

# Protecting children: a survey of caregivers' knowledge of Georgia's child restraint laws

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**Introduction:** The leading cause of injury and death among children in the United States is motor vehicle crashes. Even though restraint laws are in place and public awareness campaigns and educational interventions have increased, many children are still improperly restrained or not restrained at all. When correctly used, child restraints significantly reduce risk of injury or death.

**Methods:** The purpose of the study was to elicit caregiver baseline knowledge of car seat installation and regulation before receiving car seat education from certified technicians at Inspection Station events. Inspection Station is a program whereby staff assists parents in correctly positioning car seats in participants' vehicles. Over an 8-week period, Safe Kids Cobb County Car Seat Technicians distributed a 16-item survey, with 10 knowledge-based questions and six demographic questions to Inspection Station participants. Descriptive statistics and *t*-tests were conducted to assess relationships between participant age, ethnicity, and gender with overall knowledge scores. Regression analysis was run to determine the association between participant education level and total child restraint knowledge.

**Results:** One hundred sixty-nine surveys were completed. Participant knowledge of vehicular child restraint ranged from 0% to 90% on all items. Only 29.6% of caregivers understood the proper tightness of the harness system. Less than half of the caregivers (43.8%) were aware of the Georgia law requiring children aged 6 years and younger to be in some type of child restraint. Only 43.2% of caregivers surveyed knew that children need to ride in a rear-facing child restraint until 1 year of age and 20 pounds. No significant correlations between participant knowledge and age were found. Statistically significant associations were found between total knowledge scores and education level, ethnicity, and gender.

**Discussion:** The results from this study describe baseline knowledge among a sample of participants at Inspection Station activities held in Cobb County, Georgia. These results can help inform tailoring of future programming so that the impact of enhanced health education/prevention messages for intended populations can be maximized and health child injury risk related to improper restraints can be minimized.

**Keywords:** child injury, car seats, knowledge survey

## Introduction

Childhood injury is the leading cause of morbidity and mortality among children aged between 1 and 18 years.<sup>1-3</sup> Nearly 90% of injuries to children are the result of unintentional or "accidental" incidents. Around 830,000 children worldwide die from such injuries every year, nearly 2300 each day. Child injuries place significant strain on overstretched health care systems, but injury prevention is a very cost-effective health strategy. If effective interventions that have been proven to reduce childhood

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injuries in high-income countries were implemented around the world, more than 1000 children's lives could be saved every day.<sup>4</sup>

In the United States, the leading cause of childhood injury and death is motor vehicle crashes (MVCs).<sup>3,5-7</sup> Worldwide, they kill 260,000 children a year and injure about 10 million. They are the leading cause of death among 10–19 year olds and a leading cause of child disability.<sup>4</sup> In 2006, 42,642 motor vehicle crash fatalities occurred in the United States. Children under the age of 14 years made up 4% (1794) of these fatalities, 8% (208,000) of all injuries, and 7% (184,000) of vehicle occupants involved in the MVCs.<sup>7</sup> In one study, investigators found that 69.2% of child fatalities involved unrestrained children and 29.2% of the children were improperly restrained.<sup>8</sup> For all children under the age of 15 years, the total annual cost of death and injury caused by motor vehicle crashes exceeds US\$17.8 billion.

Every state in the United States, including the District of Columbia, has child restraint laws.<sup>3,9</sup> These laws differ by state, but all require child passengers to ride in approved child restraint devices. In November 2006, 38 states and the District of Columbia tightened previous child restraint policy to include the use of booster seats or another type of appropriate child restraint system for all children aged under 10 years.<sup>3</sup> In Georgia, effective July 1, 2004, children must be restrained if they are under the age of six, the child restraint system must be appropriate for the child's height and weight, and it must also be installed and used in accordance with manufacturer's directions.<sup>3,10,11</sup>

In a motor vehicle analysis performed by the National Highway Traffic Safety Administration, it was determined that proper use of child restraints can reduce the risk of death by 54% in toddler-aged children and 71% in infants.<sup>7</sup> Although car seats significantly reduce risk of injury or death among children, misuse occurs regularly. In the United States, correct installation and utilization rates of child safety seats has ranged from 17% (school-aged children) to 72% (infants).<sup>12</sup>

