Disparities in Age-Appropriate Child Passenger Restraint Use Among Children Aged 1 to 12 Years

WHAT'S KNOWN ON THIS SUBJECT: Age-appropriate child safety seat use in the United States is suboptimal, particularly among children older than 1 year. Minority children have higher rates of inappropriate child safety seat use based on observational studies. Explanations for observed differences include socioeconomic factors.

WHAT THIS STUDY ADDS: White parents reported greater use of age-appropriate child safety seats for 1- to 7-year-old children than nonwhite parents. Race remained a significant predictor of age-appropriate restraint use after adjusting for parental education, family income, and information sources.

abstract

OBJECTIVE: Observed racial disparities in child safety seat use have not accounted for socioeconomic factors. We hypothesized that racial differences in age-appropriate restraint use would be modified by socioeconomic status and child passenger safety information sources.

METHODS: A 2-site, cross-sectional tablet-based survey of parents seeking emergency care for their 1- to 12-year-old child was conducted between October 2011 and May 2012. Parents provided self-report of child passenger safety practices, demographic characteristics, and information sources. Direct observation of restraint use was conducted in a subset of children at emergency department discharge. Age-appropriate restraint use was defined by Michigan law.

RESULTS: Of the 744 eligible parents, 669 agreed to participate and 601 provided complete responses to key variables. White parents reported higher use of car seats for 1- to 3-year-olds and booster seats for 4- to 7-year-olds compared with nonwhite parents. Regardless of race, <30% of 8- to 12-year-old children who were ≤ 4 feet, 9 inches tall used a booster seat. White parents had higher adjusted odds (3.86, 95% confidence interval 2.27–6.57) of reporting age-appropriate restraint use compared with nonwhite parents, controlling for education, income, information sources, and site. There was substantial agreement (82.6%, $\kappa = 0.74$) between parent report of their child's usual restraint and the observed restraint at emergency department discharge.

CONCLUSIONS: Efforts should be directed at eliminating racial disparities in age-appropriate child passenger restraint use for children <8 years. Booster seat use, seat belt use, and rear seating represent opportunities to improve child passenger safety practices among older children. *Pediatrics* 2014;133:262–271

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KEY WORDS

child restraint systems, survey, health behavior, socioeconomic factors

ABBREVIATIONS

ED—emergency department
HMC—Hurley Medical Center
MVC—motor vehicle collision
RA—research assistant
UM—University of Michigan

Dr Macy conceptualized and designed the study, drafted survey questions, supervised the survey administration and data collection, carried out the analyses, and drafted the initial manuscript. Dr Cunningham contributed to the study design; mentored Dr Macy in acquisition of the data, data analysis, and interpretation of data; and critically reviewed the manuscript. Dr Resnicow contributed to the survey question design and interpretation of the data and critically reviewed and revised the manuscript. Dr Freed contributed to the study design and survey development as well as data analysis and interpretation and critically reviewed the manuscript. All authors approved the final manuscript as submitted.

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Suboptimal child passenger restraint practices contribute to crash-related injuries, which remain a leading cause of childhood death in the United States.¹ Children who are unrestrained or sitting in the front seat face the greatest risk for death in motor vehicle collisions (MVCs).^{2–6} Age-appropriate child safety seat use reduces injury risk by 50% to 75%^{7–9} and provides increased protection over seat belts in crashes.^{7,9,10} Although child passenger safety practices in the United States have improved over time,^{11–13} premature transitions to booster seats and seat belts persist,^{13–18} and racial disparities exist.^{8,17,19–23}

Minority children have higher directly observed rates of both being inappropriately restrained^{8,20–22} and unrestrained^{8,17,19,20} compared with white children. Driver minority race/ethnicity, lower education, and lower household income are associated with driver-reported suboptimal restraint use among children <9 years old who have been involved in an MVC.²² Information sources influence safety behaviors,^{24–27} and misinformation about child safety seats in minority populations has been described.^{28,29}

In this study, we explored racial differences in age-appropriate restraint use among 1- to 12-year-old children by using parent self-report and direct observation data. Our results build on the published literature by determining the impact of both socioeconomic status and child passenger safety information sources on parent-reported age-appropriate restraint use. Understanding the impact of contextual factors on racial disparities in child safety seat use is important for targeting interventions to promote optimal child passenger safety practices.

