
Seat Belt Law Enforcement and Racial Disparities in Seat Belt Use

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Background: Numerous reports have documented a lower prevalence of seat belt use among blacks in the United States, compared with whites. Limited data suggest that black–white disparities in states with primary seat belt laws (motorists can be stopped and cited solely for violating a seat belt law) are less marked than in states with secondary laws (motorists can be cited for violating a seat belt law only if stopped for another offense).

Methods: Data from the Fatality Analysis Reporting System were analyzed in 2005 to compare seat belt use among 11,574 blacks and 73,639 whites aged 16 or more years killed in crashes from 1999 to 2003 in 33 states with a primary or secondary adult seat belt law and annual reporting of race for 80% or more of decedents. After stratification of states by type of seat belt law, logistic regression was used to calculate odds ratios and 95% confidence intervals (CIs) for seat belt use among blacks, relative to whites, with adjustment for age, gender, seat position, urban/rural region, and income.

Results: Odds ratios and 95% CIs for seat belt use among blacks were 1.05 (0.97–1.13) and 0.89 (0.83–0.95), in primary- and secondary-law states, respectively.

Conclusions: Black–white disparities in seat belt use were mitigated in states with primary seat belt laws. Only 24 states have primary laws. Enacting primary laws in other states might reduce or eliminate racial disparities in seat belt use.
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Introduction

Motor vehicle crashes are the leading cause of mortality among individuals aged 1 to 34 years in the United States,¹ resulting in over 40,000 fatalities annually.² A disproportionate number of these deaths involve black motorists.^{3–5} The disparity may be attributable, in part, to low rates of seat belt use among blacks compared with whites.³ Because seat belt use reduces the risk of motor vehicle crash fatalities by 50% or more,⁶ preventive interventions to promote seat belt use among black motorists least likely to buckle up could directly reduce the racial disparity in crash fatalities. However, previous reports of black–white disparities in seat belt use have been limited in depth,

and black subpopulations for whom interventions would be of most benefit remain poorly defined.

Of at least 13 studies documenting a lower prevalence of seat belt use among blacks compared with whites,^{3,7–18} only four^{9,12,17,18} used multivariable analyses to address important potential confounders such as age, gender, social class, and state seat belt laws.^{12,15,18} The multivariate analyses were either conducted in the 1980s,^{17,18} when few states had seat belt laws, or were limited to one state,^{9,12} precluding the assessment of racial variation in seat belt use by state seat belt law. Of nine other studies,^{3,7,8,10,11,13–16} four were limited to summary prevalence data^{8,13,14,16} and five presented data stratified by one or more potential confounders including age,¹⁰ gender,^{3,7,15} education,^{3,7} seat position,¹⁰ and state seat belt law.^{7,11} Results from the stratified analyses and one multivariate analysis considering interactions⁹ suggest that age, seat position, and state seat belt law are effect modifiers of the association between race and seat belt use.

From the standpoint of preventive interventions to reduce racial disparities in motor vehicle crash morbidity and mortality, effect modification by state seat belt law is noteworthy because seat belt laws are modifiable determinants of seat belt use. Adult seat belt laws have been passed in every state except New Hampshire.¹⁹

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Twenty-four states have primary laws, whereby motorists can be stopped and cited by law enforcement officers solely for violation of a seat belt law. Twenty-five states have secondary laws, under which motorists can be cited only if stopped for another offense. While both types of seat belt law enforcement increase seat belt use,²⁰ primary laws are the more effective.^{21,22} Transition from a secondary law to a primary law increases seat belt use by up to 15% and reduces annual passenger vehicle driver death rates by 7%.²³ In Canada, Australia, and many northern European countries, where primary laws are the norm, seat belt use ranges from 90% to 95%, compared with barely 80% in the United States.²⁴

Unfortunately, primary legislation has met resistance in many states because of libertarian concerns about personal freedom and concerns among state legislators and their constituents about racial profiling, whereby law enforcement officers could selectively stop and cite minority motorists for seat belt law violations. Although there is a paucity of peer-reviewed literature addressing the occurrence of racial profiling, several reports indicate that blacks are more responsive to primary seat belt laws than whites because of a greater perceived risk of being ticketed.^{3,7,11,20,25} To investigate whether black-white disparities in seat belt use differ by state seat belt law, data were analyzed for 85,213 U.S. motorist deaths from traffic crashes between 1999 and 2003.

