Executive Summary of the Comprehensive Final Report

R40 MC 00116
INCREASING SAFETY SEAT USE AMONG PRESCHOOLERS

Statement of the Problem

Crash-related fatalities remain the leading cause of injury death for children between the ages of 1 and 4 years. Risk of death among preschoolers involved in a car crash can be reduced by approximately 71% when the child is properly restrained in a child safety seat (CSS). The 1993 national crash fatality rate for this age group was 3.1/100,000; the comparable injury rate was 366/100,000.

Most preschool children ride totally unrestrained. Studies of restraint use among preschoolers have identified usage rates ranging from 6.3% to 43%. Unrestrained children are at increased risk of ejection or secondary collision with the interior of the vehicle. Failure to use any restraint system is particularly high among minority and disadvantaged children. It is estimated that about 60% of children under the age of five years whose families receive Medicaid assistance are not restrained and deaths from motor vehicle injuries are twice as likely among poor children. Preschoolers are also inadequately protected when restrained by adult safety belts or a misused child safety seat (CSS). Use of adult safety belts for children weighing less than 60 pounds increases the risk of abdominal and spinal injuries.

A pilot study using a controlled pretest/posttest study design was conducted by the Cincinnati Children's Hospital Medical Center Trauma Service in 1992/93. This study demonstrated that a child passenger safety program integrated into the curricula of preschools significantly increases the use of restraint systems among preschool children. However, virtually all of the additional restraint usage was accounted for by increased use of safety belts rather than "graduation" from a child safety seat to a booster seat.

Research Objectives

This study examined five hypotheses related to the effectiveness of the proposed intervention:

1. A multidimensional child occupant safety program based on the principles of social learning theory and integrated into the curriculum throughout the school year will result in increased usage of safety seats among preschool children.
2. Child safety seat usage will increase significantly more among families with less income and lower parental educational attainment when perceived barriers to CSS use are addressed.
3. Use of safety belts will increase significantly among parents as a result of the parent educational component of the child passenger safety program.
4. Specific educational messages developed for parents and children will result in significantly more children riding in a rear seat position in vehicles equipped with passenger side air bags.

5. A child passenger safety program presented to parents of preschool age children will increase parental awareness and knowledge of appropriate child restraint usage.

Study Design and Methods

Intervention

The Preschool Child Passenger Safety Program is a multi-faceted intervention designed to be integrated into preschool activities throughout the academic year. The program was designed by a team of educators, preschool classroom teachers, injury prevention personnel, and researchers. It is also suitable for twelve month institutions, such as child care centers. The program includes a curriculum for preschool children, educational program for parents, and educational program for teachers.

Three focus groups were conducted to enable parents with children in non-participating preschools in low, middle, and high tuition tertiles to identify barriers and facilitators to use of appropriate child restraints. Information addressing solutions for the barriers and promoting use of the facilitators was incorporated into the parent program.

The classroom curriculum presents car safety-related messages through a variety of modalities, including fine and gross motor activities, music, whole language, and other preschool activities. Examples of curriculum components include safety seats located in the classrooms to encourage dramatic play with dolls, lacing cards in the shape of a car seat, and sheets of child passenger safety-related songs to be taught during group time. Child safety seats were sold for $5.00 to any family (intervention or control) unable to purchase one during the months of the study.

The parent program included monthly newsletters addressing specific passenger safety topics and one child passenger safety-related presentation per school. Teachers encouraged parents to be involved with "homework" sent home with the preschool children and promoted family safety games.

The teacher program included an extensive in-service for all intervention group classroom teachers. An in-service video was provided for new teachers hired during the year. Teachers served as a conduit for distribution of safety seats and boosters to parents in need.

Research design

The research design is an experimental pretest-posttest control group design. All 296 preschools and child care centers within Hamilton County were eligible to participate. As minority and socioeconomic status have both been shown to be related to safety seat use, both variables were considered in the sampling structure. Preschool tuition rates (used as a proxy variable for income) were divided into tertiles (low, middle, high) and used to stratify the sample so that sufficient numbers of students from all socioeconomic backgrounds were included in the study. African-American children were overrepresented in the sample so that there was sufficient statistical power to examine the intervention effect by racial group.

Information concerning tuition support or scholarship programs and the racial composition of the students was ascertained from each preschool director at the time of the initial contact to ensure that tuition classification was correct and that a sufficient number of minority children were included in the sample. Preschools with parking facilities in which observation could be safely conducted and whose directors agreed to participate in the study were randomly assigned to intervention or control status. The total sample size included 1,007 children.

CSS usage and parental use of safety belts were measured through direct observation. Trained observers recorded restraint type for every occupant, occupant position in the vehicle, and CSS misuse (seat not belted into car, child not belted into seat, two children in one belt, shoulder belt behind arm or across face, infant seat facing forward). Observers were blinded as to intervention/control school status, and the same information was collected during observation at all schools. Observations were conducted immediately prior to the initiation of the program and immediately following its completion.

Intraschool correlations are present in the data; students within a school are more likely to be similar to each other than to students attending other schools. To account for this potential violation of independence, logistic regression analysis was conducted. Logistic regression techniques were used to test the primary hypothesis of a different relationship between baseline CSS usage and end-study CSS usage for the control and intervention groups. "Correct" restraint use was defined by the child's age, type of restraint, location in the car, and lack of observed misuse.

Parental awareness and knowledge related to child passenger safety issues were measured using self-administered questionnaires prior to and immediately following the program. Parents of children enrolled in intervention preschools were also asked to evaluate the program on the posttest. Mantel-Haenszel and chi-square analyses were conducted on questionnaire data. Logistic regression was conducted on questions related to the outcome variable of "correct usage", with "correct usage" defined as parents' identification of the correct restraint type for the child's age and reporting that the restraint is always used.

To assess teacher compliance with the program and whether teacher attitudes toward child passenger safety might impact implementation of the curriculum, all classroom teachers completed self-administered questionnaires prior to the initial teacher in-service. A second questionnaire which included an evaluation of the program (for the intervention group) was administered following completion of the program. Mantel-Haenszel and chi-square analyses were conducted on questionnaire data.

Teachers also completed monthly activity diaries which recorded the number of minutes spent directly teaching curriculum-related lessons and the amount of time that curriculum-related materials were available in the classroom. Logistic regression was conducted on the number of minutes spent on the program with change in incorrect restraint use and change in number of unrestrained children as the outcome variables.

Findings

The primary hypothesis, that the program would increase the percentage of children arriving at preschool in a CSS, was not supported by the data. The percentage of

unrestrained children increased among intervention group students from 8.8% to 13.4% and among control group students from 12.7% to 21.7% (p=0.612).

The second hypothesis, that the greatest increases in restraint usage would occur among economically disadvantaged families and those with the lowest educational attainment, was also not supported.

The third hypothesis, that the program would increase the percentage of parents arriving at preschool wearing safety belts, was not supported. The percentage of unrestrained drivers increased from 16.2% to 21.2% within the intervention group and decreased slightly from 27.0% to 26.1% within the control group (p=0.191).

The fourth hypothesis, that the percentage of children riding in the rear seats of vehicles would increase as a result of the program, was not supported (p=0.44).

The fifth hypothesis, that the program would increase parental awareness and knowledge of child passenger safety, was supported. The program did effectively inform parents as to which restraint system they should be using with their child. On the parent pre-program questionnaires, both groups of parents demonstrated similar rates of incorrect selections for their child's restraint system. On the post-test, study school parents showed significant improvement in reporting appropriate choice and proper use of child restraints (p=0.03).

The child passenger safety program was also very successful in educating teachers. The program significantly improved teacher knowledge about appropriate restraint by child's weight, the importance of preschool programs for child passenger safety education, and awareness of restraint use in preschool carpool situations.

Both parent and teacher questionnaires demonstrated gains in knowledge and both groups considered the program valuable. Although the children's knowledge of car-related safety was not directly tested, both teachers and parents felt that the children had benefited from the program.

Recommendations

Unnecessary passenger injuries to children during the preschool years result from parental confusion about appropriate restraints, child and parent resistance to continuing use of a device beyond the time prescribed by state law, and misuse of the device itself. These barriers can be overcome through education of both participants: parents and children.