METHODS

Study Design

A 2-site, cross-sectional survey of parents seeking emergency care for any reason for their 1- to 12-year-old child

was conducted at the University of Michigan (UM) C.S. Mott Children's Hospital Emergency Department (ED) and the Hurley Medical Center (HMC) ED between October 2011 and May 2012. Parent-reported restraint use was verified by direct in-vehicle observation among a subset of children discharged during their recruitment shift. The Institutional Review Boards of the UM Medical School and HMC approved the study.

Setting

The UM Pediatric ED is located in a suburban, tertiary care, academic hospital with a predominantly white and privately insured patient population. The HMC ED is located within an urban community hospital where higher proportions of patients are African American and covered by Medicaid compared with UM.

Subjects

Parents of 1- to 12-year-old children who arrived to the EDs during peak hours (2 PM–9 PM) were potentially eligible for the study. Parents were not approached if their child was critically ill or injured (Triage Category 1 or treated in a resuscitation bay), was evaluated for suspected child abuse, or was in the process of admission, because this precluded our ability to observe restraint use at ED discharge. Parents were excluded if they were <18 years or did not speak English; if their child was taller than 4 feet, 9 inches; or if the child required a special child passenger restraint (eg, travel vest or wheelchair).

Survey Instrument

The study team developed survey questions and pilot tested the instrument with 21 parents. Survey questions that were confusing in pilot testing were modified. Items related to the presented results (Supplemental Information A) had a Flesch-Kincaid grade level of 5.1.³⁰

Survey Administration

Data collection occurred during the busiest hours to maximize recruitment. Recruitment days varied to ensure weekday and weekend enrollment. Research assistants (RAs) used a standard script to approach parents after the child was in their treatment room. Written informed consent was obtained after the RA reviewed study procedures, including the possibility of in-vehicle restraint type verification. Parents directly entered survey responses on a study tablet computer using the Qualtrics survey platform (Qualtrics Laboratories, Inc, Indiana, PA). Parents were offered a \$20 incentive for completing the survey and provided with information about local safety seat installation programs.

In-Vehicle Restraint Type Verification

To determine the degree of agreement with parent self-report, RAs trained to identify restraint types directly observed child restraint use among participants who were discharged from the ED. When not busy with another subject, the RA screened the ED patient tracking board for discharges among children of study participants. Participants who indicated an interest in completing restraint type verification during initial recruitment were approached. The RA accompanied willing families to the parking area and recorded the restraint type in use after the child was placed in their vehicle. RAs provided parents with scripted information to address any obvious misuses. Parents received an additional \$5 for allowing in-vehicle verification.

Passenger Safety Items

Parents indicated if their child sits in the front seat. Parents also were asked if their child ever used a passenger restraint. Parents who answered yes were provided sketched image examples of

child passenger restraints and asked to select the restraint(s) they use for their child and indicate the child's usual restraint. Parents were provided 2 lists of resources and asked to select all that apply to determine (1) how they learned to use their child's safety seat and (2) where they had gone to obtain child passenger safety information. Parents were asked if they received car safety information at their child's last doctor visit (yes versus no/I don't remember). Parents reported their own seat belt use when driving and as a passenger (always versus sometimes/never).

Demographic Items

Parents provided their race/ethnic background by selecting all that apply from a 6-option list. Other demographic information included parent age, gender, and relationship to child, highest education level attained, and annual household income in strata. Child age, gender, and chief complaint were obtained from the ED record.

Outcome Variables

The seat location outcome was based on parental report of the child ever sitting in the front seat. The age-appropriate restraint use outcome was defined by Michigan Child Passenger Safety Law, which states that children aged <4 must use a car seat and children aged 4 through 7 years must use a car seat or booster seat unless they are 4 feet, 9 inches tall.³¹ For analyses, age-appropriate restraint was defined as follows: 1- to 3-year-old children using car seats, 4- to 7-year-old children using car seats or booster seats, and 8- to 12-year-old children using booster seats or seat belts. When parents selected >1 type of restraint, the "worst-case scenario" (the least protective restraint or unrestrained) was used in age-appropriate restraint analyses.