## Caregiver risk factors and child seat safety

There are a number of studies that examine caregiver characteristics and their association with child restraints. Most studies conclude that increased parent age is associated with higher rates of proper child restraint installation and use.<sup>13,14</sup> In 2008, Snowdon et al<sup>6</sup> studied the predictors of child restraint misuse in Ontario, Canada, and concluded that caregiver characteristics are directly related to proper

child restraint use. The results showed increasingly higher correct installation and use rates among participants as age increased.<sup>6</sup> Robinson et al<sup>15</sup> found similar results. In their study, parents were shown three pictures and were to choose the picture of the properly installed car seat. Those parents over the age of 22 were more likely to identify the correct picture when compared with the younger parents.<sup>15</sup> Studies by Lane et al<sup>14</sup> and Bracchitta<sup>13</sup> also provided evidence that the caregiver's age is directly related to an increase in knowledge of child safety restraints.

Another positive association observed is educational level of caregivers. The educational level of the female caregiver has been found to be the highest predictor of child restraint knowledge and correct installation – even more than socioeconomic levels.<sup>13</sup> The Snowdon study also found that with every increase in education level, the percentage of correct use increased.<sup>12</sup>

Ethnicity has also been established as a significant factor in the proper use of child restraints. A 2002 study conducted by Safe Kids USA indicated that minority children (23%) were more likely to be unrestrained than Caucasian children (10%).<sup>16</sup> Most research involving ethnicity data shows that minority populations have lower rates of correct child restraint use and installation, when compared with the Caucasian participants.<sup>14,17</sup> The Robinson et al<sup>15</sup> study mentioned previously concluded that African-American parents were the population least likely to choose the correct picture. Bracchitta found similar results, reporting that African-American mothers had the lowest scores on the child passenger safety questions involved in the study.<sup>13</sup> Additional research performed by Safe Kids USA illustrates that children 14 years and younger who are of the American Indian and Alaska Native ethnicity are almost one and a half times more likely than white children to die in a motor vehicle crash. This same study indicates that Hispanic children under the age of 5 years are one and a half times more likely to die in a car accident than a non-Hispanic child.<sup>17</sup>

Gender is the least researched demographic characteristic within the context of child restraint use. When gender is included as part of the research, most studies show that females have a higher knowledge rate about child passenger safety.<sup>12,18</sup> The Canadian study by Snowdon and colleagues indicates that females were more likely than males to install and use child restraints correctly; 79.8% versus 75.0% of the time. Snowdon suggests that females are “more aware” of the correct ways to use car seats, and male caregivers in the study even indicated that the child restraints were “their wife's territory”. It is also a possibility that male caregivers would

be less likely to ask for or accept education or assistance involving child passenger safety.<sup>12</sup>

## Specific programs/interventions

Injury prevention strategies have been proven to reduce or prevent injury or death when community partnerships, involving education, legislation, and law enforcement are utilized.<sup>2</sup> Two specific programs, The Boost 'em in the Back Seat Safe Ride Program and an example of a hospital-based education program, show us how community partnerships can provide education to caregivers.

The Boost 'em in the Back Seat Safe Ride Program was specifically designed to increase risk perception and increase booster seat use in 4–8 year olds. The program presents parents with a 6-minute video that aims to “evoke a high sense of vulnerability to motor vehicle hazards and provide parents with the knowledge to protect one’s family from motor vehicle risks”.<sup>19</sup> The study also showed several changes in parent’s perceptions of child passenger safety. When compared with the control group, parents who viewed the video felt stronger regarding seating position in the vehicle (front seats versus rear seats); had increased comfort levels in regards to booster seat installation; had increased confidence about getting children to sit in a booster seat; and no longer viewed cost as a barrier.<sup>19</sup> Since the study, the booster seat laws in Virginia have changed to require anyone under the age of 8 years to ride in a booster seat, whereas previous legislation indicated restraints for children less than 5 years of age.

A second intervention example involved the use of educational programming and distribution of discounted seats. Based in a hospital, this program aimed to improve child safety through increasing caregiver knowledge and practices. Education was provided for 1 hour in a group bilingual setting. Six months after the educational class, the participants were contacted via phone and a 15-minute survey was performed.<sup>20</sup> The study found that there was a statistically significant decline in caregiver knowledge regarding car seat transitions and child safety laws, with odds ratios of 0.35 and 0.16, respectively. The most commonly reported motivators used to increase child restraint use were safety and fear of law enforcement. The most commonly reported barriers to child restraint use were lack of time and lack of understanding that car seats reduce childhood injury and death.<sup>20</sup>

Research has proven that there is a relationship between the caregiver’s demographic characteristics and their knowledge of child restraints.<sup>6</sup> A number of studies show the direct correlation between age, education level, ethnicity, and gender.<sup>6,13–15,18</sup> The relationship between these demographic

characteristics and parent knowledge will be further reviewed in this study. Based upon the review of literature, the researchers hypothesize that among a sample of caregivers attending car seat interventions in Cobb County, Georgia, younger Caucasian females, who have achieved a higher level of education, would have the highest level of car seat safety knowledge.