The methodology of the Preschool Child Passenger Safety Program was readily acceptable to preschool teachers and parents; both groups indicated that they liked the concept of preschool-based child passenger safety education. This acceptable, relatively inexpensive approach could be more effective in promoting behavior change with modifications to the classroom curriculum and to the parent program.

Suggestions for modifying the program would include: messages conveying to parents that safety belts are an acceptable alternative measure if a booster seat is not available; teaching children how to position and latch safety belts; promote better attendance at parent meetings, which would provide the opportunity for parents to practice and become comfortable with installation and use of safety and booster seats.

Because of the disproportionately low restraint usage rates among African-American and economically disadvantaged children, incorporation of a modified version

of the Preschool Child Passenger Safety Program into national Head Start curricula might provide a vehicle to address the disparity.

MCH/CCS- 01

Increasing Safety Seat Use Among Preschoolers

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Prepared for:

THE MATERNAL AND CHILD HEALTH RESEARCH PROGRAM
MATERNAL AND CHILD HEALTH BUREAU, HRSA, PHS, DHHS
PARKLAWN BUILDING
5600 FISHERS LANE
ROCKVILLE, MARYLAND 20857

Listing of Equipment

No equipment was purchased with grant funds.

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I. Introduction

A. Nature of the Research Problem

Crash-related fatalities remain the leading cause of injury death for children between the ages of 1 and 4 years.[1,2] Risk of death among preschoolers involved in a car crash can be reduced by approximately 71% when the child is properly restrained in a child safety seat (CSS).[3] The 1993 national crash fatality rate for this age group was 3.1/100,000; the comparable injury rate was 366/100,000.[4]

Prevention of passenger injuries among young children is now a national priority. In a February 15, 1997 radio address to the nation, President Clinton announced a proposed rule requesting uniform child restraint anchorage (UCRA) systems in all passenger cars, light trucks, and vans.[5] The purpose of the proposed legislation is to reduce the number of injuries resulting from improperly installed safety seats.[6] Improper installation reduces CSS effectiveness from the potential 71% to 59%.[6] However, even the most perfectly installed CSS provides no protection for a child who is not riding in the safety seat.

Most preschool children ride totally unrestrained. Studies of restraint use among preschoolers have identified usage rates ranging from 6.3% to 43%.[7-11] Unrestrained children are at increased risk of ejection or secondary collision with the interior of the vehicle.[12,13] Fatality rates are highly correlated with ejection from the vehicle.[14] Failure to use any restraint system is particularly high among minority and disadvantaged children. It is estimated that about 60% of children under the age of five years whose families receive Medicaid assistance are not restrained[15] and deaths from motor vehicle injuries are twice as likely among poor children.[16] Preschoolers are also inadequately protected when restrained by adult safety belts or a misused CSS. Use of adult safety belts for children weighing less than 60 pounds increases the risk of abdominal and spinal injuries.[12-14, 17-37] As noted previously, misuse of an approved CSS through inappropriate harnessing of the child or faulty attachment of the CSS to the vehicle drastically reduces the effectiveness of the device.[38]

Legislation is considered one of the most effective approaches to altering behaviors.[39] Although use of a CSS is mandatory in the state of Ohio for all children less than 4 years of age or weighing less than 40 pounds, observation conducted by Children's Hospital Medical Center (CHMC) in 1993 found that only 26.9% of the 3 year olds were restrained in a CSS.[40]

Reasons for parental failure to comply with existing laws are not clear. The Health Belief Model offers an explanation as to why people do not participate in disease detection or prevention programs.[41] This model hypothesizes that the potentially negative aspects of a perceived barrier may act as an impediment to adoption of the behavior. The negative factors related to CSS use (protesting child, the initial cost of the

device, difficulty with manipulation of the CSS device itself, etc.) may outweigh the negative sanctions, such as the possibility of an encounter with a law enforcement officer. The Health Belief Model does not, however, adequately address other motivational issues such as the effect of pressure to conform to social mores.

Social learning theory suggests that behaviors will change when there are feelings of self-efficacy, vicarious learning through observation of modeled behaviors, mastery of requisite skills, self-regulation of the behavior, and encouragement from a credible role model providing compelling information.[82]

Integration of the tenets of the Health Belief Model with the Social Learning Theory suggests that barriers to action can be overcome with education and participative learning. Identification of the factors perceived by parents as barriers and facilitators to CSS can provide the information necessary for development of targeted interventions addressing the specific obstacles. Social learning theory provides the basis for the interventions, stressing information, role modeling, and practice of skills under the direction of preschool educators and pediatric injury prevention professionals.

B. Purpose, scope and methods of the investigation

Providing adequate protection for preschool children is an important public health issue. Healthy People 2000 defined three broad goals for national health care endeavors: 1) to increase the span of healthy life for all Americans; 2) to decrease health disparities among all Americans; 3) to achieve access to preventive services for all Americans.[42]

A preschool-based program increasing CSS use directly promotes all three of these goals.

1) The leading cause of lost years of productive life is motor vehicle-related deaths.[43] Reducing the number of motor vehicle crash-related injuries in young children will contribute greatly to reducing both the number of lost years of life and the incidence of disabling injuries.

2) Preschool children are more frequently inappropriately restrained or completely unrestrained than infants or adults. This is an underserved group which is not receiving adequate passenger protection.

3) Providing an effective program through preschools and child care centers in disadvantaged as well as suburban areas eliminates the socioeconomic barriers to child occupant safety education and optimal child passenger safety.

The U.S. Bureau of the Census reports that about 23% of children under the age of 5 years whose mothers are employed are enrolled in organized child care facilities (day care and preschools).[44] This percentage rises with age, with one-third of the 3 and 4 year olds attending an organized child care facility. The proposed program therefore has the potential to impact a large number of preschoolers, with 2.3 million children of

working mothers and an undetermined number of children with mothers not employed outside the home attending such programs.

Increasing CSS usage nationally to 100% among infants and preschoolers would result in an annual savings of 500 lives and 53,000 injuries.[45] In accord with the national agenda for injury control, we have developed, implemented, and evaluated a preschool-based program addressing control of motor vehicle crash-related injuries by increasing usage of a proven injury prevention device - child safety seats. This program has the potential to significantly decrease morbidity and mortality among a population at high risk for injury and death from motor vehicle crashes.

C. Nature of the findings

The program successfully increased awareness and knowledge of child passenger safety among parents and teachers of preschool children but failed to increase observed use of child restraint systems. Parents in the intervention group did demonstrate movement along the continuum from awareness to knowledge and a trend toward behavior change is noted.

II. Review of the Literature

Risk of Injury

Motor vehicle occupant fatalities have decreased dramatically in recent years, yet they remain a major cause of death and injury among young Americans.[1,2,47] Almost 31,000 people died in car crashes in 1991, a 9.6% decrease from the 34,222 deaths in 1988.[48] The 1993 fatality rate of 1.7 deaths per 100 million passenger miles is an impressive decline from the 1983 rate of 2.6 deaths recorded in 1983 and the 4.6 deaths per 100 million miles recorded in 1970.[47,49] Yet crash-related fatalities remain the leading cause of injury death for U.S. children between the ages of 1 and 4.[43,50,51]

Despite the fact that a properly used CSS can reduce the risk of death by about 71% and serious injury by 67%, usage rates among preschoolers remain low.[3] Investigators conducting pre-intervention restraint usage observations between 1986 and 1990 among preschoolers report restraint usage rates ranging from 6.3% to 43%.[7-11] These findings across a variety of preschool populations are generally less than half the 84% restraint usage among 1 to 4 year olds reported by NHTSA for 1990.[52] A recent evaluation of the “Please Be Seated” program in New Jersey demonstrated that 75% of the children reported as unrestrained were 2 to 4 years of age.[53] Child safety seat usage rates are particularly low among disadvantaged and minority children.[8,15,16]

Observation of child restraint use among children under 4 years conducted by the CHMC Trauma Service and the University of Cincinnati Institute for Policy Research (IPR) in January 1993 demonstrated an inverse relationship between CSS usage and age of the child countywide.[40] Child safety seat use dropped from 90% among infants 1 year and younger to 59.8% among 2 year olds and 26.9% among 3 year olds, despite state law mandating CSS use for children younger than 4 years old or weighing less than 40 pounds.