Analyses

Descriptive statistics were calculated for each variable. Agreement between parent-reported usual restraint and observed restraint at ED discharge was assessed with the κ statistic. Sensitivity and specificity for parent-reported age-appropriate restraint were calculated. χ^2 statistics were calculated to test for bivariate associations between the outcome variables (sitting in the front seat and age-appropriate restraint use) and the predictor variables (sociodemographic characteristics, parent seat belt use, and child passenger safety information sources). Variables with a *P* value <.10 in bivariate analyses, restricted to the subjects with no missing responses, were included in multivariable logistic regression analyses to determine the independent effects of sociodemographic variables and information sources on age-appropriate restraint use. Site was included in multivariable analyses based on the potential for local variation in social norms. Interaction effects and multicollinearity were assessed. Survey responses were exported from Qualtrics to an Excel file and converted into Stata 10.0 (Stata Corp, College Station, TX) for analysis.

RESULTS

Sample Characteristics

Of the 1337 parents of 1- to 12-year-old children who arrived to the EDs during study shifts, 1084 (81.0%) were approached for recruitment into the study and 669 (89.9%) of 744 eligible parents agreed to participate (Fig 1). In-vehicle restraint use was observed for 131 (69.7%) of the 188 subjects discharged when an RA was available. Enrollment numbers were equal between sites and well distributed throughout the week (44.4% Friday through Sunday and 55.6% on weekdays). More parents refused survey participation at UM (13.7%) than HMC

(6.2%; *P* = .001). Complete responses on sociodemographic variables were provided by 601 (91.9%) of the 654 parents who finished the survey.

Characteristics of the study sample are provided in Table 1. Race/ethnicity was dichotomized into white and nonwhite based on the distribution of responses (non-Hispanic white: 63.1%, *n* = 379; non-Hispanic black: 26.8%, *n* = 161; Hispanic: 4.8%, *n* = 29; and non-Hispanic other race: 5.3%, *n* = 32). Eight parents self-identified as Hispanic white and were analyzed in the white group. The nonwhite population was smaller at UM (23.0%) than at HMC (54.3%). Parents from UM were older and of higher education and income levels. Children were more commonly evaluated for medical (78.9%) than injury-related complaints (21.1%). Injury-related complaints most frequently indicated an injured body area without specific mention of mechanism of injury (*n* = 87). Five children had a chief complaint of MVC.

In-Vehicle Restraint Type Verification

There was substantial agreement (82.6%, κ = 0.74) between parent-reported usual restraint and observed restraint among the 115 children with both data points. Among the 20 cases with discrepancies, 8 (40%) children were observed using a more protective restraint, and 12 (60%) were observed using less protective restraints than their parent-reported usual restraint. Levels of agreement were consistently high and not significantly different by race (86.7% white vs 75.0% nonwhite, *P* = .12) and by site (88.3% UM vs 76.4% HMC, *P* = .09; κ values 0.65–0.84). Observed age-appropriate restraint use did not differ by parent race (85.5% white vs 76.6% nonwhite, *P* = .20) or site (85.3% UM vs 79.0% HMC, *P* = .35) among the 131 children who completed in-vehicle verification.

FIGURE 1
Subject flow diagram.

TABLE 1 Sample Characteristics

	Overall Sample		UM (<i>n</i> = 303)	HMC (<i>n</i> = 298)
	<i>N</i> = 601 ^a	%	%	%
Parent race				
White	386	64.2	79.2	49.0
Nonwhite	215	35.8	20.8	51.0
Parent age, y				
18–29	170	28.3	19.8	36.9
30–39	176	29.3	36.6	21.8
40+	73	12.1	15.2	9.1
Did not answer	182	30.3	28.4	32.2
Relationship to child				
Mother	464	77.2	73.6	80.9
Father	111	18.5	24.8	12.1
Other	26	4.3	1.6	7.0
Education level				
High school or below	254	42.3	31.0	53.7
Technical/associate's degree	170	28.3	37.1	29.5
Bachelor's degree or higher	177	29.4	41.9	16.8
Household income				
I don't know	36	6.0	4.6	7.4
<\$25 000	203	33.8	17.5	50.3
\$25 000–49 000	138	22.9	23.1	22.8
≥\$50 000	224	37.3	54.8	19.5
Parent always uses seat belt				
Yes	281	47.8	55.8	37.6
No	320	53.3	44.2	62.4
Child age, y				
1–3	256	42.6	42.9	42.3
4–7	251	41.8	40.9	42.6
8–12	94	15.6	16.2	15.1
Child gender				
Male	321	53.4	57.1	49.7
Female	280	46.6	42.9	50.3
Reason for ED visit ^b				
Medical	470	78.9	76.8	80.9
Injury	126	21.1	23.2	19.1

^a Fifty-three responses were excluded from the 654 parents who completed surveys based on missing data on child restraint type, parent seat belt use, education, income, and/or parent race.