## Methods

The purpose of this study was to evaluate the baseline child passenger safety knowledge of caregivers before going through formal education at car seat Inspection Station events. Safe Kids Cobb County has recognized the importance of the distribution of child restraints and education about their proper use. They have implemented a permanent Child Safety Seat Inspection Station that provides caregivers with education on correct car seat installation and use. Two weekly Inspection Station events are held in the Cobb County Safe Village and promoted through media outlets, specifically newspapers, radio, and website announcements. A convenience sample of participants attending the events was used for data collection. The data examined in this study were collected from July through September, 2009. The survey instrument was disseminated and collected by certified technicians (individuals who are trained to install car seats in compliance with current Georgia laws) at Child Safety Seat Inspection Station events, and caregivers completed the survey on paper.

The 16-question survey was developed by Cobb County Safe Kids. Demographic questions included caregiver: ethnicity, educational level, gender, age, and primary language. The other 10 multiple-choice questions assessed were to test parent knowledge of child restraints installation, use, Georgia laws, safety regulations, and best practice regulations. No identifying participant information was collected. The survey instrument was available in both Spanish and English. The survey was approved by the researchers’ academic Institutional Review Board to ensure protection of human subjects.

Researchers examined the relationships between car seat knowledge and participant age, education level, ethnicity, and gender in order to test the study hypotheses. The dependent variable was a summation score of overall knowledge. Correct responses were coded 1 and incorrect 0. Each participant’s correct answers were tallied to create a new variable “total knowledge”, with the highest possible value 10 and the lowest 0. Independent two-sample *t*-tests were used to compare total knowledge scores with age, ethnicity, and gender. The groups were dichotomized accordingly: >30 versus ≤30 years old;

Caucasian versus all other; women versus men. Levene’s test for equality of variances was then used to determine the significance of the assumption made from the mean. Linear regression analysis was conducted to analyze education level and total knowledge scores.

## Results

The study population was comprised of 169 caregivers who attended Safe Kids Cobb County Car Seat Inspection Stations. The demographic profile of the sample is presented in Table 1.

The majority of respondents were female (71.0%). Over half the sample was Caucasian (52.7%), followed by African-Americans (23.7%) and Hispanic or Latino/Latina participants (16.0%). A majority of the caregivers spoke English as their primary language (89.9%) and held Bachelor’s degrees (43.2%). Almost one-fifth of respondents had high school degrees (19.0%), while 17.8% had advanced degrees. Over half of the respondents were between the ages of 25 and 34 (55.1%).

**Table 1** Demographic characteristics of study population

Demographics	Total # of participants	Total % of participants
<b>Age</b>	<b>N = 163</b>	<b>96.4%</b>
<20	5	3.0%
20–24	17	10.1%
25–29	40	23.7%
30–34	53	31.4%
35–40	29	17.2%
>40	19	11.2%
<b>Education level</b>	<b>N = 163</b>	<b>96.4%</b>
Grade school	6	3.6%
High school	31	19.0%
Technical college/associate degree	23	13.6%
Bachelor’s degree	73	43.2%
Advanced degree	30	17.8%
<b>Ethnicity</b>	<b>N = 169</b>	<b>100%</b>
African-American/Black	40	23.7%
American Indian	0	0%
Asian	7	4.1%
Caucasian	89	52.7%
Hispanic or Latino/Latina	27	16.0%
Other	4	2.4%
<b>Gender</b>	<b>N = 167</b>	<b>98.8%</b>
Male	47	27.8%
Female	120	71.0%
<b>Primary language</b>	<b>N = 169</b>	<b>100%</b>
English	152	89.9%
Spanish	15	8.9%
Other	1	0.6%

Participant knowledge varied greatly on each survey item. Table 2 shows the distribution of correct answers for the knowledge-based survey questions.