Child safety seat observation conducted by the CHMC Trauma Service prior to implementation of a preschool car safety pilot program in October 1992 found that 31% of preschoolers arriving at school in passenger vehicles were unrestrained. Forty-three percent of the children wore safety belts, 16% rode in a CSS, and 10% were in booster seats.

Motor vehicle passenger injuries among children 4 and younger have been targeted as a national priority by Healthy People 2000 (objective 9.12.1).[54] The goal for use of occupant protection systems among this age group is 95% by the year 2000.

Optimal passenger protection for preschoolers is complicated, however, by the limitations of existing restraint systems. Seat belt syndrome, first identified in adults by Garrett, has also been frequently reported among young children.[14,17-27] Child safety seats provide protection for children up to 40 pounds, at which time most preschoolers graduate to adult safety belts.[15] Adult lap belts are estimated to be about 29.5% effective in preventing fatalities among 2 to 5 year olds, primarily by preventing ejection, decreasing risk of secondary collision with the interior of the vehicle, and decreasing risk of injury to the head, face, neck, and extremities.[12,13,20-22] Although they do prevent some serious injuries, safety belts also serve to modify the pattern of injuries resulting from crash situations and provide a mechanism for inducing alternate serious injuries.[17]

The abdominal and spinal injuries associated with seat belt syndrome are caused by the rapid deceleration characteristic of high impact crashes, which result in sudden flexion of the upper body over the lap belt, which serves as a fulcrum.[14] This forward motion is intensified among preschool children because the head is disproportionately large, spinal muscles are less
well-developed, and child's shorter sitting height raises the center of gravity to the torso above the lap belt.[19-21]

Abdominal injuries occur because the iliac crest is not fully developed until about 10 years of age and the immature pelvis does not provide an adequate anchor point for the restraint, allowing it to ride up on the child's abdomen. The upward movement of the belt is exacerbated by a child's tendency to frequently readjust sitting position rather than maintain an erect posture.[28] Even children older than six years of age have been shown to have better belt fit with use of boosters until they reach a weight of about 80 pounds, possibly due to the "slouch factor".[29] Improper belt placement concentrates collision forces on the abdominal organs, which are relatively unprotected by the undeveloped abdominal musculature, pelvis, and rib cage.[30] The child is then susceptible to crushing

injuries to fixed portions of the bowel and a violent increase in intraluminal pressures. Intestinal, splenic, hepatic, and renal injuries are being described among children with increasing frequency.[14,18,20-22,31-32]

Although injuries to the lumbar spine are relatively rare among children, spinal injuries sustained by children restrained in lap belts during a crash tend to be lumbar rather than cervical.[21,24-27,33] A study of 95 children hospitalized for injuries received in car crashes identified an 11% incidence of seat belt syndrome, with the seat belt sign present in all 10 patients. Nine of the children received lumbar spine injuries, two sustained paraplegia, and one suffered transient cord injury.[14] A series of 10 seat belt injuries in children from 3 to 13 years of age identified three with resultant paraplegia.[34] The higher incidence of paraplegia among children in lap belts is attributed to an increased moment arm, greater distraction of the spinal column, and localization of the crash forces by the lap belt to the lumbar spine.[34,35]

There is general agreement that existing adult restraint systems are not adequate for preschool children. The American Academy of Pediatrics recommends use of a CSS for children up 40 pounds and a booster seat for children from 40 to 60 pounds.[36] Many authors suggest that special restraint systems are required for children up to about 10 years of age, when the sitting height would be about 28 inches and the pelvis is sufficiently developed to anchor a safety belt.[18,21-23,28,32,34,36,37,50,55-58]

Injury Prevention Approaches

Protecting preschoolers from potentially devastating occupant injuries is a twofold challenge: 1) to increase use of CSS among children weighing less than 40 pounds; and 2) to increase use of booster seats for children weighing between 40 and 60 pounds.[59,60]

Although interventions which require only one time, minimal effort on the part of the parent and/or child are optimal, such technology does not exist in preschool passenger protection.[39] Even convertible seats designed as an integral part of a vehicle's seating system are not effective unless the harness is appropriately fastened every time. Legislation, which is generally considered one of the more effective approaches to injury prevention, has failed to achieve universal usage of safety seats and does not protect children - often as young as 2 years - from lap belt injuries.[56,60,61] A program combining increased law enforcement with a comprehensive public information program increased immediate postprogram CSS use from 71.8% to 76.8% in one community and from 60.9% to 71.4% in another among infants and toddlers under the age of 5.[62] However, among “older toddlers” (3-5 years), only 37.5% to 41.1% were fully restrained after the program compared to 90% of the “young toddlers” (1-3) observed post-program.

A complex problem requires multiple complementary solutions. Educational and behavioral programs directed toward caregivers and preschoolers supplemented by existing legislative and engineering efforts appear to be the most promising approach to occupant safety for this group.[16,63,64] Educational programs which increase parental

knowledge, reinforce parents' belief in their personal responsibility for teaching their children, and provide the skills necessary for parents to competently teach children have increased self-reported usage of child occupant restraints.[65]

Preschool is developmentally an ideal time to teach self-help skills to children.[9,66] Programs that employ extensive modeling, role playing, behavior rehearsal, performance feedback, clear consequences, positive reinforcement, and intermittent booster sessions can effectively produce behavioral change.[67] However, programs designed specifically to increase use of restraints among preschoolers have been generally ineffective. Programs providing a relatively short-term educational intervention (two to four weeks) have failed to demonstrate any increase in observed restraint use.[9,11] Long-term benefits generally do not result from isolated or short-term attempts at health education.[68] Although short-term gains in increasing safety belt use have been observed in programs which reward parents, children, or both for buckling up, usage rates quickly deteriorate to near baseline levels after the reward is removed.[7,68-71] In a review of pediatric injury educational studies, Pless concludes that programs based on the principles of social learning theory are more successful than those relying on traditional approaches.[64]

The Bucklebear program is a two-week car safety curriculum for preschoolers. Evaluation of the Bucklebear program has produced mixed results.[9,10] Because of the short-term nature of the curriculum design, it may not be reasonable to anticipate long term effects from the brief intervention.[10;68] Also, the effects of modeling are greater upon the child when the observer and the model are similar, suggesting that a video of a cartoon bear may be less effective than one featuring live preschool children.[72] The cost of the program is beyond the budget of many preschools, particularly those educating disadvantaged children.[73]

A more comprehensive program targeting both parents and children piloted in one urban child care center for 4 months demonstrated a 21% increase in use of restraints.[14] However, the multiple observations, differential observation schedules, and differences in ethnicity and income between the one intervention and single control center make the actual program effects difficult to interpret.

All preschool-based studies have focused on increasing use of safety belts, which provide suboptimal protection for the preschool population. Roberts' study distributing stickers and coupons as rewards for arriving at school in a restraint demonstrated a short-term increase in safety belt use but no effect on the low pre-intervention CSS usage rate.[70]

Low usage of CSS among 2 to 4 year olds and even lower usage of a booster seat among 4 to 6 year olds weighing more than 40 pounds place preschoolers at high risk as unrestrained passengers. As Drs. Johnston, Rivara, and Soderberg have stated, "It is time to target the toddlers".[74]

III. Study Design and Methods

A. Study Design

The research design is an experimental pretest-posttest control group design.[94] This design takes into account several factors which may affect the internal validity of the study. The design also controls for the effects of the children's development and maturation over the six months of the program. The design may be conservative, tending toward the null hypothesis, because not all children attend to the safety messages to the same degree and children may have entered an intervention school at any time during the year, diluting the potential effect of the program on their restraint usage.

This experimental design is subject to some threats to external validity.[94] It is possible that the effect of the program could be altered by the administration of the initial parent questionnaires and/or the act of observation. However, such an effect is controlled for by the inclusion of the comparison schools. Another potential bias which may occur with this design results from self-selection. An element of self-selection exists because any school may refuse to participate, potentially leaving only the most motivated school faculties willing to participate in the study. The validity of the study comparisons themselves are unaffected, however, because schools willing to participate in the study were randomly assigned to intervention or control status.