^b Difference in sample size reflects missing reason for visit information for 5 children; 5 of the injured children had MVC as the reason for ED visit.

Sources of Information

Child passenger safety information sources and comparisons by parent race are presented in Table 2. Reading the instruction manual and just figuring it out were the most frequently selected ways parents learned to use their child's safety seat. Thirty-five parents selected both options. The Internet/Web and family or friends were the most frequently selected sources of information about car safety for children followed by doctors and nurses. One-quarter of parents recalled receiving car safety information at their child's last regular checkup.

Seat Location

Sitting in the front seat was associated with child age (2.7% of 1- to 3-year-olds, 10.0% of 4- to 7-year-olds, and 34.0% of 8- to 12-year-olds, $P < .001$). Race was associated with sitting in the front seat only for 4- to 7-year-old children (6.4% white vs 16.0% nonwhite, $P = .014$). Few parents with a bachelor's degree or higher reported their child ever sat in the front seat (4.5%) compared with 12.2% of parents with high school education or less and 14.7% of parents with technical/associate degrees ($P = .005$). Sitting in the front seat was less common for children of parents who

reported always using a seat belt compared with those who did not (6.7% vs 14.1%, $P = .004$). Parent gender, relationship to the child, and family income were not associated with report of the child ever sitting in the front seat.

Age-Appropriate Restraint Use

Overall 79.4% of parents reported that their child used the age-appropriate restraint on every trip. Parent-reported age-appropriate restraint use did not differ significantly between those who completed in-vehicle verification and those who were ineligible or declined. Parent-reported age-appropriate restraint use had a sensitivity of 95.3% and specificity of 63.6% among those who completed in-vehicle verification (Supplemental Information B).

Significantly higher proportions of white parents reported their 1- to 3-year-old and 4- to 7-year-old children always used the age-appropriate restraint compared with nonwhite parents (85.3% vs 61.3% and 88.5% vs 69.1%, $P < .001$ for both comparisons). Table 3 presents the worst-case scenario restraint for each age group by parent race. Premature transitions were significantly more common among nonwhite parents of children aged <8 years. Parents of 8- to 12-year-old children reported similar restraint use patterns regardless of race. In the full sample, age-appropriate restraint use was associated with higher education level and personal seat belt use (Table 4). Age-appropriate restraint use was higher among parents who read the instruction manual and lower among parents who just figured it out or selected teacher/day care provider as an information source.

Adjusted Analysis of Age-Appropriate Restraint Use

Results of the logistic regression analyses are presented in Table 5. White parents had 3.62 (95% confidence interval 2.31–5.68) higher unadjusted

TABLE 2 Sources of Information for Child Passenger Safety by Parent Race

	Reported Use of Resource, %			P
How did you learn to use your child's safety seat? ^a (Select all that apply.)	Overall (n = 568)	White (n = 370)	Nonwhite (n = 198)	
I read the instruction manual.	53.5	56.8	47.5	.04
I just figured it out.	31.2	29.2	34.8	.17
A family member/friend showed me.	14.4	13.2	16.7	.27
I went to a car seat installation program. ^b	13.4	14.3	11.6	.37
I watched a video.	3.2	3.2	3.0	.89
Other	6.3	6.6	5.6	.64
Where have you gone to find information about car safety for children? (Select all that apply.)	Overall (n = 599)	White (n = 385)	Nonwhite (n = 214)	
Internet/Web	50.9	60.5	33.6	<.001
Friend or family	50.2	52.0	47.2	.27
Doctor or nurse	36.6	39.7	30.8	.03
Magazines or books	29.2	30.4	27.1	.40
Child passenger safety technician	27.5	28.3	26.2	.57
Police officer or firefighter	21.7	24.4	16.8	.03
Day care provider or teacher	13.0	11.2	16.4	.07
Religious leader	0.8	0.8	0.9	.84
At your child's last regular checkup at the doctor's office, did you receive any specific information (written or spoken) about car seats, booster seats, or seat belts?	Overall (n = 585)	White (n = 379)	Nonwhite (n = 206)	
Yes	25.1	24.0	27.2	.40

^a Question was not asked of 14 parents of children who were always unrestrained and 7 parents of children who only used a seat belt. Otherwise differences in sample size indicate that the parent did not respond to a particular question.

