Children (LATCH) systems to withstand the higher-weight harness limits of the larger restraints. When the LATCH standards were developed and phased in beginning in 1999, with full implementation in September 2002 (Stewart, Anderson, Lang, Rose, & White, 2009), HWH restraints were not very common, thus most LATCH anchors were engineered to withstand the harness weight limits of a standard restraint of 40 pounds. Today many vehicles have lower anchor and tether weight limits of 40 or 48 pounds and would not be

appropriate to use with a HWH restraint (Stewart et al., 2009). NHTSA recognized this problem in their LATCH Report back in 2006, however the issue is yet to be resolved (Stewart et al., 2009). Currently, the LATCH Working Group is doing research to find a LATCH weight limit that all vehicle manufacturers can agree upon (Stewart et al., 2009).

RECOMMENDATIONS

Above all, more education is needed on the issue of proper restraint usage with overweight children. Parent education is most critical. The creation of an educational toolkit to be used by child passenger safety advocates would be helpful. Materials in the toolkit may include factsheets and brochures for parents, template press releases and editorials to be used in local newspapers, radio public service announcements, billboard campaign templates, and website video clips, widgets, or crawlers. Thought and consideration would be needed in the creation of such a toolkit to effectively communicate this message to the appropriate population. Caution should be used in crafting these messages due to the sensitive nature of overweight and obesity.

Education for law enforcement is a necessity. While law enforcement officers are well aware that children need to be placed in child restraints, they are not all aware that children under the age of four, still need to be in a 5-point harness restraint even if they weigh greater than 40 pounds and have outgrown their standard child restraint. With enforcement of this law, more parents will become aware of not only the need, but the requirement of HWH restraints for those children. Education for law enforcement may be done through individual interventions at the local level, as well as the addition of a more extensive review during their schooling.

Restraint manufacturers need to develop strategies to manufacture lower-cost HWH restraints that not only have increased harness weight limits, but added height in the harness straps slots. Retailers need to make these restraints much more accessible by providing larger selections in department stores in small towns, in addition to large cities.

Vehicle manufacturers need to eliminate the confusion with LATCH systems by increasing the lower anchor and tether weight limits so that the complexity of installing HWH restraints is simplified. LATCH weight limits need to be highlighted in the vehicle user manual to raise awareness that weight limit exist and differ by vehicle.

Further research on this issue is recommended. In only gathering data on children enrolled in the WIC program, this review examined a small subset of the population. It would be beneficial to expand this study to all children in this age category. It would also be helpful to examine what type of restraint is actually being used with those children who do not fit in a standard size child restraint.

CONCLUSION

It is clear that childhood obesity is affecting the proper use of child restraints. As obesity rates continue to rise, there does not seem to be an end to the problem in the near future. It is critical that overweight children are equally protected as other children. While restraint manufacturers have made strides in addressing this problem, there is still much more progress to be made. Motor vehicle crashes remain the number one cause of unintentional injury deaths for children ages 1-4 in the United States (CDC, 2006). There is no excuse for not protecting all children equally.

REFERENCES

Arbogast, K., Durbin, D., Cornejo, R., Kallan, M & Winston, F. (2004). An evaluation of the effectiveness of forward facing child restraint systems. *Accident Analysis & Prevention, 36*, 585-589.

Centers for Disease Control and Prevention. Healthy weight: Assessing your weight: BMI: About BMI for children and teens. Available from www.cdc.gov.

Centers for Disease Control and Prevention. 2006, United States unintentional injuries ages: 1-4 all races, both sexes. *Office of Statistics and Programming, National Center for Injury Prevention and Control, Centers for Disease Control and Prevention*. Available from www.cdc.gov.

Colella, J. (2008). Alternatives to boosters for children over 40 pounds. *Traffic Safety Projects.*

National Highway Traffic Safety Administration. (2006). NHTSAs National Center for Statistics and Analysis: Data - Children. Available from www.nhtsa.gov.

Ploeg, M. (2009). WIC and the battle against child overweight. *United States Department of Agriculture Economic Research Service. Economic Brief, 13*.

Pollack, K., Xie, D., Arbogast, K. & Durbin, D. (2008). Body mass index and injury risk among US children 9-15 years old in motor vehicle crashes. *Injury Prevention, 14*, 366-371.

Safety and consumer protection: New child safety seat law. (2006). Wisconsin Department of Transportation. Available from http://www.dot.wisconsin.gov/safety/vehicle/child/laws.htm.