B. Population Studied

There are 54,860 children between the ages of 2 and 5 years living in Hamilton County. Fifty-one percent of the population within this age range is male. Seventy-one percent of the children are white, 27.3% are African-American, and 1.6% belong to other racial groups.

Countywide observations of children three years and younger conducted by CHMC and the IPR have demonstrated that CSS use is lower among African-American families.[40] In January 1993, 82.1% of white drivers were observed to be wearing safety belts; 72.6% of African-American drivers were restrained. Only 7.9% of the white children were unrestrained, but 31.3% of African-American children were using no restraint. Fifty-six percent of white children were appropriately restrained in a CSS compared to only 20.8% of African-American children. These findings are supported by data from the Bureau of Health Resources Development, Department of Health and Human Services, which identified only 5.3% of African-American children under the age of 5 years as restrained at the time of a crash versus 47.2% of white children in the state of Nevada.[96]

Because an inverse relationship of socioeconomic status with CSS use has been identified, this study includes children from all financial backgrounds. To assure inclusion of all socioeconomic strata, tuition rates were obtained from all preschools and the schools grouped by tuition tertile, with approximately equal representation from each tertile.

The final sample included 1,007 children. The sample included 635 white children, 321 African-American children, and 51 children of other racial origins.

C. Sample Selection

The tuition at all 296 preschools and child care centers with preschool programs in Hamilton County was identified from a list provided by the Community Comprehensive Child Care of Cincinnati and schools grouped by tuition tertile. The list of preschool names was cut and the name slips were pulled from a box to identify a random sample of potential participants. The school names pulled for each tuition tertile were asked to participate in the order in which they were drawn. School directors were asked to participate until enough schools to provide sufficient African-American children per tuition tertile were recruited. Information concerning any tuition support or scholarship programs and the racial composition of the students was ascertained from the school director at the time of the initial contact to ensure that tuition classification was correct and that a sufficient number of minority children were included in the study. The total sample size included 1,007 children.

Income information was obtained from parents during the postprogram observation interview. Based on this self-reported information, 40% of the sample fell into the lowest tertile, 26% were in the middle tertile, and 34% were in the highest tuition tertile.

Participating schools within each tuition tertile were randomly assigned to intervention or control status by coin toss after determining whether observation would be feasible at the site. Ninety preschools were contacted, parking facilities were inspected for 44, 17 preschools were considered final participants in the study. One control school closed shortly before the intervention began, leaving 9 intervention and 7 control preschools and daycare facilities in the study.

We over-sampled the African-American population to ensure that the study includes enough African-American children to allow meaningful analysis. The final sample included 32% African-American children; the Hamilton County population of African-American children in this age group is 27.3%. To have sufficient statistical power to examine program effects by race, a minimum of 100 African-American and 100 white children per group was required. The final sample included 183 African-American children in the intervention group and 138 in the control group.

D. Instruments Used

Intervention

The Preschool Child Passenger Safety Program is a multi-faceted intervention designed to be integrated into preschool activities throughout the academic year. The program was designed by a team of educators, preschool classroom teachers, injury prevention personnel, and researchers. It is also suitable for twelve month institutions, such as child care centers. The program includes a curriculum for preschool children, educational program for parents, and educational program for teachers.

Three focus groups were conducted to enable parents with children in non-participating preschools in the low, middle, and high tuition tertiles to identify barriers and facilitators to appropriate child restraint use. Information addressing solutions for the barriers and promoting use of the facilitators was incorporated into the parent program.

The classroom curriculum presents car safety-related messages through a variety of modalities, including fine and gross motor activities, music, whole language, and other preschool activities. Examples of curriculum components include safety seats located in the classrooms to encourage dramatic play with dolls, lacing cards in the shape of a car seat, and sheets of child passenger safety-related songs to be taught during group time. Child safety seats were sold for $5.00 to any family (intervention or control) unable to purchase one during the months of the study.

The parent program included monthly newsletters addressing specific passenger safety topics and one child passenger safety-related presentation per school. Teachers encouraged parents to be involved with "homework" sent home with the preschool children and promoted family safety games.

The teacher program included an extensive in-service for all intervention group classroom teachers. An in-service video was provided if new teachers were hired during the year. Teachers served as a conduit for distribution of safety seats and boosters to parents in need.

Observation

Recording forms were used for observation. Observers recorded restraint type, child's seating position, and CSS misuse (seat not belted into car, child not belted into seat, two children in one belt, shoulder belt behind arm or across face, infant seat facing forward). Observers were blinded as to intervention/control school status, and the same information was collected during observation at all schools.

The outcome of primary interest is CSS usage. Injury prevention efforts may impact along a continuum from awareness of risk, knowledge of how to prevent or minimize injury, and ultimately to behavioral change so that the appropriate prevention actions are taken. Therefore, the most powerful outcome measure is observation, which directly measures behavioral change without the potential biases of self-reporting.[39,64,84] Using the same methodology successfully employed in 1993 and 1994 for countywide observation of restraint use among infants and toddlers under four years of age,[40] the University of Cincinnati Institute for Policy Research (IPR) conducted the parent interviews, restraint observations, and data management.

Prior to final acceptance into the study, all participating school parking lots were inspected to be sure that they were safe for observers. Traffic patterns and arrival times were noted; the required number and optimal placement for observers was determined. Sufficient interviewer pairs were placed in each parking lot so that only one day of

observation was required per site. School administrators were notified the afternoon prior to the observation; parents did not receive notification.

Trauma Service personnel conducted training sessions with the observers in the recognition of child safety restraints and proper usage of the devices.

Drivers were given a card describing the purpose of the observation (i.e., determining CSS usage rates) and providing names and telephone numbers of contact persons at the University of Cincinnati and CHMC Trauma Service for additional information.

Parent Focus Groups

Parent focus groups were organized to identify parental perceptions of the barriers and facilitators to CSS use. Trained moderators from the IPR conducted 90 minute sessions in a focus group facility which allowed observers to watch the proceedings through one-way glass. All three sessions were audio taped for future analysis.

Three separate focus groups were conducted, one for parents within each preschool tuition tertile. Financial considerations may constitute a barrier to CSS usage for some parents who may feel less inhibited about discussing economic issues with a group of parents in similar situations.[86] Parents were recruited from preschools not participating in the study. Parents were prescreened using a short questionnaire addressing pediatric injury risk issues, including questions related to current CSS use. Within tuition tertiles, a random sample of parents who reported that they do not "always" use a CSS for their preschoolers was invited to participate in the focus groups.

Eleven parents participated in the focus groups for the high and middle tuition groups. Despite incentives and multiple phone calls, only four participants attended the low tuition focus group. Forty dollar incentives and refreshments were provided to all participants.

Although the results of this qualitative methodology are not generalizable, the focus groups generated useful information regarding perceived barriers and facilitators, direction for future programmatic development, and insight into the reality of the participants.[87-93]

Parents in all three groups identified a variety of barriers to the use of child safety restraints. The most frequent response was that the biggest barrier was the difficulty associated with use of the restraints themselves (installation of device in car, buckling and latching of child into restraint). At least one parent in each group mentioned confusion about the use of locking clips used in installation of some restraint systems.

The primary facilitator for use of a child restraint system was the parent's sense of safety and security. Parents in all three groups mentioned "peace of mind" as a facilitating factor for them. Parents also said that the "child sized" seats of the child

restraint systems, especially car seats (as compared to booster seats), helped facilitate their continued use since a child was more comfortable in the seat and could see out the window. Activities, music, books, stopping at McDonald's, and candy were facilitators for some parents when traveling with preschool children. Consistent use of restraint systems was also mentioned as a facilitating behavior.

Another important factor in the use of child restraint systems was the Ohio state law. When asked," What would it take for you to use a booster seat with your child after he/she turns four years old and weighs 40 pounds?" the consistent answer was "a law". Many parents report using state law to control their child's behavior in regard to using the child restraint and threaten parental incarceration if the child does not comply.

Parents identified three areas in which they most often need information: installation of the child restraint system, information about which seat will fit into their cars, and which seat is the "safest" to use.

