A PRELIMINARY ASSESSMENT OF CHANGE IN MOTOR VEHICLE TRAFFIC TRAUMA INCIDENCE AND OUTCOME: RHODE ISLAND, 1984-1985*

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MOTOR vehicle traffic collisions rank first among causes of fatal injury in the United States.[1] They also rank third behind malignant neoplasms and heart disease as a cause of potential years of life lost before age 65.[2] Although national data on their morbidity contribution are lacking, they emerged as the fourth leading cause of trauma-related hospital emergency department visits in northeastern Ohio.[3]

The first statewide hospital emergency department surveillance system to monitor and investigate motor vehicle traffic trauma has been established in Rhode Island.[4] Since the state remains without universal mandatory seat belt legislation, a byproduct of this system is an inherent capacity for the population to be utilized as an external control in an ongoing epidemiologic evaluation of the New York State seat belt law.[5]

The principal purpose of this report, which documents short-term changes and demographic differentials in the incidence and outcome of motor vehicle traffic trauma in Rhode Island, is to facilitate preliminary evaluation of the New York seat belt legislation. Other purposes are to furnish baseline data in anticipation of a local seat belt law and to enhance the descriptive epidemiol-

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ogy of motor vehicle trauma. Data pertain to the first two quarters of calendar years 1984 and 1985, respectively.

DATA AND METHODS

Rhode Island occupies a land area of 1,049 square miles, and its population, as of July 1, 1985, was estimated to be 967,910.[6] Between 85 and 90% of the population are urban residents. The state is served by 12 civilian acute care nonpsychiatric hospitals with emergency departments, all of which are participating in the surveillance system.

Data for this initial report primarily represent a 23.1% systematic sample of first encounter motor vehicle trauma patients who presented at hospital emergency departments during the first six months of 1984 and 1985. Three weeks of data were generated for each quarter. These data are a subset of a larger data set, which represents the whole of 1984 and 1985. Since the sampling cycle comprised one week on and three weeks off, the complete sample is 25% rather than 23.1%

Also of concern are individuals who died from injuries sustained on in-state public roads during the first six months of 1984 and 1985. To be included in this study, fatal and nonfatal motor vehicle traffic trauma cases had to be Rhode Island residents who could be assigned an external cause code (E Code) within ranges E810-E816 and E818-E819, under the ninth revision of the *International Classification of Diseases—Clinical Modification* (ICD-9-CM).[7] Fatalities were identified from official death certificates maintained by the State Department of Health.

Case finding was implemented through reference to emergency department logs (two hospitals) where adequate, or by review of emergency department medical records. Periodic problem solving sessions were conducted with data abstractors, and whenever necessary original records were retrieved and reexamined. Additional quality control procedures included visual scanning of completed surveillance forms, use of a decision book, validation of a 5% random sample of cases, verification through double data entry, and routine computer checks on internal consistency.

Incidence rates were based on hospital emergency department trauma cases whose age and sex were known. The denominator for the 1985 rates was the midyear population estimated by the statewide planning program of the Rhode Island Department of Administration.[6] However, because disaggregation of the projected data was restricted to quinquennial and decennial age-sex groupings, some adjustments were necessary to accommodate the need to examine certain variations on those configurations. These adjust-

ments entailed limited application of age-sex distributions from the 1980 Rhode Island Census population.[8] The denominator for the 1984 rates was the midyear population, derived through linear interpolation.

Motor vehicle traffic trauma outcome was measured in terms of case-admission and case-fatality ratios. Case-admission ratios were defined as the estimated number of admissions divided by the estimated number of incidence cases and case-fatality ratios as the number of deaths divided by the estimated number of fatal and nonfatal cases. Significance tests were performed to assess the stability of observed changes and differentials in incidence and outcome measures.[9,10]

RESULTS

The emergency department sample produced 2,511 motor vehicle traffic trauma cases, of whom 93.9% were Rhode Island residents, the subjects for this research. The resident sample was further diminished by 0.3% to exclude cases whose age or sex was unknown. Eighty-nine residents died from injuries sustained in motor vehicle collisions on public roads in Rhode Island during the first halves of 1984 and 1985.

Based on point estimates, overall motor vehicle trauma incidence rates rose across corresponding quarters between 1984 and 1985 (Table I). The first quarter and first half changes achieved statistical significance at the 0.05 probability level or less. First half rates in 1985 were 14% higher than their 1984 counterparts. When age was disaggregated, the largest rate of change was manifest for the 16-17 age group in the first quarter comparison. Age-specific incidence rates peaked between ages 16 and 24, and were lowest for those under 16 and over 44. Uniformly observed male excesses in overall incidence rates only achieved statistical significance in the second quarter comparisons ($p \leq 0.01$). Second quarter rates typically surpassed those for the first quarter. For each sex and the totals, these differences reached significance at the 0.05 probability level or less, except among females in 1985.

None of the observed changes in case-admission ratios between corresponding periods in 1984 and 1985 were statistically significant (Table II). A temporal decline is suggested by the second quarter and first half comparisons. Sample admissions were numerically similar for the first halves of 1984 and 1985; 93 and 97, respectively. Sex differences in case-admission ratios were not statistically significant, nor were quarter differences by year.