Methods

Study data were extracted from the Fatality Analysis Reporting System (FARS) in 2005. FARS is a National Highway Traffic Safety Administration (NHTSA) database containing information on all fatal motor vehicle crashes on U.S. public roadways.²⁶ Although FARS became operational in 1975, data on race and Hispanic ethnicity were not collected until 1999.²⁷ Racial and ethnic data are derived from death certificates.²⁷

The preliminary study population comprised 11,574 black and 73,639 white occupants aged ≥ 16 years, of passenger cars or light trucks, who were fatally injured in crashes between January 1, 1999 and December 31, 2003 in 33 U.S. states: AZ, AR, CA, CT, DE, FL, GA, IL, KS, KY, LA, ME, MA, MI, MN, MS, MO, MT, NE, NV, NC, ND, OH, OK, OR, SC, SD, TN, VT, WA, WI, WV, WY. Race was reported for $\geq 90\%$ of the fatalities annually in all states except CT, GA, MN, and NV, which had annual reporting of $\geq 80\%$. In this paper, "white" refers to non-Hispanic whites and "black" refers to non-Hispanic blacks. If race was coded as "black," but Hispanic ethnicity was unknown, decedents were classified as non-Hispanic black. Fatalities were identified from Final FARS "person-level" SAS files for 1999 through 2003.²⁸ This study was completed following release of the 2003 Final FARS SAS file in September 2005. Seat belt use was reported for 90.3% of fatalities ($n = 78,223$).

Analyses were stratified by state seat belt law. Seven states had primary laws (CA, CT, GA, LA, NC, OK, OR), and 22 states had secondary laws (AZ, AR, FL, KS, KY, ME, MA, MN,

MS, MO, MT, NE, NV, ND, OH, SC, SD, TN, VT, WV, WI, WY) throughout the study period. Four states upgraded from secondary to primary laws during the study period: MI (effective April 1, 2000), WA (effective July 1, 2002), DE (effective June 30, 2003), and IL (effective July 3, 2003). For analysis, these states were classified as secondary-law states from January 1, 1999 until primary laws became effective, and thereafter were classified as primary-law states. Because few states have adult seat belt laws covering all seats, the analyses were limited to fatalities involving drivers ($n = 58,527$) and front-seat passengers ($n = 15,017$). Associations between race and seat belt use were examined by age group (16 to 19, 20 to 29, 30 to 39, 40 to 49, 50 to 64, ≥ 65), gender, seat position (driver, front seat passenger), urban/rural region, and socioeconomic status (SES, quartiles of median household income for driver ZIP code of residence).

The FARS variable "roadway function class"²⁹ was used to classify fatalities as urban or rural. Although FARS contains no data on the SES of decedents, ZIP codes of residence are coded for drivers of vehicles involved in fatal crashes. To adjust for SES as a confounder, driver ZIP codes were linked with Census 2000 data on median household income for corresponding ZIP code tabulation areas.³⁰ After excluding 777 fatalities with missing information on covariates, the linkage rate was 98% ($n = 71,145$). The final study population comprised 8798 blacks and 62,347 whites.

In bivariate analyses, race-specific proportions of seat belt users were compared within strata of study covariates. Ninety-five percent confidence intervals (CIs) for the difference between proportions were calculated using StatsDirect, version 2.4.4 (StatsDirect Ltd., Cheshire, United Kingdom, 2005). Multivariate logistic regression analyses were conducted using SAS, version 8.0 (SAS Institute Inc., Cary NC, 1999) to calculate overall adjusted odds ratios and 95% CIs for seat belt use among blacks relative to whites in separate models for primary- and secondary-law states. Age group, gender, seat position, urban/rural region, and income quartile were included as covariates to adjust for confounding. Pairwise interaction effects for race and each covariate were assessed by adding product terms to base models; statistical significance was assessed using the likelihood-ratio chi-square test. Because multiple significant second-order interactions were found for both primary- and secondary-law states, adjusted odds ratios for seat belt use were also calculated in separate models within strata of the covariates.

To account for residual confounding from racial differences in life expectancy, age was added as a continuous covariate in models for the 50-to-64 and ≥ 65 age strata.