Parents said that they frequently get information about child restraint systems from informal sources, such as family and friends, but they indicated that they would prefer to receive such information from more authoritative sources.

Parents identified the pediatrician's office as the best location to receive child passenger safety information. They indicated a preference for a videotape (rather than printed materials) demonstrating proper restraint installation and addressing other child passenger safety issues. The videotapes could be checked out of the physician's office or viewed there. Parents also suggested preschools as possible locations for child passenger safety education.

A copy of the complete parent focus group report is enclosed.

Parent Surveys

Secondary outcome measures include changes in parental awareness of injury risks to preschool passengers and assessment of their own child's susceptibility, attitudes toward the importance of a CSS, and knowledge of how to prevent child passenger injuries. This information was collected using a modification of the questionnaires used in the pilot program. Questions were added to assess awareness, attitudes, and knowledge of the factors identified as barriers or facilitators by the focus groups.

Self-administered questionnaires were distributed to parents following completion of pre- and postprogram observation. The postprogram questionnaire for intervention schools also queried parents about their reactions to and evaluation of the program. Incentives were provided to encourage completion of the questionnaires. The response rate for the pretest was 59% and the posttest response rate was 62.5%.

Additional Measures

Because different program materials and activities were used intermittently in each classroom at the discretion of the teacher, it was not feasible to accurately observe the degree of compliance with the program in all intervention school classrooms throughout the year. To obtain some estimate of the degree of implementation, teachers reported how often (i.e., how many days per month) specific materials were available in their classrooms and how often they conducted program-related activities. Activity diaries were delivered monthly to every classroom teacher in intervention schools.

Teachers completed self-administered questionnaires before and after the program. Intervention school teachers also evaluated the program on the posttest.

Intervention group teachers were also interviewed by two members of the research team following completion of the program.

E. Statistical techniques employed

Observation

The outcome measures of primary interest are:

1) change in the percentage of children arriving at preschool in a CSS;
2) disproportionate increase in restraint usage among economically disadvantaged and minority children;
3) change in the percentage of parents arriving at preschool wearing safety belts;
4) change in the percentage of children riding in the rear seats of vehicles equipped with passenger side air bags.

The primary outcome variables in the study were dichotomous categorization of unrestrained driver (Y/N), unrestrained children (Y/N), and incorrect safety seat use (Y/N). The adult responses to teacher and parent questionnaires were similarly categorized. Hypotheses were tested using the interaction term between time (pre/post) and group (intervention/control) variables.

The analysis was conducted in two phases. An unadjusted analysis was performed using contingency tables comparing group by time with chi-square tests. Subsequently, an adjusted analysis was conducted using logistic regression models. In addition to the group and time variables, the effects of race, gender, school, age, tuition tertile, and parent education were also examined. Only those covariates which were statistically significant or whose inclusion substantially changed the effects of group or time were retained in the final models.

After all of these analyses were completed, the generalized estimating equation (GEE) approach was employed. The GEE analysis considers multiple children in each car as correlated responses with the car defining a cluster of observations. This method recognizes the lack of independence among outcomes and makes adjustments to the standard errors of regression coefficients.

Parent Focus Groups

Many barriers and facilitators were identified by each of the 3 focus groups, not all of which were appropriate to include in the program. Using a multi-voting process, each focus group was asked to produce a list of the 3 barriers and 3 facilitators considered by the group to be the most important. Content analysis of all focus group data was also performed. A copy of the final report is enclosed.

Parent Surveys

The fifth hypothesis is that a child passenger safety program presented to parents of preschool age children will increase awareness and knowledge of appropriate child restraint usage.

Comparisons were made between intervention and control school parents using the Mantel-Haenszel procedure or chi square, as appropriate. Analysis included measures of awareness of injury risk to preschoolers, knowledge of and attitudes toward CSS usage, children's attitudes toward riding in a CSS, perceived barriers and facilitators to CSS use, and factual knowledge about risk of occupant injuries during childhood.

Comparisons were made among the three socioeconomic strata on pretest and posttest responses using the Mantel-Haenszel chi square procedure. Changes from pretest to posttest within socioeconomic strata were analyzed. Comments and suggestions for improving the program from intervention school parent posttests were coded and frequency counts performed.

Teacher Evaluations

As teacher attitudes affect implementation of the program, comparisons of intervention and control school teacher attitudes and knowledge regarding passenger safety for preschoolers were conducted pre- and postprogram using chi-square and Mantel-Haenszel analysis.

Activity diaries were collected each month from all teachers in the intervention schools. Logistic regression was conducted on the number of minutes spent on the program with change in incorrect restraint use and change in number of unrestrained children as the outcome variables.

IV. Presentation of Findings

Hypothesis Testing - Observation

The primary hypothesis, that the program would increase the percentage of children arriving at preschool in a CSS, was not supported by the data. The percentage of unrestrained children increased among intervention group students from 8.8% to 13.4% and among control group students from 12.7% to 21.7% (p=0.612).

The second hypothesis, that the program would have a greater impact on restraint usage among low income and minority families, was not supported by the data. African-American children remained significantly more likely to be unrestrained (p=0.001). Children of parents with college degrees were significantly less likely to be unrestrained (p=0.001).

The third hypothesis, that the program would increase the percentage of parents arriving at preschool wearing safety belts, was not supported. The percentage of unrestrained drivers increased from 16.2% to 21.2% within the intervention group and decreased slightly from 27.0% to 26.1% within the control group (p=0.191). Male drivers were significantly more likely to be unrestrained than females (p=0.001). Less education than a college degree was also associated with failure of a driver to be restrained (p=0.027).

The fourth hypothesis, that the percentage of children riding in the rear seats of vehicles would increase as a result of the program, was not supported (p=0.44). African-American children were significantly more likely to be riding in the front seat (p=0.002).

A higher percentage of study group parents were observed to be restrained but the difference failed to achieve statistical significance (CI: 0.23-1.36). Similarly, study group children were less likely to be inappropriately restrained but the difference failed to achieve statistical significance (OR=0.43; CI=0.16-1.19).

There is a statistically significant difference from preprogram to postprogram observation in incorrect safety seat use. However, this reflects an increase in incorrect use for both intervention and control groups rather than a program effect (I: 67.2% to 73.3%; C: 75.1% to 79.2%).

Descriptive Findings – Parent Surveys

There were 590 parent pretests returned and 629 posttests. The response rate for the pretest was 59% and the posttest response rate was 62.5%.

The average age of the children was 3.52 years on the pretest and 4.19 years on the posttest. There is no difference in mean age between the intervention and control schools (p=0.32).

Cross tabulations for the individual questions by study group and pre/post are presented in tables 1 through 7. There were no significant postprogram differences between groups for these questions.

When asked, “Did you learn any new information from the car safety program?” 81.4% of the intervention school parents responded “yes”, 13.3% responded “no”, and 5.4% were unsure. About the same number (82%) indicated that their child had benefited from the program. Only 7.3% responded that their child had not benefited, and 10.7% were unsure. Thirty-six percent of the intervention school parents indicated that they restrained their children differently than they had prior to the program.

Table 1

“Please rate how difficult it is for you to get the car safety seat fastened in the car.”

	1=not at all difficult		2		3		4		5=very difficult	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Control	31 37.4%	47 49.5%	23 27.7%	14 14.7%	17 20.5%	24 25.3%	12 14.5%	9 9.5%	0	1 1.1%
Intervention	55 36.2%	53 42.7%	38 25%	37 29.8%	37 24.3%	21 16.9%	17 11.2%	11 8.9%	5 3.2%	2 1.6%

Table 2

“Which statement best describes where your preschooler sits in a vehicle?”

	Always in front		Always in back		Sometimes front	
	Pre	Post	Pre	Post	Pre	Post
Control	2 0.84%	3 1.0%	202 85.2%	248 81.0%	33 13.9%	55 18.0%
Intervention	7 1.7%	6 1.6%	340 84.2%	322 84.1%	57 14.1%	55 14.4%

Table 3

“Think about the times when your preschooler rides with other family members or friends.
Please rate how concerned you are that your child is not being properly restrained.”