Safety Belt Safe USA. Which safety seat is "the best" for my child? Available at: http://www.carseat.org/Resources/624_bestseat.pdf. Accessed July 8, 2009.

Stewart, D., Anderson, M., Lang, N., Rose, K. & White, L. (2009). The LATCH manual: Using lower anchors and tethers for child restraints (6th ed.). Edmonds: Safe Ride News Publications.

Technician manual. (2007). Available from http://www.cpsboard.org/techmanual.htm.

Trifiletti, L., Shields, W., Bishai, D., McDonald, E., & Gielen, A. (2006). Tipping the scales: Obese children and child safety seats. *Pediatrics, 117*(4), 1197-1202.

Winston, F., Durbin, D., Kallan, M. & Moll, E. (2000). The danger of premature graduation to seat belts for young children. *Pediatrics, 105*(8), 1179-1187.

APPENDIX A

LITERATURE REVIEW

MORBIDITY AND MORTALITY STATISTICS

Accounting for 29.3% of all deaths for children ages 1-4, motor vehicle crashes remain the number one cause of unintentional injury death for this age group (CDC, 2006). According to the National Highway and Traffic Safety Administration (NHTSA), in the United States, an average of five children ages 14 and younger were killed and 568 were injured in motor vehicle crashes every day in 2006. NHTSA also reports that in 2006, those children where restraint use was known, 25% were unrestrained and among those who were killed, 45% were unrestrained. These are deeply saddening statistics, when we know that child safety seats reduce the risk of fatal injury by 71% for infants and by 54% for toddlers in passenger cars (NHTSA's National Center for Statistics and Analysis, 2006).

HISTORY

Surprisingly, the first so-called child restraint was developed and sold on the market by the Bunny Bear Company in 1933. This restraint, by today's standards, was really not a restraint at all, but merely a positioning device designed to lift the child up for better visibility and eliminated interaction with the driver (Shelness & Charles, 1975).

Unfortunately, occupant safety hasn't always been a priority. It wasn't until the 1960's that true motor vehicle safety efforts began (CDC, 1999). However, sadly these efforts were geared towards adults, not children. In 1972 motor vehicle crashes accounted for 1,090 child deaths and 77,000 child injuries in the 0-4 age group in the United States (Shelness & Charles, 1975). Eventually, researchers began to realize that seat belts designed for adults, are not appropriate for children. As reported in a study completed by Burdi and his colleagues and reported by Annemarie Shelness and Seymour Charles, " A

child's body dimensions, proportions, and biomechanical properties are so markedly different from those of an adult that a child can not, for design purposes (of child restraints), be considered simply as a scaled-down adult" (1975, p. 272). The report went on to conclude that children need special restraints designed specifically for their size.

In the late 60's safety belts began to become more popular, however, the idea that children were too small for safety belts designed for adults continued to be ignored (Shelness & Charles, 1975) and "true" child restraints were non-existent.

Finally, in 1971 the U.S. government stepped up and passed the Motor Vehicle Safety Standard No. 213 for "Child Safety Systems." While the legislation was not perfect, it was a good starting point. Components of the law included: means of anchoring the device to the seat of the vehicle with a standard lap belt, provision of a harness to keep the child contained within the device, and head support to minimize "whiplash" injury (Shelness & Charles, 1975). The law also required the restraints to withstand primitive static crash tests using a wooden block to act as the child (Shelness & Charles, 1975).

It was not long before researchers found that while the seats manufactured under the new legislation were an improvement, they were still inadequate (Shelness & Charles, 1975). Finally, in 1974 Standard 213 was revised (Shelness & Charles, 1975). Seats were now required to undergo dynamic crash tests, rather than static crash tests and they had to meet certain criteria to pass the tests (Shelness & Charles, 1975).

Availability of child restraints in the 60's and 70's was also a problem. Restraints were hard to come by, and public education on their importance was almost non-existent (Shelness & Charles, 1975). Unlike today, restraints were developed by car

manufacturers; however the dealerships either did not have knowledge of the restraints available, or would refuse to take orders for them (Shelness & Charles, 1975).

As of 1975, there were twelve child restraints available (Shelness & Charles, 1975). Education on the importance of using a restraint was beginning to surface and information could be found in some parenting books (Shelness & Charles, 1975). Select hospitals were also beginning to teach new parents child passenger safety as they left with their newborn babies (Shelness & Charles, 1975).