Results

Altogether, 40% (3519/8798) of deaths among blacks were in primary-law states compared to 31.6% (19740/62347) among whites. Race-specific distributions of fatalities across covariates were comparable between states with primary and secondary seat belt laws, except that urban deaths were more common in primary-law states (Table 1). Compared with the prevalence of seat belt use in secondary-law states, seat belt use in primary-law states was 15.2% higher among whites and 17.9%

Table 1. Race-specific demographic characteristics of study population,^a stratified by type of state seat belt law, FARS, 1999–2003

Characteristic	White (n = 62,347)		Black (n = 8798)	
	Deaths (n)	%	Deaths (n)	%
PRIMARY SEAT BELT LAW^b	19,740		3519	
Age (years)				
16–19	2571	13.0	348	9.9
20–29	4018	20.4	947	26.9
30–39	2882	14.6	686	19.5
40–49	2877	14.6	600	17.0
50–64	3061	15.5	524	14.9
≥65	4331	21.9	414	11.8
Gender				
Male	12,567	63.7	2305	65.5
Female	7173	36.3	1214	34.5
Seat				
Driver	15,793	80.0	2748	78.1
Front passenger	3947	20.0	771	21.9
Region				
Urban	13,194	33.2	1686	47.9
Rural	6546	66.8	1833	52.1
Income				
Top quartile ^c	5361	27.2	458	13.0
2nd quartile	5114	25.9	698	19.8
3rd quartile	4994	25.3	829	23.6
4th quartile	4271	21.6	1534	43.6
SECONDARY SEAT BELT LAW^b	42,607		5279	
Age (years)				
16–19	5641	13.2	560	10.6
20–29	8897	20.9	1440	27.3
30–39	6485	15.2	982	18.6
40–49	6335	14.9	940	17.8
50–64	6230	14.6	758	14.4
≥65	9019	21.2	599	11.3
Gender				
Male	27,543	64.6	3589	68.0
Female	15,064	35.4	1690	32.0
Seat				
Driver	34,007	79.8	4079	77.3
Front passenger	8600	20.2	1200	22.7
Region				
Urban	11,915	28.0	2004	38.0
Rural	30,692	72.0	3275	62.0
Income				
Top quartile ^c	11,293	26.5	684	12.9
2nd quartile	11,027	25.9	943	17.9
3rd quartile	10,607	24.9	1362	25.8
4th quartile	9680	22.7	2290	43.4

^aAll fatalities among non-Hispanic white and non-Hispanic black driver and front-seat passenger occupants of cars and light trucks in transit aged ≥16 years from 1999 to 2003 in 33 states reporting race for ≥80% of decedents.

^bPrimary law: CA, CT, DE (6/30/03–12/31/03), GA, IL (7/3/03–12/31/03), LA, MI (4/1/00–12/31/03), NC, OK, OR, WA (7/1/02–12/31/03). Secondary law: AR, AZ, DE (1/1/99–6/29/03), FL, IL (1/1/99–7/2/03), KS, KY, MA, ME, MI (1/1/99–3/31/00), MN, MO, MS, MT, ND, NE, NV, OH, SC, SD, TN, VT, WA (1/1/99–6/30/02), WI, WV, WY.

^cMedian household income in driver ZIP code of residence for both races combined.

FARS, Fatality Analysis Reporting System.

higher among blacks (Table 2). In both primary- and secondary-law states, the overall proportion of seat belt users was significantly lower among blacks (Table 2). In primary-law states, significant disparities were evident among black motorists who were aged 16 to 19 or ≥65 years, men, drivers, front seat passengers, or had crashed in either urban or rural areas. In secondary-law

states, the proportion of seat belt users was significantly lower among black motorists who were aged 16 to 19, 50 to 64, and ≥65 years, men, women, drivers, front seat passengers, or had crashed in either urban or rural areas.

In states with primary seat belt laws, the overall adjusted odds ratio for seat belt use among blacks was 1.05 (95%

Table 2. Race-specific^a bivariate analysis of seat belt use proportions, by type of state seat belt law, FARS, 1999–2003