Irrespective of sex, point estimated case-fatality ratios were higher in the first half of 1985 than in the corresponding interval for 1984 (Table III). Reflecting the small number of deaths, these differences were not statistically significant. Data instability is also apparent from within and across quarter

TABLE I. ESTIMATED MOTOR VEHICLE TRAUMA INCIDENCE RATES PER 1,000 POPULATION BY AGE AND SEX FOR PERSONS TREATED IN HOSPITAL EMERGENCY DEPARTMENTS, RHODE ISLAND, FIRST AND SECOND QUARTERS, 1984 AND 1985

	1984			*1985*		
Age (years)	*Both sexes*	*Male*	*Female*	*Both sexes*	*Male*	*Female*
First quarter						
<16	1.0	.9	1.2	1.0	1.0	1.0
16-17	2.8	2.9	2.8	7.0*	5.9	8.2*
18-24	5.2	5.7	4.8	5.6	6.0	5.2
25-44	2.6	2.8	2.5	3.3+	3.5	3.1
45-64	1.4	1.1	1.6	1.6	1.6	1.5
65+	.5	.7	.5	.7	.7	.7
All ages	2.1	2.2	2.0	2.5*	2.7+	2.4
Second quarter						
<16	1.8	1.9	1.8	1.9	1.8	1.9
16-17	7.3	5.8	8.9	7.4	8.3	6.5
18-24	6.3	7.8	4.9	7.5	8.4	6.6+
25-44	3.5	4.1	2.9	3.5	3.8	3.2
45-64	1.5	1.5	1.4	1.5	1.7	1.4
65+	.6	1.0	.4	.9	.8	1.0
All ages	2.8	3.3	2.4	3.1	3.4	2.7
All ages (first half)	4.9	5.5	4.4	5.6*	6.1	5.1+

*1985 rate differed significantly from 1984 rate ($p \leq .01$)
+1985 rate differed significantly from 1984 rate ($p \leq .05$)

TABLE II. ESTIMATED MOTOR VEHICLE TRAUMA ADMISSIONS PER 1,000 HOSPITAL EMERGENCY DEPARTMENT TREATED CASES BY SEX, RHODE ISLAND, FIRST AND SECOND QUARTERS, 1984 AND 1985

	1984			*1985*		
Period	*Both sexes*	*Male*	*Female*	*Both sexes*	*Male*	*Female*
First quarter	74.8	76.9	72.6	74.5	77.2	71.7
Second quarter	91.8	98.9	82.7	80.3	90.4	68.8
Total (first half)	84.5	90.1	78.1	77.7	84.6	70.1

comparisons, and from same sex comparisons. Although observed male rates were universally higher than female rates, significant sex differences were registered only for the 1984 first quarter ($p \leq 0.01$) and for the two combined quarters in 1985 ($p \leq 0.05$).

COMMENT

This research indicates that the motor vehicle traffic trauma incidence rate in Rhode Island increased by 14% between the first halves of 1984 and 1985, respectively. There is also some evidence of a concomitant increase in the

TABLE III. ESTIMATED MOTOR VEHICLE TRAUMA FATALITIES PER 1,000 HOSPITAL EMERGENCY DEPARTMENT TREATED CASES* BY SEX, RHODE ISLAND, FIRST AND SECOND QUARTERS, 1984 AND 1985

	1984			*1985*		
Period	*Both sexes*	*Male*	*Female*	*Both sexes*	*Male*	*Female*
First quarter	8.4	12.9	3.9	9.2	10.0	8.4
Second quarter	7.3	7.9	6.6	10.1	14.6	5.1
Total (first half)	7.8	9.9	5.4	9.7	12.6	6.6

*The rate denominator is estimated nonfatal emergency department cases plus total fatalities.
Source of fatality data: Division of Vital Statistics, Rhode Island Department of Health.

case-fatality ratio. By contrast, the case-admission ratio may have declined. Increases in motor vehicle traffic trauma incidence rates and case-fatality ratios are consistent with changes in two risk indicators, both pertaining to speed. Adjusting for variability in speed monitoring equipment and sampling, the Rhode Island Department of Transportation estimated that 54% of motorists exceeded the statutory limit on 55 MPH highways in Fiscal Year 1985 compared with 45% in 1984.[11] Mean speed on those highways was estimated to be 59.3 MPH in 1985 and 57.2 MPH in 1984.[12] A comprehensive analysis of changes between 1984 and 1985 in motor vehicle trauma incidence and outcome measures is needed which takes account of such exposures and uses the complete 25% sample of cases collected through the statewide hospital emergency department surveillance system.

Unlike Rhode Island, New York State enacted universal mandatory seat belt use during the period of study. A preliminary evaluation of this legislation, based upon hospital emergency department and vital statistics data from Suffolk County, found that the vehicular injury occurrence rate and the case-fatality ratio both declined between the first six months of 1984 (pre-law) and the first six months of 1985 (post-law).[5] In light of the parallel observed increases in the incidence rate and case-fatality ratio in Rhode Island, it is plausible that the New York State seat belt law was even more effective in reducing motor vehicle traffic trauma mortality and morbidity than indicated by Suffolk County findings alone. Considered jointly, the results of these two preliminary studies have potentially important public safety and policy implications for Rhode Island and other states which have either not enacted, or have rescinded, universal mandatory seat belt legislation.

While numbers are small, this study suggests that motor vehicle traffic trauma in Rhode Island is selective of males, and of older teenagers and younger adults of both sexes. There is a further suggestion of seasonal variation, incidence rates appearing higher in spring than in winter. Further re-

search on sociodemographic selection among motor vehicle trauma victims and on the effects of seasonality is warranted from the perspectives of epidemiology and prevention.

The true incidence of motor vehicle traffic trauma is likely to be appreciably underestimated here because of underrepresentation of less severe cases in the study population. Excluded were those individuals who refrained from seeking treatment for their injuries or were self-treated and those who received treatment outside the surveillance system, such as in an out-of-state hospital emergency department, a military facility, a health maintenance organization, or in the office of a physician or another health care provider. However, there is no reason to believe that incorporation of these cases would have altered the direction of the reported change in trauma incidence rates given the brevity of the time frame.

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