

# **Growing Traffic in Rural America: Safety, Mobility and Economic Challenges in America's Heartland**

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## Executive Summary

The nation's rural roads are a critical link in the nation's transportation system, providing access from urban areas to the nation's Heartland. These roads also provide farm-to-market transportation and are the primary routes of travel and commerce for the approximately 60 million people living in rural America. But rural roads in the nation's Heartland are carrying growing levels of traffic and commerce, often lack many desirable safety features and experience serious traffic accidents at a rate far higher than all other roads and highways. This report looks at the condition, use and safety of the nation's non-Interstate rural roads, based partly on a new analysis of all fatal rural traffic accidents over the five year period from 1999 to 2003. Rural Interstate routes were excluded from the safety analysis in this report because they are built to very high safety standards, and do not have the significant traffic safety problems common on many rural roads. The report also looks at steps some states are taking to improve rural traffic safety and concludes with recommendations to reduce traffic fatalities on the nation's rural roads.

Key findings of the report:

### **The use of rural roads is increasing as rural populations increase and the dependence on roads increases in rural areas.**

- Travel on rural roads increased by 27 percent between 1990 and 2002 by all vehicles and by 32 percent by large commercial trucks.
- Approximately 60 million people – 21 percent of the nation's population – live in rural communities in the United States, an increase of approximately 11 percent since 1990.
- The rate of rural population growth in the 1990s was approximately three times the rate of rural population growth in the 1980s.
- Population growth in rural areas has been uneven, with growth being strongest in the South and West, and rural areas in the Upper Plain and Central states more likely to see population losses.
- Sixty-four percent of the nation's predominately rural counties experienced gains in population the first and second halves of the 1990s.
- Eighteen percent of the nation's predominately rural counties experienced population loss in both halves of the 1990s.
- A recent study found that rural counties that had high levels of natural amenities – a mild climate, varied topography or access to surface water – averaged a 120 percent increase in population from 1970 to 1996, whereas rural areas that offered few natural amenities averaged only a one percent increase in population during the same period.

- Growth in rural areas, particularly in the South and West, has been fueled by significant domestic and international migration to regions that offer affordable housing, small-town quality of life, but yet are within commuting distances of larger metropolitan areas.
- The 2000 Census found that 30 percent of rural Americans have a one-way daily commute of 30 minutes or longer.
- While the movement of retirees into rural communities slowed in the 1990s as a result of lower birth rates during the Depression era, an influx of older Americans to rural America is expected as the Baby Boom generation begins to retire.

**The nation's food distribution system is becoming increasingly reliant on truck travel to move agricultural products, including grains, wheat, corn and fruits and vegetables. The reliance on trucking for goods movement by the agricultural sector is expected to increase.**

- Transportation is becoming an even more critical segment of the food distribution network as food distribution is the most dispersed segment of the economy at the same time that food demand is concentrated mostly in urban areas.
- A recent report by the Pacific Economic Cooperation Council recommends that governments improve the quality of transportation systems serving the movement of goods from rural to urban regions as a strategy to lower food costs and increase economic prosperity.
- The United States Department of Agriculture (USDA) reports that 90 percent of refrigerated perishables, such as fruits and vegetables, are delivered by truck.
- From 1990 to 2000 the share of all U.S. grains, which includes corn, wheat and soybeans, delivered by trucks, increased from 36 percent to 50 percent, while 32 percent was delivered by rail and the remaining 18 percent was delivered by barge.
- The USDA also reports that the transportation of livestock and other live animals is almost exclusively by truck.
- A recent report on agricultural transportation by the USDA found that it was likely that market changes and changes in consumer preferences were likely to further increase the reliance on trucking to move U.S. agricultural products.