	White seat belt use %	Black seat belt use %	Proportion difference (% white–% black) and 95% CI
PRIMARY SEAT BELT LAW^b	51.5	46.4	5.1 (3.4–7.0)
Age (years)			
16–19	51.2	41.7	9.5 (4.0–15.0)
20–29	40.4	39.4	1.0 (–2.5–4.4)
30–39	39.7	39.2	0.5 (–3.7–4.5)
40–49	46.2	49.3	–3.1 (–7.5–1.2)
50–64	55.9	53.4	2.5 (–2.1–7.1)
≥65	70.4	64.7	5.7 (1.0–10.6)
Gender			
Male	45.0	39.0	6.0 (3.8–8.1)
Female	62.9	60.2	2.7 (–0.2–5.7)
Seat			
Driver	50.7	46.6	4.1 (2.1–6.1)
Front passenger	54.8	45.5	9.3 (5.4–13.1)
Region			
Urban	57.0	50.5	6.5 (3.9–9.2)
Rural	48.8	42.6	6.2 (3.8–8.6)
Income			
Top quartile ^c	59.4	58.1	1.3 (–3.3–6.1)
2nd quartile	54.2	50.7	3.5 (–0.4–7.4)
3rd quartile	50.0	46.8	3.2 (–0.5–6.8)
4th quartile	40.2	40.6	–0.4 (–3.3–2.4)
SECONDARY SEAT BELT LAW^b	36.3	28.5	7.8 (6.5–9.1)
Age (years)			
16–19	30.3	24.1	6.2 (2.3–9.8)
20–29	24.4	22.2	2.2 (–0.1–4.5)
30–39	26.1	25.6	0.5 (–2.5–3.4)
40–49	31.2	29.7	1.5 (–1.7–4.5)
50–64	42.8	35.1	7.7 (4.1–11.3)
≥65	58.2	42.2	16.0 (11.9–20.0)
Gender			
Male	29.6	23.0	6.6 (5.1–8.1)
Female	48.5	40.1	8.4 (5.9–10.8)
Seat			
Driver	35.4	28.3	7.1 (5.6–8.5)
Front passenger	40.0	29.1	10.9 (8.1–13.6)
Region			
Urban	41.4	27.7	13.7 (11.5–15.8)
Rural	34.3	29.0	5.3 (3.7–7.0)
Income			
Top quartile ^c	42.7	34.5	8.2 (4.4–11.8)
2nd quartile	38.4	32.4	6.0 (2.7–9.0)
3rd quartile	33.6	28.5	5.1 (2.5–7.6)
4th quartile	29.5	25.0	4.5 (2.4–6.4)

^aAll fatalities among non-Hispanic white and non-Hispanic black driver and front-seat passenger occupants of cars and light trucks in transit aged ≥16 years from 1999 to 2003 in 33 states reporting race for ≥80% of decedents.

^bPrimary law: CA, CT, DE (6/30/03–12/31/03), GA, IL (7/3/03–12/31/03), LA, MI (4/1/00–12/31/03), NC, OK, OR, WA (7/1/02–12/31/03). Secondary law: AR, AZ, DE (1/1/99–6/29/03), FL, IL (1/1/99–7/2/03), KS, KY, MA, ME, MI (1/1/99–3/31/00), MN, MO, MS, MT, ND, NE, NV, OH, SC, SD, TN, VT, WA (1/1/99–6/30/02), WI, WV, WY.

^cMedian household income in driver ZIP code of residence for both races combined.

CI=0.97–1.13) (Table 3). Interaction effects were evident for age ($p=0.02$) and gender ($p=0.002$). Stratification by age indicated that odds ratios for seat belt use were <1 among blacks in the 16-to-19 and ≥65 age groups, but exceeded unity among blacks aged 20 to 64 years. In the 40-to-49 age group, blacks were significantly more likely than whites to buckle up. A sensitivity analysis excluding two primary-law states reporting race for <90% of fatalities annually (CT, GA) yielded an overall adjusted black–

white odds ratio for seat belt use of 0.99 (95% CI=0.90–1.08); most stratified odds ratios were minimally affected (<10% change), although associations reached significance for blacks aged 16 to 19 years and for black passengers.

In states with secondary seat belt laws, the overall adjusted odds ratio for seat belt use among blacks was 0.89 (95% CI=0.83–0.95), indicating that blacks were significantly less likely than whites to have buckled up (Table 3).