Almost all of the caregivers, 98.2%, understood the Georgia law involving children under the age of six riding in the back seats. Nearly all were knowledgeable about the dangers of buying a used car seat (93.5%) and when car seat replacement was in order (89.3%). However, only 29.6% of caregivers understood the proper tightness of the harness system. Less than half of the caregivers, 43.8%, were aware of the Georgia law requiring children 6 years and younger to be in some type of child restraint. Only 43.2% of caregivers surveyed knew that children need to ride in a rear-facing child restraint until 1 year old and 20 pounds.

Independent samples *t*-tests were conducted to compare the child restraint knowledge scores for caregivers under 30 years of age and those older than 30 years of age, ethnicity, and gender (Table 3). There was no significant difference in scores for those under 30 (mean [M] = 5.79,

**Table 2** Distribution of correct child restraint knowledge responses by survey item

Survey question with correct answer	Percentage correct
Georgia law requires children to be in the car seat or booster until they turn <b>6 years old</b>	43.8%
An infant should be kept rear-facing in his car seat until? <b>The child turns 1 year old and weighs 20 pounds</b>	43.2%
An infant seat should be kept at what angle? <b>A 45 degree angle (a little reclined)</b>	68.6%
You should replace your car seat if? <b>All of the above [has been in a crash, is over 6 years old, has broken or missing parts]</b>	89.3%
Georgia law requires children under age 6 to ride ... ? <b>In the back seat</b>	98.2%
Where should the harness retainer clip be on the child? <b>At the child’s armpit level</b>	58.6%
When your child has reached 40 pounds, what type of seat should he use? <b>A booster seat</b>	55.6%
A child should use a car seat with a 5-point harness until ... ? <b>He has reached the upper weight limit for the seat</b>	55.0%
Is it a good idea to buy a used car seat? <b>No, the seat might not be safe</b>	93.5%
How do you know if the harness is tight enough? <b>The straps lie snug on the child’s body and you can’t pinch any slack</b>	29.6%

**Table 3** Independent 2 sample *t*-test results for total knowledge scores

	N	M	SD	SE	t	df	Sig (2-tailed)
Age							
>30 years old	56	5.7857	1.41054	0.18849	1.502	150	0.135
<30 years old	96	5.4375	1.35966	0.13877			
Race							
Caucasian	80	5.8000	1.42965	0.17211	-2.130	147	0.035
Other	69	5.3188	1.32550	0.14820			
Gender							
Male	48	5.0833	1.30194	0.18792	-2.920	151	0.004
Female	105	5.7714	1.37461	0.13415			

**Abbreviations:** N, sample size; M, mean; SD, standard deviation; SE, standard error; t, *t*-test score; df, degrees of freedom; Sig, significance.

standard deviation [SD] = 1.41) and those over 30,  $M = 5.44$ ,  $SD = 1.36$ ;  $t(150) = 1.50$ ,  $P = 0.135$  (two-tailed). In terms of ethnicity, there was a significant difference in child restraint knowledge scores for Caucasians ( $M = 5.8$ ,  $SD = 1.43$ ) and non-Caucasians,  $M = 5.32$ ,  $SD = 1.33$ ;  $t(147) = -2.13$ ,  $P = 0.035$  (two-tailed). For gender, a significant difference in scores among men ( $M = 5.08$ ,  $SD = 1.30$ ) and women,  $M = 5.77$ ,  $SD = 1.37$ ;  $t(151) = -2.92$ ,  $P = 0.004$  (two-tailed) was found. Finally, linear regression analysis revealed that education level was a slightly significant predictor of total child restraint knowledge ( $\beta = 0.198$ ,  $P = 0.054$ ).

## Discussion

This study examined the relationship between caregiver knowledge and demographic characteristics as they relate to child restraint education. The predictions were that younger Caucasian females, who have achieved a higher level of education, would have the highest level of knowledge. The 10-question knowledge survey revealed gaps in caregiver knowledge concerning basic laws and best practice child restraint recommendations. Only three questions were answered correctly by at least 80% of the population. All other questions ranged from 29.6% to 68.6% of the population who were able to answer the question correctly. Each question presents a vital aspect of child passenger safety for children of different ages, and it is imperative that the public understand the importance of correctly installing and using child restraints.