POLICY

The first child occupant protection law was passed in Tennessee in 1978 (National Safe Kids Campaign, 2001) and by 1985, all 50 U.S. states and the District of Columbia had passed such legislation (Wagenaar & Webster, 1986). Research was done to see if implementing such laws was effective, and the results were positive. Tennessee found a 6% increase in restraint use, and only dropped one percentage point 12 months after the law took effect and actually jumped 8 percent higher than the "pre-law" rate 24 months after the law was implemented (Wagenaar & Webester, 1986). Another study conducted in Tennessee found restraint use was eight percent 5 months before the law, sixteen percent four months after, and twenty-nine percent 29 months after the law went into effect (Wagenaar & Webster, 1986).

While every state had child occupant protection laws, many of them were insufficient. In 2001, the National Safe Kids Campaign did a study and graded each state on their child passenger safety laws (National Safe Kids Campaign, 2004). In the National Safe Kids Campaign report, almost half of the states had inadequate child occupant protection laws that failed to protect children properly. Since their report was

released, much advocacy and education was done, and 26 states have upgraded their laws (National Safe Kids Campaign, 2004). As of July 1, 2006, 37 states and the District of Columbia have child restraint laws for children to at least five years of age or older (NHTSA, 2006).goo

CHILD RESTRAINT USE TODAY

Child passenger safety advocates recommend that children stay in a 5-point harness restraint until the age of four and 40 pounds, at which time they can graduate to a booster seat. Unfortunately, despite these recommendations, many parents move their children into a belt positioning booster (BPB) seat too early (Winston, Durbin, Kallan & Moll, 2000). One study found that more than one-third of children ages 2-5 were improperly restrained, which resulted in a 3.5 times increased risk of serious injury and more than four times increased risk of head injuries (Winston et al., 2000). Another study that examined the effectiveness of a forward-facing child restraint versus a child in a seatbelt only, found that the use of a forward-facing child restraint reduced hospitalization by 82% and serious injury by 80% (Arbogast, Durbin, Cornejo, Kallan & Winston, 2004).

Currently, the standard weight-limit of a forward-facing child restraint is 40 pounds. HWH restraints do exist, but many of them are considerably more expensive. Table 1 displays current HWH restraints and their approximate retail price (Colella, 2008). Forward-facing restraints in the form of a vest are the least expensive, however, these vests require a tether anchor during use, and most vehicles made before 1999 do not have that capability.

Table 1. Current High-Weight Harness Child Restraints

Child Restraint	Forward-Facing Harness Limit	Approx. Retail Price
Bergeron Special Tomato	80 pounds	$846.00
Britax Boulevard	65 pounds	$299.00
Britax Decathlon	65 pounds	$284.00
Britax Frontier	80 pounds	$279.00
Britax Marathon	65 pounds	$269.00
Britax Regent	80 pounds	$269.00
Carrie Safety Car Seat	60 pounds	$741.00
Columbia Child 2000	102 pounds	$782.00
Evenflo Titan Elite	50 pounds	$99.00
Evenflo Triumph Advance	50 pounds	$149.00
E-Z On 86Y Harness	168 pounds	$80.00
E-Z On Kid Y Harness	80 pounds	$52.00
E-Z On Vest	168 pounds	$120.00
Graco Nautilus	65 pounds	$149.00
Merritt Roosevelt	115 pounds	$995.00
Orbit Toddler Car Seat	50 pounds	$300.00
Recaro Como	70 pounds	$249.00
Recaro Signo	70 pounds	$289.00
Ride Safer Travel Vest (small)	60 pounds	$99.00

Ride Safer Travel Vest (large)	60 pounds	$129.00
SafeGuard Child Seat	65 pounds	$429.00
SafeGuard Go	60 pounds	$199.00
Safety 1st Apex 65	65 pounds	$129.00
SnugSeat Hippo	65 pounds	$500.00
SnugSeat Traveller Plus	105 pounds	$625.00
Sunshine Kids Radian 65	65 pounds	$199.00
Sunshine Kids Radian 80	80 pounds	$279.00
The First Years True Fit	65 pounds	$199.00

CHILDHOOD OBESITY

Childhood obesity is a growing problem in our nation. According to the National Center for Health Statistics (2006), the number of children ages 2-5 deemed overweight almost doubled from 7.2% in 1988-1994 to 13.9% in 2003-2004. Children and teen BMI's are rated differently than adult BMI's. According to the Centers for Disease Control (CDC), there are four weight categories for children and teens as displayed in Table 2.

