Primary injury prevention policies and mortality from motor-vehicle crashes among children and adolescents in the US: From safety behaviors to healthy environments.

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Introduction

Unintentional injuries from motor-vehicle crashes are the leading cause of death among children ages one to 19. On average, 4,500 children die every year from motor-vehicle crashes in the U.S.

- The majority of the deaths associated with motor-vehicle crashes involve improper use of restraints, travelling at high speeds and alcohol use, and are also influenced by built environments.

- For every child traffic injury fatality there are
  - ✓18 hospitalizations
  - ✓233 emergency department visits.

Total lifetime injury costs are estimated at more than $40,000 per child and more than $240 billion in productivity losses.

Materials and methods

- Retrospective study using panel data from 1997 to 2005 from all 50 states and the District of Columbia. Data sources included the Fatality Analysis Reporting System (FARS), the Insurance Institute for Highway Safety (IIHS), the US Census Bureau, the Atlas of Presidential Elections and the US Bureau of Labor Statistics.

- I used fixed effects negative binomial regression to analyze the effect of the covariates on mortality by state and year. I also performed sensitivity analysis using conditional fixed effects negative binomial regression. All models include Incidence Rate Ratios (IRR).

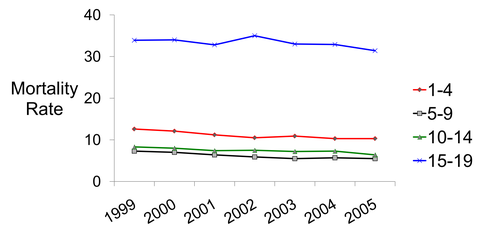
The parameterized model follows the form:

$$F_{iy} = (\text{Population})_{iy} + \beta_o + \beta_1(\text{Road})_{iy} + \beta_2(\text{Vehicle})_{iy} + \beta_3(\text{Person})_{iy} + \beta_4(\text{Restraint})_{iy} + \beta_5(\text{Financial})_{iy} + \beta_6(\text{Enforcement})_{iy} + \beta_7(\text{Political})_{iy} + \beta_8(\text{Unemployment})_{iy} + \text{State}_i + \text{Year}_y + \varepsilon_{iy}$$

where $_i$ = *State and* $_y$ = *Year*

Results

Figure 1. MVCs fatality rate among children ages 0-18, by year



WISQARS, 2008*Using ICD-10 coding for unintentional injury deaths (V01-X59, Y85, Y86)

Table 1. Percentage and mean values for selected covariates

	1997		2005	
Covariate	%	μ	%	μ
Fatalities	13%		8%	
Child seat (age)	-	5.57	-	5.50
Adult belt permissible	-	12.90	-	12.58
Restraint prim.enf.	33	-	51	-
Travel speed (estimated)	-	79.13	-	80.60
Age	-	13.80	-	14.31
Restraint fine ($)	-	≤ $25		
Red light camera	51	-		
Speed camera	25	-		
Min. age learner's permit	-	15		
Mandatory holding period	-	6		
Min. age -intermediate-	-	16		
Night restrictions (int.)	94	-		
Night restr. enf.(int.)	71	-		
Young pass. restr. (int.)	49	-		
Young pass. enf. (int.)	69	-		
Night restr. -full-	-	< 18		
Young pass. restr.	81	-		
Rural interstate speeds	-	70		
Urban interstate speeds	-	65		
Other roads-speed-	-	55		
Gender	-	Male		
Road function class	-	Rural local		
Speed limit	-	High		
Traffic control devices	-	None		
Traffic -way flow	-	2-way		
License status	-	Valid		
Restraint use	-	None		

Covariates with no change between time periods

Figure 2. Number of MVCs fatalities among children ages 0-18, by year

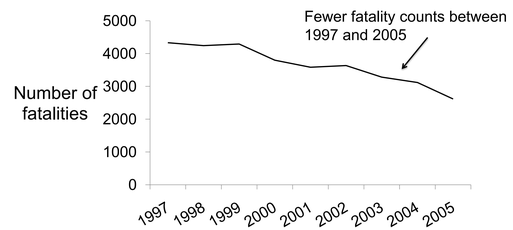


Table 2. Regression results (significant covariates)

Fatals	IRR	p value
Adult belt permissible**	0.94	0.031
Child restraint fine >$50***	0.54	0.001
Red-light camera***	0.38	0.000
Speed camera**	1.62	0.012
Minimum age -intermediate -15***	0.17	0.000
Minimum age -intermediate -16***	0.10	0.000
Minimum age -intermediate -17***	0.05	0.000
Young passenger restrictions –int.-**	0.63	0.016
Young passenger restrictions –enf.-***	2.26	0.000
Night restrictions -full- < 18***	0.20	0.000
Night restrictions -full- > 18***	0.14	0.000
Young passenger restr. -full-**	2.08	0.041
Other roads-60**	1.87	0.017
Other roads-65**	1.41	0.043
Violations charged - Reckless***	0.83	0.000
Violations charged - Impairment***	0.69	0.000
License status - Valid**	0.92	0.010
Alcohol test result - Illegal	0.98	0.329
Driver-related factors - Physical/Mental	1.01	0.804
Driver-related factors - Miscellaneous**	0.93	0.018
Driver-related factors - Vision/Distraction**	0.89	0.045
Seating position - Second***	1.42	0.000
Seating position - Back***	1.22	0.002
Road function class - Rural local***	0.86	0.000
Road function class - Urban arterial***	0.85	0.001
Road function class - Urban local***	0.76	0.000
Speed limit - Low	0.81	0.107
Speed limit - Moderate**	0.76	0.021
Speed limit - High***	0.67	0.002

*** p<=.05, ***p<=.01*

Conclusions

The most important and significant reductions in mortality occurred in 1999 through 2000, with mortality reductions in the range of 18 to 20 percent, compared to 1997. The reductions decrease significantly after 2000, probably due in part to the increase in legal speed limits on federal roads and highways in 1997.

- Some important regulatory laws have contributed to the reduction in MVC fatalities, such as laws that establish minimum age for licensing levels.
- Road design plays a major role in preventing fatal injuries. Enforcement of certain regulations may also contribute to injury control but may also have unintended consequences.
- Establishing a higher minimum age will help reduce the number of MVC fatalities, as well as reducing speeds in rural interstate roads.

Large rural areas also have higher fatality rates compared to other regions and more urban areas because of the degree of urbanization, types of vehicles driven, traffic safety laws, miles per vehicle driven, licensing requirements, emergency care capabilities and weather, among other factors.

Establishing adequate ages for using a child restraint and an adult safety belt, appropriate fines for traffic safety law violations, minimum age requirements for intermediate license holders, lowering rural and urban speeds, and road planning are among some of the promising interventions that can help control and prevent fatal injuries from MVCs.

✓ This research focuses on the effects that laws have on mortality, but not on how effectively these laws are implemented and/or enforced. This is an important limitation, since the existence of a law says nothing about how effectively the law is implemented and, more importantly, how effectively the law is enforced. This is an important area for future research.

For further information

Please contact *lpinet1@umbc.edu*. More information on this and related projects can be obtained at http://*www.idehs.com*, *including* a link to an online, PDF-version of the poster.