When examining the relationship between knowledge and age, the results showed no significant correlation between the two variables. These results suggest that age does not appear to be a major factor in knowing Georgia's child restraint laws. Several studies have contradicted our results, including Snowdon's Canadian study. A majority of Snowdon's population were over the age of 36 years, and most of the population (68.2%) surveyed in this study were under the age

of 36 years.<sup>12</sup> The different ages presented in the two study groups could help explain why the results are contradictory. One explanation for why knowledge scores may not have been found to be significantly associated with increasing age of caregivers is that the majority of our sample (71%) were aged 34 years or younger.

Based on the regression results, caregiver educational level was found to be a slightly significant predictor of total child restraint knowledge ( $\beta = 0.198$ ,  $P = 0.054$ ), thus indicating that increasing education levels were associated with higher total knowledge scores. This finding is aligned with other scientific evidence. The Toumakas et al<sup>18</sup> study found that the caregivers with higher level of education were more informed about risk and prevention of injuries in motor vehicle crashes. Toumakas explained these results by indicating that educated parents are more willing to obtain information concerning current issues.<sup>18</sup> Education level might also play a role in understanding the complicated directions and process involved in properly installing and using a car seat.

Total caregiver knowledge and ethnicity also produced a significant relationship. These results suggest that ethnic differences are a factor in knowing Georgia's child restraint laws. Caucasian men and women are more likely to properly install and use child restraints, when compared with other ethnic groups. A 2002 study conducted by Safe Kids USA reported that minority children were more likely to be unrestrained than the white children surveyed, 23% and 10% respectively.<sup>16</sup> Minority groups often face other adversities including lower levels of educational attainment and socioeconomic status, which could also attribute to these findings.

The association between total knowledge and gender is not as heavily researched as some of the other demographic relationships. This study found a significant relationship between total knowledge level and gender, indicating women

have a higher knowledge of child restraints than men. This finding is similar to the Snowdon study which reported that 79.8% of women used child restraints correctly, compared with 75% of men. Snowdon theorized that females are “more aware” of the correct ways to use car seats and more willing to ask and accept education or assistance involving child passenger safety.<sup>6</sup> Although the respondents in this study are nearly all female, results may support Snowdon’s proposed theory. In future studies that involve equal participation from both sexes, caregiver gender differences can be examined more closely.

## Limitations

This study is limited in that a convenient sample of parents was used and thus, generalizability of findings is not possible. Predictions cannot be made concerning knowledge gained during the education session provided after the survey or the level of education sustained 6, 8, or even 12 months after leaving the Inspection Station. The information gained from this study highlights the need for a more robust study design investigating this population further. Including a follow-up evaluation that would provide additional understanding about the sustainability of the education and prevention messages received.

Finally, it is important to note that although generally agreed upon by the vast majority of investigators and regulators, controversy regarding restraint safety does exist. At least one study links restraint use to cervical spine injuries among child fatalities in motor vehicular collisions.<sup>21</sup> Undoubtedly, there is potential injury risk associated with use of restraints in general;<sup>22</sup> however, child safety seats have been shown to reduce the risk of death in passenger cars by 71% for infants, and by 54% for toddlers ages 1–4 years.<sup>23</sup> Assessing caregivers’ perceptions of safety seat utility and risk would have given researchers in this study greater insights into the nature of social norms and to which side of the controversy caregivers relate to. This is a suggested avenue for future research.

## Conclusion

Many of the childhood deaths and serious injuries caused by motor vehicle accidents could be prevented through correct installation and use of child restraints. In order to improve the management of risk – various ecological levels of influence – from the individual to interpersonal and regulatory could be targeted. Public health professionals must further investigate the scope of current child restraint laws and their enforcement so that childhood death and

injury in motor vehicle crashes can be reduced and the safety of children when riding in vehicles can be improved. To create and implement a successful action plan, the program planner must collaborate with health professionals and other community members. This study has shown how individual knowledge and predisposing factors like age, gender, and education level, can directly affect a caregiver’s decision involving child passenger safety.<sup>6</sup> The findings from this study provides a preliminary assessment of baseline knowledge of individuals, and enables program planners and community organizations to use this information to improve health promotion interventions sensitive to enabling and reinforcing factors related to caregiver knowledge.

Understanding the caregiver’s knowledge base can help improve education programs currently being offered in the community. This baseline information can also be used by child restraint manufacturers, government officials, law enforcement officers, health care systems, and other organizations to understand the knowledge deficiencies that lead to this preventable public health problem.

## Disclosure

The authors report no conflicts of interest in this work.

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