Table 3. Adjusted odds ratios^a for seat belt use among blacks,^b FARS, 1999–2003

	States with primary seat belt laws ^c		States with secondary seat belt laws ^c	
	Adjusted odds ratio	95% CI	Adjusted odds ratio	95% CI
Overall^d	1.05	0.97–1.13	0.89	0.83–0.95
Age (years)				
16–19	0.79	0.62–1.01	0.86	0.70–1.06
20–29	1.08	0.93–1.26	0.97	0.84–1.11
30–39	1.11	0.93–1.33	1.11	0.95–1.30
40–49	1.29	1.07–1.55	1.05	0.90–1.22
50–64	1.04	0.86–1.27	0.83	0.71–0.98
≥65	0.92	0.74–1.15	0.60	0.51–0.72
Gender				
Male	0.99	0.90–1.09	0.87	0.80–0.95
Female	1.15	1.01–1.32	0.92	0.82–1.02
Seat				
Driver	1.08	0.99–1.18	0.90	0.84–0.98
Front passenger	0.93	0.78–1.10	0.86	0.74–0.99
Region				
Urban	1.03	0.92–1.16	0.75	0.67–0.84
Rural	1.03	0.93–1.14	0.97	0.90–1.06
Income				
Top quartile ^e	1.11	0.90–1.36	0.79	0.67–0.94
2nd quartile	1.00	0.84–1.18	0.92	0.79–1.06
3rd quartile	0.95	0.81–1.11	0.90	0.79–1.02
4th quartile	1.08	0.95–1.23	0.90	0.81–1.00

^aOverall odds ratios are adjusted for age group, gender, seat position, urban/rural region, and median household income. Stratum-specific odds ratios are adjusted for nonstrata covariates. The reference group is non-Hispanic whites (i.e., for each stratum, the odds ratio for seat belt use among non-Hispanic whites is defined as 1.00).

^bAll fatalities among non-Hispanic white and non-Hispanic black driver and front-seat passenger occupants of cars and light trucks in transit aged ≥16 years from 1999 to 2003 in 33 states reporting race for ≥80% of decedents.

^cPrimary law: CA, CT, DE (6/30/03–12/31/03), GA, IL (7/3/03–12/31/03), LA, MI (4/1/00–12/31/03), NC, OK, OR, WA (7/1/02–12/31/03). Secondary law: AR, AZ, DE (1/1/99–6/29/03), FL, IL (1/1/99–7/2/03), KS, KY, MA, ME, MI (1/1/99–3/31/00), MN, MO, MS, MT, ND, NE, NV, OH, SC, SD, TN, VT, WA (1/1/99–6/30/02), WI, WV, WY.

^dIn primary law states, significant interactions were evident for age ($p=0.02$) and gender ($p=0.002$). In secondary law states, significant interactions were evident for age ($p=0.002$) and region ($p=0.004$).

^eMedian household income in driver ZIP code of residence for both races combined.

CI, confidence interval; FARS, Fatality Analysis Reporting System.

Interaction effects were evident for age ($p=0.002$) and urban/rural region ($p=0.004$). Stratification by age indicated that odds ratios were less than unity in all but the 30-to-39 and 40-to-49 age groups. In the 50-to-64 and ≥65 age groups, blacks were significantly less likely than whites to have worn seat belts. Black motorists of both genders were less likely than their white counterparts to have buckled up, although the association was not statistically significant for women. Among both drivers and front seat passengers, blacks were significantly less likely than whites to have used seat belts. Seat belt use among blacks was also significantly less frequent than among whites in urban areas. A sensitivity analysis excluding secondary-law states reporting race for <90% of fatalities annually (MN, NV) did not meaningfully affect odds ratios (≤3% change).

Discussion

The finding that overall black–white disparities in seat belt use were mitigated in states with primary seat belt laws is consistent with two previous studies^{7,11} that used different designs. In a direct observation study, Wells et

al.⁷ observed seat belt use at urban minimarts in two primary-law states (Houston TX, New York NY) and two secondary-law states (Boston MA, Chicago IL). Motorists were queried about race and education on entry to minimarts. In primary-law states, racial differences in seat belt use were not evident. In secondary-law states, blacks were less likely than whites to buckle up, regardless of education. Davis et al.¹¹ reviewed records of crash victims hospitalized at regional trauma centers, respectively located in a primary-law state (CA) and a secondary-law state (FL). Seat belt use did not differ significantly by race in the primary-law state, but seat belt use among blacks was significantly less prevalent than among whites in the secondary-law state. Authors of both studies^{7,11} attributed findings to a perception among blacks of an increased likelihood of being ticketed for seat belt law violations in primary-law states because of the potential for differential enforcement.