	1=not at all concerned		2		3		4		5=very concerned	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post

Control	93 40.4%	127 42.1%	43 18.7%	56 18.5%	29 12.6%	29 9.6%	20 8.7%	19 6.3%	45 19.6%	71 23.5%
Intervention	152 38.4%	122 32.2%	84 21.2%	87 23.0%	56 14.1%	51 13.5%	35 8.8%	38 10.0%	69 17.4%	81 21.4%

Table 4

"Please indicate which one of the following statements best describes how you feel about restraining your preschooler for both long and short trips."

	More important to buckle child for a long trip		More important to buckle child for a short trip		Equally important for long and short trips		Not important to buckle child for long or for short trips	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Control	5 2.1%	10 3.4%	2 0.8%	3 1.0%	229 96.2%	276 92.6%	2 0.8%	8 2.7%
Intervention	11 2.8%	9 2.3%	5 1.2%	2 0.5%	375 94.0%	366 95.3%	8 2.0%	6 1.6%

Table 5

"About how often does your preschooler complain about being buckled into a car safety seat, booster seat, or seat belt?"

	Always		Most of the time		Sometimes		Rarely		Never	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Control	9 3.8%	13 4.3%	15 6.3%	16 5.4%	50 20.9%	66 22.1%	70 29.3%	79 26.4%	95 39.8%	125 41.8%
Intervention	13 3.2%	8 2.1%	28 7.0%	20 5.2%	84 20.9%	63 16.5%	122 30.4%	122 32.0%	155 38.6%	168 44.1%

Table 6

"From what you have read or heard, when should a child switch from a car safety seat to a booster seat?"

	When they weigh	When they	When they	Not sure

	about 20 pounds		weigh about 40 pounds		weigh about 80 pounds			
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Control	13 5.4%	17 5.7%	206 86.2%	255 85.6%	1 0.4%	10 3.4%	19 8.0%	16 5.4%
Intervention	16 4.0%	7 1.9%	348 86.8%	337 89.2%	2 0.5%	17 4.5%	9 2.2%	17 4.5%

Table 7

"About how often do you yourself wear a safety belt?"

	Always		Most of the time		Sometimes		Rarely		Never	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Control	168 70.6%	206 69.1%	44 18.5%	62 20.8%	10 8.0%	22 7.4%	6 2.5%	7 2.3%	1 0.4%	1 0.3%
Intervention	295 73.2%	280 73.1%	68 16.9%	67 17.5%	28 7.00%	28 7.3%	7 1.7%	5 1.3%	5 1.2%	3 0.8%

Hypothesis Testing – Parent Surveys

The program did effectively inform parents as to which restraint system they should be using with their child (table 8). On the parent pre-program questionnaires, both groups of parents demonstrated similar rates of incorrect selections for their child's restraint system. On the post-test, study school parents showed significant improvement in reporting appropriate choice and proper use of child restraints ($p=0.03$).

Table 8

Incorrect Choice of Seat*

	Pre	Post
Control	61.0%	64.5%
Intervention	61.5%	57.7%

*This outcome variable included the child's age, parents' identification of seat, and frequency of use. To be coded as "correct use", the choice of restraint must be appropriate for the child's age and the parent must report **always** using the restraint.

Teacher Surveys

The child passenger safety program was also very successful in educating teachers. The program significantly improved teacher knowledge about appropriate restraint by child's weight, the importance of preschool programs for child passenger safety education, and awareness of restraint use in preschool carpool situations.

There was no preprogram difference between control and intervention teacher responses on the question," When do you think it is safe for a child to ride in a seat belt rather than a safety seat?" (table 9). There was a significant difference on the post-test (Mantel-Haenszel p=0.0002), with intervention school teachers more correctly identifying 80 pounds as a major criterion for moving a child from a child restraint system to an adult safety belt.

Table 9

"When do you think it is safe for a child to ride in a seat belt rather than a safety seat?"

	When they weigh about 20 lbs.		When they weigh about 40 lbs.		When they weigh about 80 lbs.		Not sure	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Control	3 5.3%	0 0	37 64.9%	41 74.6%	13 22.8%	11 17.2%	4 7.0%	3 5.5%
Intervention	1 1.6%	0 0	48 75%	7 13.5%	11 17.2%	42 80.8%	4 6.3%	3 5.8%

There was no preprogram difference between control and intervention school teachers on the question," When a child is 4 years old and weighs 40 pounds, the safest way for him/her to ride in a car is:…" (table 10). There was a significant difference on the post-test (Mantel-Haenszel: p=0.02), with intervention school teachers more likely to correctly identify the belt-positioning booster seat as the safest restraint for the child described. It appears that much of the increase came from teachers who had previously considered the lap/shoulder belt combination to be the restraint of choice in this situation.

Table 10

"When a child is 4 years old and weighs 40 pounds, the safest way for him/her to ride in a car is:"

	In a lap belt		In lap/shoulder belt		In a shield booster seat		In a belt-positioning booster seat		Not sure	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Control	1 1.8 %	3 5.6 %	17 30.9 %	17 31.5 %	10 18.2 %	4 7.4%	24 43.6 %	27 50%	3 5.5 %	3 5.6 %
Intervention	1 1.5 %	0 0	14 21.5 %	6 11.5 %	16 24.6 %	12 23.1 %	31 47.7 %	33 63.5 %	3 4.6 %	1 1.9 %

There was no significant preprogram difference between control and intervention school teachers on the question," How important is it for preschool teachers to provide safety information to children in their classrooms?" (table 11). The responses to this question were universally positive. There was a significant difference on the posttest (Mantel-Haenszel: p=0.04), with teachers from both groups more frequently responding that it was "very important" on the posttest.

Table 11

"How important is it for preschool teachers to provide safety information to children in their classrooms?"

	Very important		Somewhat important		Not at all important		Not sure	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Control	51 89.5%	52 94.6%	6 10.5%	3 5.5%	0	0	0	0
Intervention	53 80.3%	47 85.5%	13 19.7%	8 14.6%	0	0	0	0

There was no preprogram difference between control and intervention school teachers on the question, **"**Is it your impression that children driven to school in carpools are usually:…" (table 12). There was a significant difference between groups on the post-test (Mantel-Haenszel: p=0.003), as a higher percentage of intervention school teachers reported that children in carpools are less safely restrained.

Table 12

"Is it your impression that children driven to school in carpools are usually:…"

	As safely restrained as children not transported in carpools		Less safely restrained than children not transported in carpools		More safely restrained than children not transported in carpools		Not sure	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post
Control	19 34.6%	13 23.6%	20 36.4%	18 32.7%	5 9.1%	5 9.1%	11 20.0%	19 34.6%
Intervention	14 22.6%	8 14.6%	34 54.8%	34 61.8%	3 4.8%	1 1.8%	11 17.7%	12 21.8%

There was no difference between treatment groups on pretests or posttests for six questions. The responses are combined for the following analyses presented in tables 13 – 18.

About three-quarters of the preschool teachers considered injuries to be the greatest danger to the safety of preschool children (table 13).

Table 13

"What do you consider the greatest danger to the safety of preschool children?"

Drugs		Injuries		Strangers/kidnapping		School violence		Other	
Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
2 1.7%	4 3.8%	93 76.9%	78 73.6%	12 9.9%	20 18.9%	2 1.7%	1 0.9%	12 9.9%	3 2.8%

More than ninety percent of all the preschool teachers correctly identified "accidents" as the leading cause of death among preschool age children (table 14).

Table 14

"What do you think causes the most deaths in children between 2 and 6 years of age?"

Leukemia		Other diseases		Accidents		Murders		Other	
Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
0	0	0	2 1.9%	113 94.2%	100 92.6%	4 3.3%	5 4.6%	3 2.5%	1 0.9%

Preschool teachers overwhelmingly identified failure to use a safety restraint as the most unsafe behavior in a car (table 15).

Table 15

"Please circle the **ONE** behavior you consider **most** unsafe in a car."

Fighting in the back seat		Children putting arms or heads out the window		Not using a seat belt or car seat		Throwing objects in the car		Bothering the driver		Other	
Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
2 1.6%	1 .9	1 0.8%	4 3.7%	114 92.7%	101 92.7%	1 0.8	1 0.9	5 4.1%	2 1.8%	0	0

The vast majority of preschool teachers consider it very important for preschool children to ride in car seats (table 16).