**Traffic fatalities are occurring on the nation's rural roads at a rate approximately two-and-a-half times higher than on all other roads.**

- The traffic fatality rate on non-Interstate rural roads in 2003 was 2.72 deaths for every 100 million vehicle miles of travel, compared to a traffic fatality rate on all other roads in 2003 of 0.99 deaths per 100 million vehicle miles of travel.
- Accidents on the nation's rural, non-Interstate routes resulted in an average of 22,127 fatalities annually from 1999 to 2003, accounting for more than half – 52 percent – of the nation's traffic deaths.
- Rural, non-Interstate routes accounted for 28 percent of all vehicle miles of travel in the U.S. from 1999 to 2003.
- The reduction of the fatality rate on rural non-Interstate routes has lagged behind the safety improvements on all other routes since 1990. From 1990 to 2003, the fatality rate on all roads, excluding non-Interstate rural roads, decreased by 32 percent from 1.45 fatalities per 100 million vehicle miles of travel to .99. But on rural, non-Interstate routes, the traffic fatality rate has declined by only 21 percent, from 3.44 fatalities per 100 vehicle miles of travel to 2.72.
- The fatality rate on rural, non-Interstate routes has actually increased from 2000 to 2003, from 2.65 fatalities per 100 million vehicle miles of travel to 2.72 in 2003.
- The five states with the largest number of rural non-Interstate traffic deaths from 1999 to 2003 are: Texas, California, Florida, North Carolina and Pennsylvania (data for each state is available in the Appendix A).
- The five states with the highest rate of traffic fatalities per 100 million miles of travel are: Arizona, Florida, South Carolina, Montana and Kentucky (data for each state is available in Appendix B).

**Inadequate roadway safety design, longer emergency vehicle response times and the higher speeds traveled on rural roads compared to urban roads are factors in the higher traffic fatality rate found on rural, non-Interstate routes.**

- Rural roads are more likely than urban roads to have poor roadway design, including narrow lanes, limited shoulders, sharp curves, exposed hazards, pavement drop-offs, steep slopes and limited clear zones along roadsides.
- Many rural routes have been constructed over a period of years and as a result often have inconsistent design features for such things as lane widths, curves, shoulders and clearance zones along roadsides.

- Rural roads are more likely than urban roads to be two-lane routes. Seventy percent of the nation's urban non-freeway arterial and collector roads have two-lanes, but 94 percent of rural non-freeway, arterial and collector routes have two-lanes.
- In about 30 percent of fatal rural traffic accidents in 2002, victims who died did not reach a hospital within an hour of the crash, whereas only eight percent of people injured in fatal, urban traffic accidents did not reach a hospital within an hour
- From 1999 to 2003, 66 percent of the traffic fatalities that occurred on non-Interstate rural roads were in accidents on routes with speed limits 55 miles per hour or higher. But only 40 percent of traffic fatalities on all other routes occurred on roads or highways with a speed limit of 55 miles per hour or higher.

**Motorists on rural roads are far more likely than those on urban roads to be involved in a fatal crash as a result of a vehicle leaving its lane.**

- Fatal non-Interstate rural accidents are more likely than fatal accidents on all other routes to occur once a vehicle has left the roadway. From 1999 to 2003, 47 percent of all fatal accidents on non-Interstate rural roads involved a vehicle leaving the roadway, whereas only 35 percent of fatal traffic accidents on all other routes involved a vehicle leaving the roadway.
- Motorists are approximately six-and-a-half times more likely to be killed while attempting to negotiate a curve on rural, non-Interstate routes than on all other roads. From 1999 to 2003, the rate of fatalities per 100 million miles of travel from accidents involving negotiating curves on rural, non-Interstate routes was 0.58, compared to 0.09 on all other routes.
- Motorists are approximately four times more likely to be involved in a fatal collision between vehicles going in opposite directions while traveling on a rural, non-Interstate route than on any other roads. In 2002 and 2003, the rate of fatal accidents per 100 million vehicle miles of travel involving vehicles going in opposite directions was 0.50 on rural, non-Interstate routes and 0.12 on all other roads.
- While the vast majority of rural roads are two-lane facilities, very few rural traffic fatalities occurred while one vehicle was trying to pass another. From 1999 to 2003, only three percent of all vehicle occupants killed in rural, non-Interstate accidents died in crashes where one vehicle was trying to pass another vehicle.