In 11 other studies,^{3,8–10,12–18} some or all black subpopulations were less likely to buckle up than their white counterparts. Inconsistent results from four studies^{31–34} in which black–white disparities were not ob-

served could reflect limitation of the analyses to summary prevalence data by race. Alternatively, the inconsistent findings could be attributable to effect modification by state seat belt law. Three of the negative studies^{32–34} were limited to a primary-law state. Therefore, if blacks were as likely, or more likely, than whites to have worn seat belts due to concerns about differential enforcement of a primary law, disparities that might otherwise have existed under a secondary law would not have been expected. The fourth study³¹ summarized results from the 2002 and 2004 National Occupant Protection Use Surveys (NOPUS), direct observation studies periodically conducted by NHTSA.

The failure of the NOPUS surveys to detect a black–white disparity in seat belt use may be an artifact of study design. First, although NOPUS uses a multistage probability sampling strategy to collect nationally representative data, this strategy does not take into account the geographic distribution of the black population. Therefore, NOPUS is not representative of the U.S. black population. Consequently, confounding could lead to serious bias in observed race-specific prevalences of seat belt use, if not accounted for in statistical analyses. Unfortunately, reported NOPUS data are limited to overall summary prevalences of seat belt use by race. Second, since 2002, NOPUS surveys have been conducted immediately following highly publicized, nationwide seat belt law enforcement blitzes.³⁵ Because blacks are more responsive to these ticketing campaigns than whites due to concerns about differential enforcement,²⁰ a measurable, but fleeting, reduction in seat belt use disparities may have occurred.

Regardless of state seat belt law, black–white seat belt use disparities were most marked at the extremes of driving age. Because motorists buckle up less often on short trips than when traveling long distances,³⁶ one explanation for the greater magnitude of black–white disparities at extremes of driving age may be that blacks travel less or take more short trips than whites. Likewise, the finding that seat belt use among blacks was significantly lower than among whites only in urban areas of secondary-law states could reflect a greater concentration of blacks in the inner city, where speed limits tend to be lower and points of destination are often closer than comparable points in more outlying areas. It is noteworthy that racial disparities in seat belt use have been reported to partially explain increased motor vehicle crash mortality rates among blacks observed after adjustment for vehicle miles traveled.³

In secondary-law states, preventive interventions to eliminate black–white disparities in seat belt use might be most effective if targeted toward black motorists who are aged 16 to 19 or 50 and older, or who drive in urban areas. Preventive interventions in primary-law states might do well to focus on reaching black motorists aged 16 to 19 years.

This study has several strengths. First, to our knowledge, it is the largest study of black–white disparities in seat belt use conducted in the United States to date. The large study population provided sufficient statistical power for multivariate analyses stratified by type of state seat belt law. Second, because decedent race was not collected until 1999, FARS has only recently become a viable resource for epidemiologic studies of racial disparities in seat belt use.²⁷ Third, in contrast to studies using seat belt use data obtained by motorist self-report, which is subject to over-reporting of up to 20% or more, FARS data on seat belt use are police reported and have validity comparable to assessments of trained crash investigators.³⁷ Fourth, unlike direct observation studies, which preclude accurate assessment of race and ethnicity, racial and ethnic data in FARS are derived from death certificates, for which coding of race is more than 98% accurate for both blacks and whites.³⁸

Several methodologic limitations also need to be considered. First, the study population comprised victims of fatal motor vehicle crashes. Therefore, residual confounding may have resulted from crash fatality determinants other than seat belt use (e.g., speeding, drinking and driving, vehicle crashworthiness) that set the study population apart from the general motorist population. However, this is likely to have been minimal given the consistency of the findings with results of direct observation studies.^{7,9} Second, median household income for driver ZIP code of residence was used as a measure of SES. Because household income data were based on aggregates of all residents within a ZIP code, they may not have reflected household incomes of individual drivers. Additionally, household incomes of front seat passenger fatalities may not have been comparable to those of drivers. Therefore, residual confounding from SES may have existed. However, given previous studies showing that SES is only a partial confounder of associations between race and seat belt use, this is an unlikely explanation for these findings. Third, selection bias may have been introduced because seat belt use was not reported for about 10% of fatalities. Fourth, selection bias may have resulted from systematic differences between fatalities for which race was and was not reported. To reduce this possibility, the study population was limited to a 33-state aggregate with reliable reporting on race. Fifth, this analysis covered the 5-year period from 1999 to 2003, and may not reflect more recent trends.