^b Parents who selected "Other" and indicated learning how to use their child's car seat from a fire station, police department, or doctor's office were analyzed with parents who reported they went to a car seat installation program.

TABLE 3 Worst-Case Scenario Restraint Use by Parent Race

	White, %	Non-White, %	P
Age 1 to 3 y	n = 163	n = 93	
Age-appropriate			.002
Rear-facing car seat	15.9	7.5	
Forward-facing car seat	71.8	60.2	
Premature transition			
Booster seat	11.0	29.0	
Seat belt	0.6	2.1	
Unrestrained	0.6	1.1	
Age 4 to 7 y	n = 157	n = 94	
Age-appropriate			.013
Forward-facing car seat	14.6	8.5	
Booster seat	77.7	70.2	
Premature transition			
Seat belt	6.4	18.1	
Unrestrained	1.3	3.2	
Age 8–12 y and ≤4 feet, 9 inches tall	n = 66	n = 28	
Age-appropriate			.93
Booster seat	27.3	28.6	
Premature transition			
Seat belt	63.6	64.3	
Unrestrained	7.6	7.1	

odds of reporting age-appropriate restraint use compared with nonwhite parents. White parents maintained significantly higher odds (3.86, 95% confidence

interval 2.27–6.57) of reporting age-appropriate restraint use compared with nonwhite parents after adjusting for education, income, parent age,

parent seat belt use, information sources, and study site.

The interaction between race and site was significant ($P = .016$). The model including this interaction term resulted in postestimation probability of age-appropriate restraint use being highest among white parents at HMC (0.92) followed by white parents at UM (0.87), nonwhite parents at UM (0.73), and nonwhite parents at HMC (0.67; $P = .014$). Interactions between race and sociodemographic variables were not statistically significant. All parents ($n = 23$) who both learned from the instruction manual and an installation station used the age-appropriate restraint. This interaction term was collinear; therefore, the installation station variable was omitted from the final model.

DISCUSSION

Our results demonstrate racial disparities in parent-reported age-appropriate restraint use among 1-to 7-year-old children despite overall improvements in restraint use relative to research spanning 30 years.^{11–13} Importantly, the proportions of nonwhite parents who prematurely transitioned their children to booster seats and seat belts were almost triple those of white parents. Although the magnitude of difference has shifted and methods vary, our findings are consistent with the published literature.^{20–22,32} In 2004, 28% of black 4- to 8-year-olds at a child restraint system inspection program were not appropriately restrained compared with 12% of whites.²⁰ Surveys of insured drivers of children involved in a sample of crashes in 2000–2004 revealed more suboptimal restraint use among African American 1- to 3-year-olds and 4- to 8-year-olds than whites (8% vs 4% and 76% vs 64%, respectively).²²

Parental education, family income, parental seat belt use, and some information sources were also associated with age-appropriate restraint use in

our sample. However, these variables did not significantly alter the relationship between race and age-appropriate restraint. Other studies confirm associations between suboptimal child safety seat use and both lower socioeconomic status²² and nonprofessional information sources.³³ The persistence of race as a significant predictor of age-appropriate restraint use suggests that modifiable factors not measured in our study, such as parental knowledge, motivation, barriers, and sociocultural norms,^{29,34–37} may contribute to disparities. The interaction of race and site indicates the potential for regional differences or local variation in dissemination of child passenger safety information.