- Most head-on crashes on rural, non-Interstate roads are likely caused by a motorist making an unintentional maneuver as a result of driver fatigue, being distracted or driving too fast in a curve.
- While driver behavior is a significant factor in traffic accident rates, both safety belt usage and impaired driving rates are similar in their involvement rate as a factor in urban and rural traffic accidents.
- The share of fatal traffic accidents on rural-Interstate routes occurring at intersections or interchanges is smaller than the share of fatal traffic accidents on all other routes. Twenty-two percent of fatal non-interstate accidents from 1999 to 2003 occurred at intersections and interchanges, whereas 34 percent of fatal traffic accidents on all other routes occurred at either intersections or interchanges.

**There are numerous roadway safety improvements that can be made to reduce serious accidents and traffic fatalities. These improvements are designed largely to keep vehicles from leaving the correct lane and reducing the consequences of a vehicle leaving the roadway.**

- The type of safety design improvement that is appropriate for a section of rural road will depend partly on the amount of funding available and the nature of the safety problem on that section of road.
- Low cost safety improvements include rumble strips, centerline rumble strips, improving signage and pavement/lane markings, installing lighting, removing or shielding roadside obstacles, the use of chevrons and post-mounted delineators along curves and upgrading or adding guardrails.
- Moderate-cost improvements include adding turn lanes at intersections, resurfacing pavements and adding median barriers.
- Moderate to high-cost improvements include improving roadway alignment, reducing the angle of curves, widening lanes, adding or paving shoulders and adding intermittent passing lanes or adding a third or fourth lane.

**There are several factors that hinder the ability of state and local governments to make needed rural roadway safety improvements.**

- A large number of rural roads and the relatively low volume of traffic they carry combined with the high cost of some desirable improvements make it difficult to pay for them.
- Federal highway funding cannot be used on many rural roads, most of which are the responsibility of local governments, which may have limited resources.

- Many governments lack adequate information upon which to make informed decisions on potential road safety solutions.

**Numerous states are taking significant steps to try and reduce traffic fatalities, particularly on its rural roads, where traffic fatality rates are much higher.**

- States are becoming more aggressive at gathering data on fatal traffic accidents to allow them to identify high accident locations and corridors and determine which traffic safety improvements would be the most useful.
- State and local governments lack adequate funds to pay for many needed highway safety improvements, but are trying to spend their limited highway traffic safety money where and how it will provide the greatest increase in traffic safety.

**State activities to reduce rural road traffic fatalities include:**

- The identification of high-risk highway corridors and roadway locations with high rates of run-off-the-road crashes in California.
- The use of improved roadway design, increased public education and enhanced law enforcement along key highway corridors in Georgia.
- The introduction of a uniform crash reporting system in Mississippi, to help identify roadway sections most in need of safety improvements.
- The installation of 300 miles of centerline rumble strips in Pennsylvania.
- The assessment of roadway safety needs along 30,000 miles of rural, two-lane roads in Texas. Based on these assessments, changes will be made to address the most important findings.

## **Introduction**

Rural roads are a critical link in the nation's transportation system, providing mobility for rural residents and visitors as well as linking America's urban areas with the source of much of its food supply and other natural resources.

The importance of rural roads is likely to increase in the future as more people choose to live in rural America and the reliance on roads to transport products in and out of rural communities increases.

This report looks at roadway safety, travel and population trends in rural America and makes recommendations on steps that can be taken to improve the safety and efficiency of these critical roads.

Sources of information for this report include the Federal Highway Administration, the National Highway Traffic Safety Administration, the United States Department of Agriculture and the U.S. Department of Transportation.

## **Population Trends in Rural America**

Approximately 60 million people – 21 percent of the nation's population – live in rural communities in the United States. Rural areas are defined by the Census Bureau as open country and settlements with fewer than 2,500 residents.<sup>1</sup> Because growing rural areas are often reclassified as urban, and the Census bureau periodically changes the definition of urban and rural areas, it is difficult to measure population trends. The best way to determine whether growth is occurring in rural America is to look at population trends in counties that are predominately rural. From 1990 to 2000, the population of non-metro counties in the U.S. increased by 10 percent. This rate of rural growth in the