Table 2. Definitions of Children and Teen Weight Status

Weight Status Category	Percentile Range
Underweight	Less than the 5th percentile
Healthy weight	5th percentile to less than the 85th percentile
Overweight	85th to less than the 95th percentile
Obese	Equal to or greater than the 95th percentile

The CDC and the American Academy of Pediatrics (AAP) recommend the use of BMI to screen for overweight and obesity in children beginning at the age of 2 years old.

It has been proven that childhood obesity is creating a negative effect on parents' ability to properly restrain their children. After examining National Health and Nutrition Examination Survey (NHANES) data from 1999 to 2000, it was found that 8,683 children 2 years of age, 182,661 children 3 years of age, and 91,927 children 4 to 6 years of age in the United States may have an extremely difficult time finding an appropriate child restraint for their weight and age (Trifiletti, Shields, Bishai, McDonald, Reynaud & Gielen, 2006).

In addition, obese children have a 2.5 greater risk of injury in a crash than normal weight children (Pollack, Xie, Arbogast, Durbin, 2008). Researchers hypothesized that this may be due to a combination of physiology, biomechanical forces, and vehicle design (Pollack et al., 2008).

REFERENCES

Centers for Disease Control and Prevention. (1999). Motor vehicle safety: A 20th century public health achievement. *The Journal of American Medical Association, 281*(22), 2080-2082.

Childhood Obesity Action Network. (2008). State obesity profiles, 2008. *National Initiative for Children's Healthcare Quality, Child Policy Research Center and Child Adolescent Health Measurement Initiative.* Retrieved December 1, 2008, from http://childhealthdata.org/content/ObesityReportCards.aspx.

He, Q. (2006). BMI monitoring in the management of obesity in toddlers. Available from the American Academy of Physicians website at www.aafp.org/afp.

Mokdad, A., Serdula, M., Dietz., H., Bowman, B., Marks, J. & Koplan J. (1999). The spread of the obesity epidemic in the United States, 1991-1998. *The Journal of the American Medical Association, 282*(16), 1519-1522.

National Center for Health Statistics. (2006). Prevalence of overweight among children and adolescents: United States, 2003-2004. Available from www.cdc.gov/nchs

National Highway Traffic Safety Administration. (2008). Child safety seat ease of use rating program. Available from www.nhtsa.gov

National Highway Traffic Safety Administration. Key provisions of occupant restraint laws through July 1, 2006. Retrieved December 2, 2008, from http://www.nhtsa.dot.gov/people/injury/occupant_restraints_chart-4-3-06.pdf

National Highway Traffic Safety Administration. NHTSA dictionary of child safety seat terms. Available from www.nhtsa.gov

National Safe Kids Campaign. (2001). Child passengers at risk in America: A national rating of child occupant protection laws. Available from www.safekids.org

National Safe Kids Campaign. (2004). Closing the gaps: A progress report on Safe Kids' efforts to improve child occupant protection laws. Available from www.safekids.org

Shelness, A. & Charles, S. (1975). Children as passengers in automobiles: The neglected minority on the nation's highways. *Pediatrics, 56*(2), 271-284.

Wagenaar, A. & Webster, D. (1986). Preventing injuries to children through compulsory automobile safety seat use. *Pediatrics, 78*(4), 662-672.

Winston, F., Chen, I., Elliot, M., Arbogast, K., & Durbin, D. (2004). Recent trends in child restraint practices in the United States. *Pediatrics, 113*(5).

APPENDIX B

DEFINITION OF TERMS

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The terms used in this study were defined as follows:

5-point harness – a child restraint harness with five attachment points, two at the shoulder, two at the hips, and one between the legs (National Highway Traffic Safety Administration, n.d).

Belt-positioning booster seat (BPB) – a platform that raises the child (provides a taller sitting height) so adult lap and shoulder belts fit better; some have high backs as well. Never use with a lap belt only across the child (National Highway Traffic Safety Administration, n.d).

High-weight harness restraint – seats that are sometimes used for children with special healthcare needs or for those heavier than 40 pounds and who are not yet behaviorally mature enough for a booster seat (Tech Manual, 2007).

Technician – a person who successfully completes the National Highway Traffic Safety Administration's standardized child passenger safety certification program (Technician Manual, 2007).