The influence of information sources on reported age-appropriate restraint use is noteworthy. Parents who remembered receiving child passenger safety information at their child's last checkup were more likely to report age-appropriate restraint use. Yet only one-quarter of participants recalled receiving such information. The American Academy of Pediatrics recommends coverage of child passenger safety at every visit.³⁸ Parents in this study were either not retaining or consistently receiving this information. Our findings may result from less discussion of car seats after infancy³⁹ or greater emphasis on other health supervision topics.⁴⁰ Although approximately one-third of parents reported going to a clinician for car safety information, this was not associated with age-appropriate restraint use. Although not commonly selected information sources, day care providers/teachers were associated with lower age-appropriate restraint use. This warrants investigation because day care settings have been sites in successful child passenger safety programs.^{41–43} Racial differences in sources of information that were predictive of age-appropriate restraint use (eg, instruction manuals and the Internet/Web) may

TABLE 4 Age-Appropriate Restraint Use by Demographic Characteristics and Child Passenger Safety Information Sources

		Age-Appropriate Restraint Use, %	P
Demographic characteristics	N = 601		
Parent race			<.001
White	386	86.5	
Nonwhite	215	66.5	
Parent age, y			.21
18–29	170	76.5	
30–39	176	80.7	
40+	73	87.7	
Did not answer	182	77.5	
Relationship to child			.85
Mother	464	79.1	
Father	111	81.1	
Other	26	76.9	
Education level			.03
High school or below	254	75.6	
Technical/associate's degree	170	78.2	
Bachelor's degree or higher	177	85.8	
Household income			.05
I don't know	36	77.7	
<\$25 000	203	75.9	
\$25 000–49 000	138	75.4	
≥\$50 000	224	85.3	
Parent always uses seat belt			<.001
Yes	281	85.8	
No	320	73.7	
Site			.13
UM	303	81.8	
HMC	298	76.8	
Child age, y			.34
1–3	256	76.6	
4–7	251	81.3	
8–12	94	81.9	
Child gender			.06
Male	321	82.2	
Female	280	76.1	
Reason for ED visit ^a			.30
Medical	470	78.3	
Injury	126	82.5	
Learned to install seat from ^b	N = 601	%	
Instruction manual			<.001
No	264	75.8	
Yes	304	87.5	
Just figured it out			.001
No	391	85.7	
Yes	177	74.0	
Family member showed me			.18
No	486	82.9	
Yes	82	76.8	
Installation program			.07
No	492	80.9	
Yes	76	89.5	
I watched a video			.63
No	550	82.2	
Yes	18	77.8	
Source of Information	N = 599		
Internet/Web			.08
No	294	76.5	
Yes	305	82.3	
Friend or family			.66
No	298	80.2	
Yes	301	78.7	

TABLE 4 Continued

		Age-Appropriate Restraint Use, %	P
Doctor or nurse			.52
No	380	80.3	
Yes	219	78.1	
Magazines or books			.26
No	424	80.7	
Yes	175	76.6	
Child passenger safety technician			.07
No	434	77.6	
Yes	165	84.2	
Police officer or firefighter			.36
No	469	76.7	
Yes	130	82.3	
Teacher or day care provider			.02
No	521	81.0	
Yes	78	69.2	
Religious leader			.98
No	594	79.5	
Yes	5	80.0	
None selected			.12
No	543	80.3	
Yes	56	71.4	
Received information at doctor's office			.08
No	438	77.6	
Yes	147	84.3	

^a Difference in sample size reflects missing reason for visit information for 5 children; 5 of the injured children had MVC as the reason for ED visit.

^b Question was not asked of 14 parents of children who were always unrestrained and 7 parents of children who only used a seat belt. Unless otherwise noted, differences in sample size are because the parent did not respond to a particular question.

signal differential access to certain resources. The accessibility, quality, and content of information used by parents to guide their child passenger restraint choices requires further exploration.

Our study is unique among surveys because of the inclusion of children aged >8 years who are recommended to use booster seats. The majority of these children used seat belts, nearly 1 in 10 had been unrestrained, and 1 in 3 sat in the front seat. Social stigma associated with reporting children to be unrestrained and general awareness of Michigan Law requiring only seat belt use after a child's eighth birthday may minimize racial differences among the older children in this study. Regardless of race, there is potential for MVC-related injury reduction among 8- to 12-year-old children by sitting in a rear seat, increasing restraint use, and using height to guide the transition

to seat belts.^{3,6,9,10,44,45} Promoting consistent seat belt use among early adolescents may also represent a critical time to instill safety behaviors before these children become drivers. This hypothesis requires study to determine the lasting impacts of interventions to promote child passenger safety.