1990s was approximately three times the rate of growth from 1980 to 1990, when the population of non-metro counties increased by only three percent.<sup>2</sup> The rate of rural population growth, as defined as non-metro counties, has slowed since 2000, increasing by approximately another one percent by the year 2003.<sup>3</sup>

There are several reasons for the recent growth in rural populations. The lower cost of living, the proximity to natural resources such as lakes and mountains and a less stressful quality of life are a significant attraction to many Americans and recent immigrants. The U.S. Department of Agriculture notes that many rural areas have experienced significant recent growth as a result of the arrival of many people who have moved into a region for non-economic reasons.<sup>4</sup> While some of these recent arrivals to rural America are retired, most of them are still of working age. Increased geographic flexibility for many workers, largely as a result of improved technology, has also allowed many people to move or build second homes in rural areas that are close to desirable recreation areas.

A recent study found that rural counties that had high levels of natural amenities – a mild climate, varied topography or access to surface water – averaged a 120 percent increase in population from 1970 to 1996, whereas rural areas that offered few natural amenities averaged only a one percent increase in population during the same period.<sup>5</sup> The movement of urban retirees to rural communities slowed in the 1990s because of the relatively low number of Americans reaching retirement age, as a result of lower birth rates during the Depression era. But as the baby boom generation begins to retire, a significant influx of urban retirees moving to rural communities is expected.<sup>6</sup>

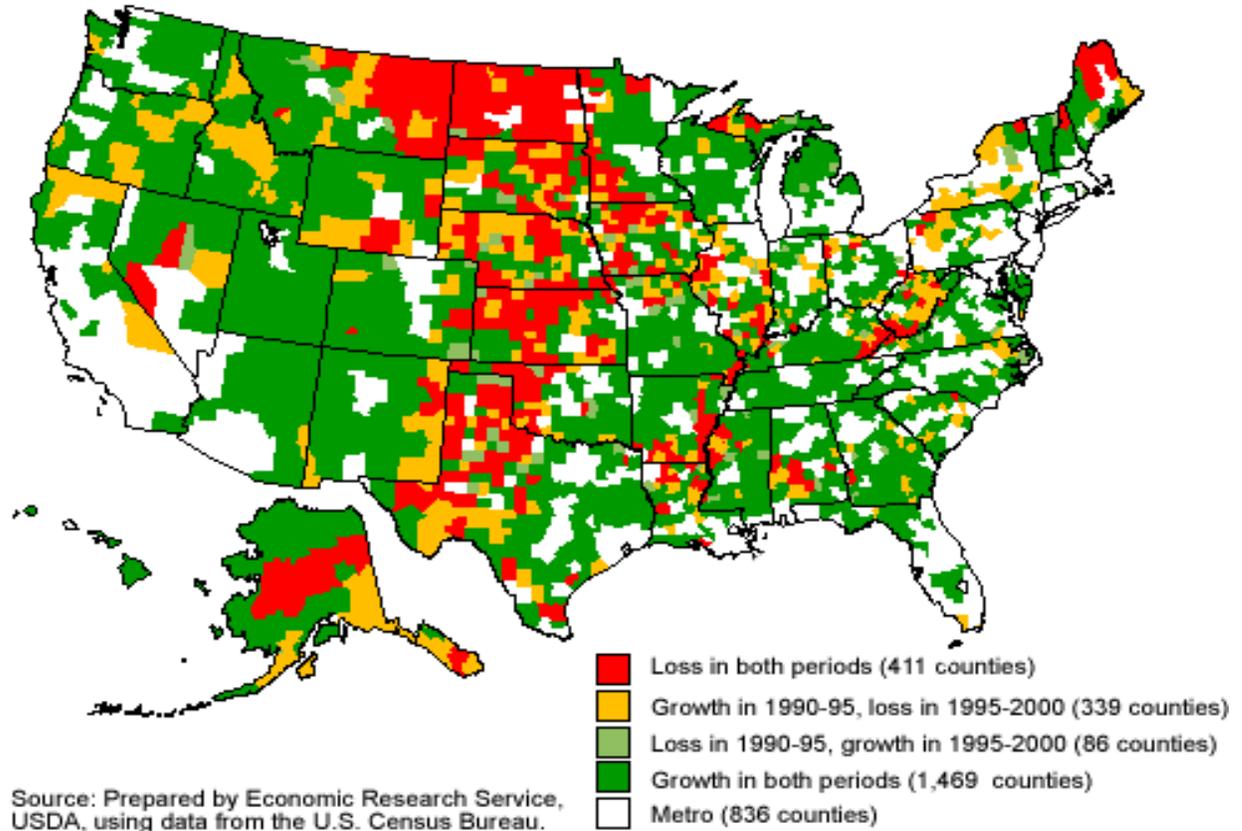
Growth in rural areas, particularly in the South and West, has been fueled by significant domestic and international migration to regions that offer affordable housing, small-town quality of life, but yet are within commuting distances of larger metropolitan areas.<sup>7</sup> In fact, the 2000 Census found that 30 percent of rural Americans have a one-way daily commute of 30 minutes or longer.<sup>8</sup>

