URBANIZATION AND MOTOR VEHICLE CRASHES

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ABSTRACT

Data were obtained on all police reported crashes in Ohio and Texas for 1986. Crashes involving motor vehicle occupants were categorized by county of occurrence; counties were classified into an urban-rural continuum. Results show that population-based motor vehicle occupant crash rates are highest in the most urban areas for property-damage-only crashes and injury crashes; rates for fatal crashes are higher in the less urban areas.
INTRODUCTION

Baker and colleagues examined motor vehicle occupant death rates by county of occurrence and found that population-based occupant death rates were highest in counties of low population density. However, the Highway Data Loss Institute (HLIDI), examine insurance claims by garaging location of vehicle and found that both collision and injury claim frequencies per insured vehicle year were highest in urban areas. Nearly 20 years ago, a presidential commission noted that the United States has become mainly a nation of cities and their environs. At that time, about 69 percent of the U.S. population lived in metropolitan areas, 75 percent did so in 1980, and 85 percent are expected to do so by the turn of the century. Categorizing crashes by their place of occurrence, the present study examines the variation in motor vehicle occupant crash rates by urban-rural location based on police reported crashes in two states. The data are examined in terms of crashes per resident population and crashes per vehicle registered in the counties in which the crashes occurred.

METHODS

Data were obtained on police reported crashes in Ohio and Texas for calendar year 1986. A motor vehicle crash is required to be reported in these states if it involves injury or if the amount of damage to any one car exceeds $150 in Ohio and $250 in Texas. Crashes were categorized by severity (property damage only, crashes involving any reported injury (including fatality), and fatal crashes only), and the number of vehicles involved (single versus multiple). Crashes that involved a pedalcyclist or pedestrian are excluded from all calculations.
Counties in these states were classified using a U.S. Department of Agriculture scheme that assigns each county to one of 10 urban-rural categories, ranging from central counties of metropolitan areas of one million population or more to nonmetropolitan counties not adjacent to a metropolitan area (see appendix). These urban-rural codes and 1986 population estimates for all counties in Ohio and Texas were obtained from the U.S. Department of Agriculture. Information on registered vehicles per county in 1986 was obtained from the state motor vehicle departments. Crashes were assigned counties based on location of occurrence.

RESULTS

Crash rates involving motor vehicle occupants were higher in Ohio than in Texas, but the relationship between crash rates and urban-rural location was similar in both states (Figure 1). Rates based on all crashes were highest in the most urban areas and decreased linearly as areas became more rural, although the results for fringe counties of metropolitan areas of one million population or more (code 1) were anomalous in both states. The overall decrease was more pronounced in Texas than in Ohio. There was little difference in the trends whether the rates were based on registered vehicles or population; thus population-based rates are given in the remainder of the paper.

Figures 2 and 3 indicate that in both Ohio and Texas population-based property damage crashes and crashes involving any reported injury were highest in the most urban counties and decreased with decreasing urbanization, but fatal crash rates were higher in the less urban areas. Property damage crashes accounted for about 65 percent
of all police reported crashes in Ohio and Texas, and fatal crashes accounted for less than one percent.

Figure 4 shows that multiple vehicle crashes were more common in urban areas than in rural ones. However, population-based crash rates for single vehicle crashes were generally higher in the more rural counties. Because of the preponderance of multiple vehicle crashes in urban areas, rates based on driver involvements rather than crashes would accentuate the urban-rural differences illustrated in Figure 1.

**DISCUSSION**

The most urban counties have the highest population-based rates of motor vehicle occupant crashes involving injury, and they have higher rates of property-damage-only crashes as well. These data, based on police reported crashes, are consistent with data based on insurance injury and collision claims. They are also consistent with previous work indicating that population-based fatal crash rates are highest in the most rural areas, which may be due in large part to differences in road characteristics, travel speeds, seat belt use, types of vehicles, and availability of emergency care.

The finding that injury producing crashes involving motor vehicle occupants are more frequent in urban counties, even after controlling for population size, has important public health implications. The results suggest that the continuing trend toward urbanization will produce an increase in the population-based rates of crashes involving injury and that greater attention should be focussed on reducing the number and severity of crashes in urban environments. In addition, many crashes occur -- particularly in high-vehicle density urban areas -- that are below the reporting threshold, and many crashes that
should be reported are not. Although the bulk of these crashes involve only property damage, their inclusion would further accentuate the urban-rural differences in crash rates reported here.
REFERENCES


## APPENDIX

**U.S. Dept. of Agriculture**  
**Rural-Urban Continuum Codes**

### Metropolitan Counties

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Central counties of metro areas of 1 million population or more</td>
</tr>
<tr>
<td>1</td>
<td>Fringe counties of metro areas of 1 million population or more</td>
</tr>
<tr>
<td>2</td>
<td>Counties in metro areas of 250,000 to 1 million population</td>
</tr>
<tr>
<td>3</td>
<td>Counties in metro areas of fewer than 250,000 population</td>
</tr>
</tbody>
</table>

### Nonmetropolitan Counties

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>4</td>
<td>Urban population of 20,000 or more, adjacent to a metro area</td>
</tr>
<tr>
<td>5</td>
<td>Urban population of 20,000 or more, not adjacent to a metro area</td>
</tr>
<tr>
<td>6</td>
<td>Urban population of 2,500 to 19,999, adjacent to a metro area</td>
</tr>
<tr>
<td>7</td>
<td>Urban population of 2,500 to 19,999, not adjacent to a metro area</td>
</tr>
<tr>
<td>8</td>
<td>Completely rural or fewer than 2,500 urban population, adjacent to a metro area</td>
</tr>
<tr>
<td>9</td>
<td>Completely rural or fewer than 2,500 urban population, not adjacent to a metro area</td>
</tr>
</tbody>
</table>

Figure 1
Crashes per 100,000 Population and per 100,000 Registered Vehicles. Ohio and Texas 1986
By U.S. Dept. of Agriculture Urban—Rural Categories
Figure 2
Crashes per 100,000 Population by Crash Severity. Ohio and Texas 1986
By U.S. Dept. of Agriculture Urban—Rural Categories

Property Damage Only

Any Injury

Urban → Rural

Urban → Rural
Figure 3
Crashes Per 100,000 Population by Crash Severity. Ohio and Texas, 1986
By U.S. Dept. of Agriculture Urban—Rural Categories

Fatal Injury Only

- Ohio
- Texas

*Too few cases for meaningful rates.
Figure 4
Crashes Per 100,000 Population by Number of Vehicles Involved.* Ohio and Texas, 1986.
By U.S. Dept. of Agriculture Urban—Rural Categories

*Excludes crashes involving pedestrians