This study is subject to several limitations. First, our results underestimate the number of children traveling unrestrained compared with observational studies,^{14,15,17} likely because of social desirability bias. Social desirability also may bias parental report of the type of restraint their child uses, but the extent to which this affects racial disparities is not clear. Differences in awareness of recommendations and in socioeconomic/cultural norms for restraint use were not assessed. Second, misclassification bias may have occurred when parents indicated their

child's restraint(s). Even though images of child restraint systems were provided, racial differences in interpretation of these terms and images are possible. Interestingly, misclassification was noted in both directions, with some parent-reported usual restraints being more protective and others being less protective than the observed restraint. Third, informing parents of the potential for in-vehicle verification may have introduced selection bias and influenced parent-reported restraint use or restraint use at discharge. Fourth, by defining "age-appropriate" using Michigan Law (a less strict standard than the 2011 American Academy of Pediatrics Guidelines for Child Passenger Safety),^{38,46} we overestimate this outcome for some 1-year-olds using forward-facing car seats and many children age >8 years using seat belts before achieving proper fit. Finally, responses from parents in these 2 Michigan EDs, with small Hispanic populations, may not be generalizable to other areas or to populations that do not seek ED care.

CONCLUSIONS

Racial disparities in age-appropriate restraint use are complex and were not fully or partially explained by socioeconomic variables or child passenger safety information sources. Other factors including social norms, motivations for, and barriers to age-appropriate restraint use require further study. Among 8- to 12-year-olds, child passenger safety can be improved through rear-row seating and consistent use of booster seats until the seat belt fits properly. Clinicians caring for children have the potential to influence child passenger safety practices, and efforts should be directed at eliminating disparities through culturally appropriate interventions.

TABLE 5 Unadjusted and Adjusted Odds of Age-Appropriate Restraint Use

	Unadjusted OR (n = 552)	95% CI	Adjusted ^a OR (n = 552)	95% CI
Parent race				
Nonwhite	Ref	—	Ref	—
White ^b	3.63 ^b	2.31–5.68 ^b	3.86 ^b	2.27–6.57 ^b
Parent age, y				
18–29	Ref	—	Ref	—
30–39	1.58	0.91–2.74	1.21	0.63–2.32
40+	3.92 ^b	1.47–10.46 ^b	4.45 ^b	1.54–12.8 ^b
Did not answer	1.39	0.81–2.39	1.31	0.71–2.42
Highest education				
High school or below	Ref	—	Ref	—
Technical/associate's degree	1.44	0.85–2.43	1.45	0.79–2.65
Bachelor's degree or higher	1.91 ^b	1.11–3.30 ^b	1.29	0.64–2.59
Household income				
I don't know	0.78	0.33–1.87	0.91	0.35–2.36
<\$25 000	Ref	—	Ref	—
\$25 000–49 000	0.92	0.52–1.61	0.63	0.33–1.22
≥\$50 000	1.65	0.96–2.83	0.70	0.33–1.45
Parent always uses belt				
Not always	Ref	—	Ref	—
Always	2.33 ^b	1.46–3.71 ^b	1.92 ^b	1.14–3.24 ^b
Site				
HMC	Ref	—	Ref	—
UM	0.76	0.49–1.18	0.64	0.38–1.10
Learned to install seat from instruction manual				
No	Ref	—	Ref	—
Yes	2.22 ^b	1.42–3.47 ^b	2.50 ^b	1.50–4.15 ^b
Source of information				
Day care/teacher				
No	Ref	—	Ref	—
Yes	0.52 ^b	0.30–0.92 ^b	0.48 ^b	0.25–0.93 ^b
Internet/Web				
No	Ref	—	Ref	—
Yes	1.61 ^b	1.03–2.50 ^b	1.00	0.59–1.70
Received information at doctor's office				
No	Ref	—	Ref	—
Yes	1.78 ^b	1.01–3.12 ^b	1.93 ^b	1.05–3.55 ^b

CI, confidence interval; OR, odds ratio; ref, referent group.

^a The adjusted ORs presented here are the result of a logistic regression model predicting age-appropriate restraint use adjusting for the other variables included in the table. Site was included in this model to account for the potential for geographic differences by location. Results from the model that included the interaction term between race and site are presented in the text. The caregiver's relationship to the child, child gender, child passenger safety technician as an information source, and the study site were not significant at the $P < .10$ level when bivariate analyses were restricted to parents without any missing responses to variables in the model. Therefore, these variables were not included in the adjusted analyses.

^b $P < .05$.

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