Population growth in rural areas was uneven, with growth being strongest in the South and the West, and rural areas in the Upper Plain and Central states more likely to see population losses. From 1990 to 2000, 64 percent of the nation's predominately rural counties gained population in both the 1990 to 1995 period and also in the 1995 to 2000 period. Only 18 percent of the counties experienced population losses in both the first and second halves of the 1990s.<sup>9</sup> Rural regions that lost population in the 1990s were mostly regions dependent on agriculture or mining.

Chart 1.

### Patterns in nonmetro population change, 1990-1995 versus 1995-2000

*Some 339 widely distributed nonmetro counties reverted from growth to decline in 1995-2000*



### Trends in Rural Road Use

Travel on the nation's rural roads, by all vehicles and by large commercial trucks, has increased significantly since 1990. The continued increase in travel on rural roads is a result of increased rural population as well as the growing reliance of agriculture on efficient farm-to-market transport. Travel on rural roads increased by 27 percent between 1990 and 2002 by all vehicles and by 32 percent by large commercial trucks.<sup>10</sup>

The importance of a good rural transportation system to the efficiency of a region's economic performance is increasing as food distribution becomes increasingly dependent on reliable transportation. A new report by the Pacific Economic Cooperation Council found that transportation is becoming an even more critical segment of the food distribution network as food distribution is the most dispersed segment of the economy at the same time that food demand is concentrated mostly in urban areas. The report recommends that governments improve the quality of transportation systems serving the movement of goods from rural to urban regions as a strategy to lower food costs and increase economic prosperity.<sup>11</sup>

The share of agricultural products that are shipped by truck is increasing. Agricultural products that are shipped in smaller quantities and are time-sensitive, such as fruits and vegetables, are shipped mostly by trucks. The United States Department of Agriculture (USDA) reports that 90 percent of refrigerated perishables, such as fruits and vegetables, are delivered by truck.<sup>12</sup> But even the shipment of bulkier, less time-sensitive agricultural products is increasingly being provided by trucks. From 1990 to 2000 the share of all U.S. grains, which includes corn, wheat and soybeans, delivered by trucks increased from 36 percent to 50 percent.<sup>13</sup> Thirty-two percent of all U.S. grains was delivered by rail and the remaining 18 percent was delivered by barge.<sup>14</sup> Overall shipment of grains in the U.S. by trucks increased by 69 percent from 1990 to 2000.<sup>15</sup> The USDA also reports that the transportation of livestock and other live animals is almost exclusively by truck.<sup>16</sup>

A recent report on agricultural transportation by the USDA found that it was likely that market changes and changes in consumer preferences were likely to further increase