Conclusion

In summary, these data show that seat belt use among both blacks and whites was more than 15% higher in primary-law states than in secondary-law states. This corroborates previous reports indicating that primary legislation is an effective intervention to increase seat

belt use and to decrease motor vehicle crash morbidity and mortality.⁶ The study findings further revealed that black–white seat-belt use disparities in states with secondary seat belt laws were mitigated in states with primary seat belt laws. This suggests that black–white disparities in seat belt use could be reduced or eliminated if states with secondary seat belt laws upgraded to primary enforcement. The issue of differential enforcement has received little attention in the peer-reviewed literature, and should be addressed using methodologically robust epidemiologic studies. In the interim, however, the passage of primary seat belt laws, in conjunction with provisions or companion legislation to monitor and prevent racial profiling, appears to be justified given the possibility that we can achieve racial parity in motor vehicle crash mortality rates.

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References

- Centers for Disease Control and Prevention. Web-based Injury Statistics Query and Reporting System (WISQARS). National Center for Injury Prevention and Control, 2002. Available at: www.cdc.gov/ncipc/wisqars. Accessed October 1, 2005.
- Vyrostek SB, Annett JL, Ryan GW. Surveillance for fatal and nonfatal injuries—United States, 2001. *MMWR Surveill Summ* 2004;53:1–57.
- Braver E. Race, Hispanic origin, and socioeconomic status in relation to motor vehicle occupant death rates and risk factors among adults. *Accid Anal Prev* 2003;35:295–309.
- Daniels F, Moore W, Conti C, et al. The role of the African-American physician in reducing traffic-related injury and death among African Americans: consensus report of the National Medical Association. *J Natl Med Assoc* 2002;94:108–18.
- Baker SP, Braver ER, Chen LH, Pantula JF, Massie D. Motor vehicle occupant deaths among Hispanic and black children and teenagers. *Arch Pediatr Adolesc Med* 1998;152:1209–12.
- National Highway Traffic Safety Administration. Fourth report to Congress: effectiveness of occupant protection systems and their use. Washington DC: U.S. Department of Transportation, National Highway Traffic Safety Administration, 1999 (DOT HS 808 919).
- Wells JK, Williams AF, Farmer CM. Seat belt use among African Americans, Hispanics, and whites. *Accid Anal Prev* 2002;34:523–9.
- Beck LF, Gilbert BC, Shults RA. Prevalence of seat belt use among reproductive-aged women and prenatal counseling to wear seatbelts. *Am J Obstet Gynecol* 2005;192:580–5.
- Vivoda JM, Eby DW, Kostyniuk LP. Differences in safety belt use by race. *Accid Anal Prev* 2004;36:1105–9.
- Mayrose J, Jehle DVK. An analysis of race and demographic factors among motor vehicle fatalities. *J Trauma* 2002;52:752–5.
- Davis JW, Bennink L, Kaups KL, Parks SN. Motor vehicle restraints: primary versus secondary enforcement and ethnicity. *J Trauma* 2002;52:225–8.
- Lerner EB, Jehle DVK, Billittier AJ 4th, Moscati RM, Connery CM, Stiller G. The influence of demographic factors on seatbelt use by adults injured in motor vehicle crashes. *Accid Anal Prev* 2001;33:659–62.
- Everett SA, Shults RA, Barrios LC, Sacks JJ, Lowry R, Oeltmann J. Trends and subgroup differences in transportation-related injury risk and safety behaviors among high school students, 1991–1997. *J Adolesc Health* 2001;28:228–34.
- Bolen JC, Rhodes L, Powell-Griner EE, Bland SD, Holtzman D. State-specific prevalence of selected health behaviors by race and ethnicity —Behavioral Risk Factor Surveillance System, 1997. *MMWR Morb Mortal Wkly Rep* 2000;49:1–60.
- Nelson DE, Bolen J, Kresnow M. Trends in safety belt use by demographics and by type of state safety belt law, 1987 through 1993. *Am J Public Health* 1998;88:245–9.