Table 16

"How important do you think it is for preschool children to ride in car seats?"

Very important		Somewhat important		Not important at all		Not sure	
Pre	Post	Pre	Post	Pre	Post	Pre	Post
119 96.8%	107 97.3%	3 2.4%	1 0.9%	0	1 0.9%	1 0.8%	1 0.9%

Virtually all of the preschool teachers identified the back seat as the safest seating position for a preschool child (table 17).

Table 17

"What do you think is the safest position in a car for a preschool child?"

In the front so the driver can see them		In the back		Not sure	
Pre	Post	Pre	Post	Pre	Post
1 0.8%	2 1.8%	122 99.2%	107 98.2%	0	0

All of the teachers agreed that it is important to provide safety information to parents in the preschool setting.

Table 18

"How important do you think it is for preschool teachers to provide safety information to parents?"

Very important		Somewhat important		Not important at all		Not sure	
Pre	Post	Pre	Post	Pre	Post	Pre	Post
106 86.2%	94 86.2%	17 13.8%	15 13.8%	0	0	0	0

On the postprogram questionnaire, intervention school teachers were asked to evaluate the program (tables 19-23). More than ninety percent responded that the program was a worthwhile use of classroom time (table 19).

Table 19

"Did you feel that the child passenger safety program was a worthwhile use of your classroom time?"

Yes	No	Not sure
49 94.2%	0	3 5.8%

The majority of teachers (84.3%) indicated that they intend to include the safety program materials and activities in their classrooms for the year following the completion of the study (table 20).

Table 20

"Will you include the child passenger safety program materials and activities in your classroom next year?"

Yes	No	Not sure
43 84.3%	1 2%	7 13.7%

The teachers overwhelmingly report that they enjoyed teaching the program (table 21).

Table 21

"Did you enjoy teaching the child passenger safety program?"

Yes, all the time	Yes, most of the time	No
24 49%	24 49%	1 2%

About two-thirds of the preschool teachers indicated that the children enjoyed having the child passenger safety program in the classroom (table 22).

Table 22

"Do you think that the children enjoyed the child passenger safety program materials and activities?"

Yes, a lot	Yes, a little	No	Don't know
33 66%	14 28%	0	3 6%

About ninety percent of the teachers indicated that the children learned from the child passenger safety program (table 23).

Table 23

"Do you think that the children learned from the child passenger safety program?"

Yes, a lot	Yes, a little	No	Not sure
35 67.3%	12 23.1%	2 3.9%	3 5.8%

Teacher Activity Logs

The number of minutes per week that preschool devoted to the program ranged from 1 to 270, with a mean of 26.7 minutes (±32.8). The amount of time spent on the program was not associated with an increase in correct child restraint use ($p=0.78$), an increase in use of safety belts by preschool children ($p=0.34$), or increase in use of safety belts among drivers ($p=0.06$).

The validity of these results is difficult to assess because of the low response rate. Of the 65 preschool classroom teachers, only 16 (25%) returned the activity logs.

Teacher Exit Interviews

Two members of the research team conducted structured interviews with the director and classroom teachers at each of the intervention preschools after the completion of the program. The primary strengths of the program identified by the teachers were:

1) Educational presentations to parents by credible professionals who were the same race as the parents;
2) Providing low cost safety seats to the parents through the program;
3) Group time activities worked well;
4) Children could make choices among the materials.

The primary weaknesses of the program identified by the teachers included:

1) Program materials were not "realistic" – BuckleBear components of the program were not compatible with some educational philosophies – better to use real children as a role model.
2) Worked better with 3 years olds; 4 years is "too late"
3) Children loved the program but could not transfer it home without parental cooperation – need to do a better job of communicating the message to parents.
4) Program not successful in getting children back into a booster seat once they have been out of a safety seat.

Teachers identified several issues related to the parent programs:

1) All of the intervention preschools suggested that messages to parents not be "sugar coated"; suggest use of a "gruesome" video or photographs of injured children to capture the attention of the parents.
2) Suggest more than one parent program per year to increase exposure to the message.
3) Suggest taping the parent program so that parents unable to attend in person could still experience the power of the presentation.
4) Suggest using statistics to frighten parents.

The teachers offered several suggestions for improving the program, including:

1) Distribute child passenger safety information through car dealerships;
2) Explain the physics of crashes to parents;
3) Get manufacturers to show commercials for safety seats;
4) Develop a safety seat that plays a tune when the strap is buckled;
5) Put up billboards in neighborhoods;
6) Have a child passenger safety "festival" in places where families shop – provide free food and do car seat checks, answer questions, sell seats for a minimal price – make it fun
7) Incorporate safety seat information into preschool registration process – "how to get your child to school safely", "new shoes, new backpack, new booster seat", etc.
8) Integrate safety themes into holiday celebrations ("Buckle up your Valentine", etc.)

V. Discussion of Findings

A. Conclusions

Teaching child passenger safety in a preschool setting is an effective methodology for increasing awareness and knowledge among teachers and parents. Responses on

surveys indicated that both had gained knowledge and considered the program valuable. Although the children's knowledge of car-related safety was not directly tested, both teachers and parents felt that the children had benefited from the program.

This methodology was readily acceptable to preschool teachers and parents; both groups indicated that they liked the concept of preschool-based child passenger safety education. After modification, this acceptable, relatively inexpensive approach could be more effective in effecting behavior change.

The most important modifications must occur in the parent program. Teachers demonstrated greater increases in awareness and knowledge than did parents, possibly because teachers received greater exposure to the program. Teachers were required to attend in-service programs and to familiarize themselves with the program materials and activities. Teachers also interacted with program personnel on a regular basis. Parents received monthly newsletters and were invited to attend one meeting at their child's preschool. Attendance at the programs was very low despite incentives for attendance (raffles for safety seats and department store gift cert6ificates). As there was no control over parent participation (reading the newsletters/ attending the meeting), it is not possible to measure how much exposure to the program parents actually received. Increasing parent participation in the program may result in increasing appropriate safety seat use.

Restraint use decreased from preprogram to postprogram among both intervention and control group preschoolers. Ohio state law mandates use of a child safety restraint until a child weighs 40 pounds and is four years old, and by the end of the program a much larger percentage of our sample was no longer covered this legislation. A smaller increase was noted in the number of unrestrained intervention group children (I: 52% increase: 8.8% to 13.4%; C: 71% increase: 12.7% to 21.7%). This finding does suggest that the program may have prevented more intervention children from riding unrestrained after they reached the age of four.

This study identified African-American children as a very high-risk group for inadequate and improper restraint use. Modifications of the Preschool Child Passenger Safety Program to enhance the cultural sensitivity of materials and messages and further adapted for preschools serving primarily African-American families, may be an effective way to reach this group. A Head Start child safety program is currently being developed and evaluated with funding from the Maternal and Child Health Bureau. Another approach being employed by the Trauma Service is a faith-based focus, incorporating child safety messages into the culture of the African-American church, including Sunday services, programs for youth and young children, and literature. The faith-based program includes a culturally sensitive theatrical performance centering on the importance of child passenger safety.

One interesting finding is that the focus group data indicate that many parents find installation of child restraint devices to be very difficult; however, this barrier did not appear to be a problem among parents responding to the surveys. Less than 15% of parent

respondents indicated that installation is a problem. As focus group participants are a self-selected group, it may be that those who had the most difficulty with child restraint chose to attend the focus group sessions and that they are not representative of parents as a group.

B. Limitations

It was anticipated that the highest child restraint rates, parent safety belt use rates, and knowledge levels among parents would be highly correlated with the amount of time the classroom teacher devoted to the program. The analysis failed to support this hypothesis.
However, the response rate for teacher activity logs was very low (25%). Because of the poor data acquisition, it is not possible to assess the relationship between teacher effort and study outcome measures. The inability to assess the "dose" of education received by parents and children also raises questions about whether the program was properly implemented. It is possible that the expected behavioral changes might have been observed if the program had been well implemented.

Another limitation to the study is the insufficient emphasis on safety belts as an acceptable second tier of protection. Although suboptimal, safety belts do provide some degree of protection in a crash. Classroom activities involving use of safety belts (belts installed in pedal cars, belts attached to boards, etc.) were included in the pilot study. These activities were deleted and parent literature and presentations emphasized the use of safety and booster seats. The pilot study for this program and other studies in the literature, such as the Bucklebear study, demonstrated an increase in use of safety belts but no improvement in safety seat use. The current study, however, did not achieve an increased use of safety belts. The value of the program might be enhanced by modifying the curriculum to include several engaging activities for the classroom and by clarifying the message to parents that it is better to use a safety belt than to use no restraint at all.

Use of preschool tuition tertiles was employed as a proxy variable for family income. The question was included during the posttest interviews to see how well the tuition rates correlated with family income. Only 13% refused to answer the question. The tertile system appears to be more accurate at the upper end of the income scale. Sixty percent of respondents in the highest tuition tertile responded that their incomes were in the two top income categories listed in the question. In the middle tertile, 38.9% reported incomes in the two middle-income categories. Of the lowest tuition tertile, only 29.4% reported incomes in the two lowest income groups. Almost half (47.6%) of the lowest tuition tertile parents report incomes in the middle range. More than half (67.1%) of the middle tuition group report incomes in the high range. This finding may be due to faulty self-reporting but it seems likely that it is related to a tendency to save money on preschool education. Tuition tertile does not appear to be an accurate measurement for family income.

C. Comparisons with findings of other studies

All other published preschool-based studies have focused on increasing use of safety belts, which provide suboptimal protection for the preschool population. The current study focused on the use of booster seats, which require parental action to acquire and install the seats. The current study did not teach children how to use safety belts nor did it encourage their use.

The Bucklebear program is a two-week car safety curriculum for preschoolers which teaches the use of safety belts. In a controlled study with six experimental sites and seven control preschools, the immediate post-program intervention site observations did demonstrate an increase in the use of safety belts, from 21.9% to 44.3%. The effect at two months following the intervention was decreased at all of the four intervention sites at which it was measured. The authors report no change in safety belt use among control sites. [10]

Another study of the Bucklebear program was conducted using a pretest-posttest design at a single day care center. [9] Preprogram observation of 35 children identified 15 (43%) riding in either a seat belt or a car seat. The children demonstrated increased knowledge scores from pretest to posttest but there was no significant increase in the use of safety belts or riding in a back seat position.

A study of an internally-developed program compared two preschools in poor minority communities. [8] The two schools were significantly different in terms of racial composition, poverty, and single parent families, with the control school more likely to demonstrate low child safety restraint usage. The control center restraint usage rates were 20% to 30%; intervention center rates increased from 54% to 75%.

Roberts' study distributing stickers and coupons as rewards for arriving at school in a restraint demonstrated a short-term increase in safety belt use but no sustained effect on the low pre-intervention CSS usage rate.[70]

As noted previously, the current child passenger safety study requires modification to include materials and activities related to safety belt use as a secondary option when an appropriate child restraint system is not available. It appears that it is possible to teach the children themselves how to use the vehicle safety belt when a booster or safety seat is not available.

Restraint rates for the cited studies (published in 1985, 1990, and 1993) were much lower than those observed during the current study in 1999 (91.2% for intervention 87.3% among controls). Perhaps Hamilton County is approaching a ceiling effect, in which only the most recalcitrant parents do not use restraints for their children under the age of four years.

D. Application of findings

Increasing African-American Restraint Use

As noted, African-American parents were less likely to properly restrain their children. During preprogram observation, 26% of African-American children were completely unrestrained; only 4% of white children were unrestrained. African-American parents were also less likely to be wearing a safety belt (65% vs. 84%). Programs targeting this population are essential to properly protect this high-risk group. The Preschool Child Passenger Safety Program can serve as the basis for development of culturally sensitive programs implemented through pediatric offices and clinics serving minority families and through faith-based family safety programs as well as preschools and day care centers.

Increasing Restraint Use Among Economically Disadvantaged Families

Low income families (as measured by tuition tertile) are also a high risk group. Children in the lowest tuition tertile schools were more frequently unrestrained than other children (13% vs. 8% for the middle and the high tertiles). Drivers at the low tuition tertile preschools were also less likely to be belted than those in middle and high tertile preschools (74% vs. 83% vs. 81%). With modification, the preschool car safety program might be an effective, inexpensive methodology for reaching this population through Head Start programs. Focus groups conducted with low income parents would be vital to the success of such an endeavor.

Preschool Teacher Education

While preschool teachers were very aware of the importance of child passenger safety and their role in complying with state law while transporting children, the program significantly improved their knowledge. Curriculum standards for early childhood education programs should include instruction specific to state law and to the best practice in the field of child passenger safety. The preschool child passenger safety program could be adapted to the needs of college students. The program would introduce them to age-appropriate activities and materials presenting safety messages, explain state law relevant to preschool-age children, and teach the current child passenger safety best practice. The curriculum should also include an interactive, “hands on” laboratory to provide practice in identifying and differentiating between types of restraints and provide practice in installation of seats.

Development of Programs for Pediatric Offices

Focus group participants indicated that they would prefer to receive child passenger safety information from an authoritative source, such as the pediatrician. However, time constraints often preclude such guidance. The activities and materials developed for the child passenger safety program could be packaged to be appropriate for use in medical waiting areas. Printed information from the parent newsletters could be adapted into a brochure to educate parents and to suggest questions they might ask the pediatrician during the visit.

Development of Pediatric Medical Centers as Child Passenger Safety Resources

One disappointing finding from the focus groups was that no parent considered Children's Hospital Medical Center or any other community hospital as authoritative resources for child passenger safety information. A hospital-based telephone/e-mail information system with well-publicized phone numbers and addresses might be helpful to parents with questions and provide more accurate information than the family and friends who currently serve as the usual source of information. This would make the expertise intrinsically resident in the medical centers readily available to the community.

E. Policy implications

Head Start programs may provide an appropriate vehicle for providing child passenger safety information to preschool age children and their caregivers. Head Start programs serve economically underprivileged families and often serve minority populations, demonstrated to use proper restraints at lower rates than the general population. A national revision enhancing the child passenger safety component of the existing Head Start curriculum might be an effective methodology for reaching high-risk preschool age children. Because Head Start does require parental attendance at mandatory monthly meetings, the parent component of the program might be better attended and enhanced with additional presentations and demonstrations.

One of the important findings from the focus groups was the emphasis that parents place on following state law in regard to child passenger safety. Participants made it very clear that they would not use booster seats unless it was required by law. Parents expressed the view that if children really needed booster seats, seat usage would be mandatory. They also use the existence of the law to convince their children that they must sit in an approved restraint device. Education for state legislators to make them aware of the importance of booster seats to the safety of preschool age children may result in changes in the law. The National Highway Traffic Safety Administration would be an important ally in this endeavor as they already recommend booster seats for children up to the age of 8 years or who are 57" tall.

F. Suggestions for further research

The current research suggests that parents do learn from programs presented within a preschool context. One issue adversely affecting the outcome of this study was the poor attendance at educational parent meetings. As noted previously, parent meetings are mandatory in the Head Start program. With funding from the Bureau of Maternal Child Health, the Cincinnati Children's Hospital Medical Center Trauma Service is instituting a three-year Head Start family injury prevention program. This study will include a child passenger safety component in addition to a curriculum addressing fire, home, pedestrian, bicycle and water safety. It is anticipated that parent attendance will be higher because of faculty expectations but previous experience has demonstrated that

attendance is often low even at “mandatory” meetings. Therefore, more resources have been committed to provide incentives to encourage parental presence at the presentations.

Another study of interest would be a pre/post trial examining the effects of the LATCH program. Although the LATCH legislation does not impact booster seat use, it may simplify installation of child safety seats used by preschoolers under 4 years and 40 pounds (in Ohio).

VI. List of Products

1. Garcia VF, JE Zins, TL Byczkowski, RW Hornung, B Tuchfarber, SC Laurence. 2001. Promoting Preschool Child Passenger Safety. Paper presented: American Academy of Pediatrics 2001 National Conference and Exhibition. San Francisco, CA. Oct. 19-24, 2001.

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