- Hahn RA, Teutsch SM, Franks AL, Chang MH, Lloyd EE. The prevalence of risk factors among women in the United States by race and age, 1992–1994: opportunities for primary and secondary prevention. *JAMA* 1998;280:104–104.
- Lichtenstein MJ, Bolton A, Wade G. Body mass as a determinant of seat belt use. *Am J Med Sci* 1989;297:233–7.
- Goldbaum GM, Remington PL, Powell KE, Hogelin GC, Gentry EM. The Behavioral Risk Factor Surveys Group. Failure to use seat belts in the United States. *JAMA* 1986;255:2459–62.
- Insurance Institute for Highway Safety. Safety belt use laws, 2005. Available at: www.hwysafety.org/laws/state_laws/restrain3.html. Accessed November 4, 2005.
- Shults RA, Nichols JL, Dinh-Zarr TB, Sleet DA, Elder RW. Effectiveness of primary enforcement safety belt laws and enhanced enforcement of safety belt laws: a summary of the Guide to Community Preventive Services systematic reviews. *J Saf Res* 2004;35:189–96.
- Dinh-Zarr TB, Sleet DA, Shults RA, et al. Reviews of evidence regarding interventions to increase use of safety belts. *Am J Prev Med* 2001;21(suppl 4):48–65.
- Rivara FP, Thompson DC, Cummings P. Effectiveness of primary and secondary enforced seat belt laws. *Am J Prev Med* 1999;16:30–9.
- Farmer CM, Williams AF. Effect on fatality risk of changing from secondary to primary seat belt enforcement. *J Saf Res* 2005;36:189–94.
- Transportation Research Board. Buckling up: technologies to increase seatbelt use. Committee for the Safety Belt Technology Study, Transportation Research Board of the National Academies, 2003. Special Report 278. Available at: <http://newton.nap.edu/html/SR278/SR278.pdf>. Accessed February 7, 2006.
- Eby DW, Vivoda JM, Fordyce TA. The effects of standard enforcement on Michigan safety belt use. *Accid Anal Prev* 2002;34:815–23.
- National Highway Traffic Safety Administration. Fatality Analysis Reporting System: fatal crash data overview. Washington DC: U.S. Department of Transportation, 2004 (DOT HS 809 726).
- Briggs NC, Levine RS, Haliburton WP, Schlundt DG, Goldzweig I, Warren RC. The Fatality Analysis Reporting System as a tool for investigating racial and ethnic determinants of motor vehicle crash fatalities. *Accid Anal Prev* 2005;37:641–9.
- National Highway Traffic Safety Administration. Fatality Analysis Reporting System public access data sets. Washington DC: Department of Transportation, 2005. Available at: www.nhtsa.dot.gov/people/nca/fars.html. Accessed September 18, 2005.
- National Highway Traffic Safety Administration. FARS 2004 coding and validation manual. Washington DC: U.S. Department of Transportation, 2003.
- U.S. Census Bureau. Census 2000 summary file 3, table P53. Median household income in 1999. U.S. Census Bureau, 2003. Available at: www.factfinder.census.gov. Accessed October 7, 2005.
- Glassbrenner D, Carra JS, Nichols J. Recent estimates of safety belt use. *J Saf Res* 2004;35:237–44.
- Reinfurt DW. Documenting the sustainability of a mature Click It or Ticket program: the North Carolina experience. *J Saf Res* 2004;35:181–8.
- Reinfurt D, Williams A, Wells J, Rodgman E. Characteristics of drivers not using seat belts in a high belt use state. *J Saf Res* 1996;27:209–15.
- Williams AF, Reinfurt DW, Wells JK. Increasing seat belt use in North Carolina. *J Saf Res* 1996;27:33–41.
- Glassbrenner D. Safety belt and helmet use in 2002—overall results. National Highway Traffic Safety Administration, September 2002 (DOT HS 809 500). Available at: www-nrd.nhtsa.dot.gov/pdf/nrd-30/NCSA/Rpts/2002/809-500.pdf. Accessed February 1, 2006.
- Mawson AR, Biundo JJ. Contrasting beliefs and actions of drivers regarding seat-belts: a study in New Orleans. *J Trauma* 1985;25:433–7.
- Cummings P. Association of seat belt use with death: a comparison of estimates based on data from police and estimates based on data from trained crash investigators. *Inj Prev* 2002;8:338–41.
- Rosenberg HM, Maurer JD, Sorlie PD, et al. Quality of death rates by race and Hispanic origin: a summary of current research, 1999. *Vital Health Stat* 2 1999;(128).