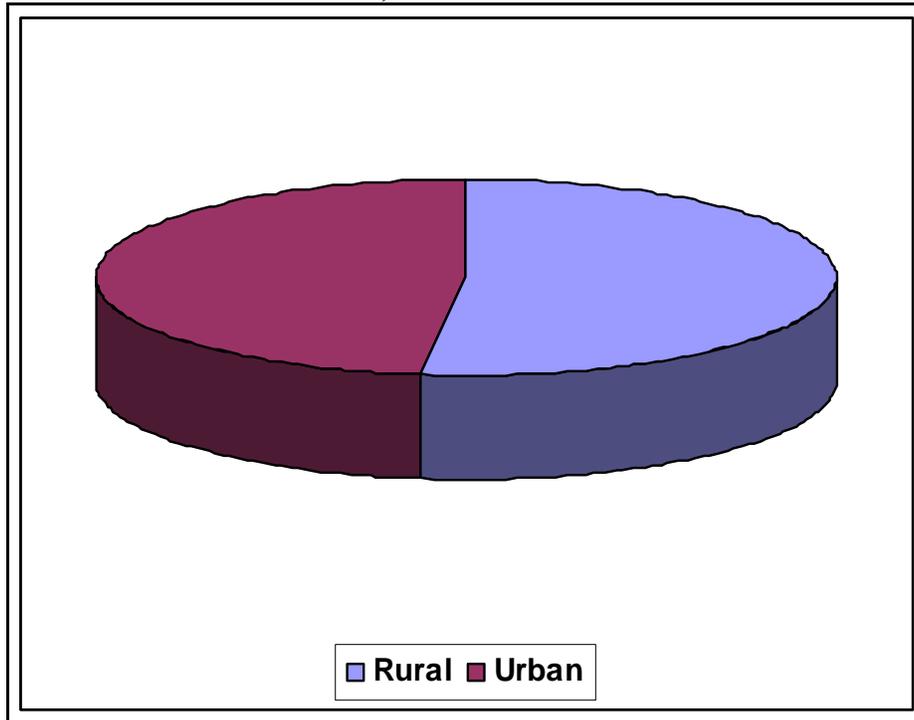
the reliance on trucking to move U.S. agricultural products. The USDA report found that future, foreign demand for U.S. agricultural products will increasingly be for processed products, such as flour, which rely on increased domestic transportation. Consumer demands in the U.S. and the need for greater traceability of where and how an agricultural product was produced will also increase the need for smaller, time-sensitive delivery. The USDA report found that for agricultural products, “movements toward lower volumes of trait-specific commodities will likely favor trucks as the primary mode of transport.”<sup>17</sup>

## **Rural Road Traffic Accidents**

Traffic accidents are a major source of fatalities in the U.S., with an average of 42,301 people killed annually in highway vehicle accidents from 1999 to 2003.<sup>18</sup> The roads that have the highest rate of traffic fatalities are the nation’s rural, non-Interstate roads. TRIP analyzed traffic fatalities on rural roads over the years 1999 to 2003, based on data obtained from the National Highway Traffic Safety Administration (NHTSA). Information was obtained for all fatal traffic accidents that occurred during this period on all rural roads and highways in the U.S., excluding the Interstate system. Rural Interstate routes were excluded from the safety analysis in this report because they are built to very high safety standards, and do not have the significant traffic safety problems common on many rural roads. This report, instead, focuses on the segment of the nation’s rural roads that have the worst traffic safety record.

Accidents on the nation's rural, non-Interstate routes resulted in an average of 22,127 fatalities annually from 1999 to 2003, accounting for more than half – 52 percent -- of the nation's annual traffic fatalities.<sup>19</sup>

**Chart 2. Share of total traffic fatalities, 1999 to 2003**



**Source: TRIP analysis of National Highway Traffic Safety Administration data**

The five states with the largest number of fatalities in accidents on rural, non-Interstate roads from 1999 to 2003 are Texas, California, Florida, North Carolina and Pennsylvania. There were 9,209 traffic fatalities from 1999 to 2003 on rural non-Interstate roads in Texas. State-by-state data on the number of traffic fatalities occurring on rural, non-Interstate routes from 1999 to 2003 and their share of overall fatalities and vehicle miles of travel can be found in Appendix A.

**Chart 3. States with most fatalities in accidents on non-Interstate, rural roads, from 1999 to 2003**

Texas	9,209
California	6,633
Florida	6,210
North Carolina	4,887
Pennsylvania	4,362
South Carolina	4,035
Georgia	3,908
Ohio	3,854
Mississippi	3,696
New York	3,591

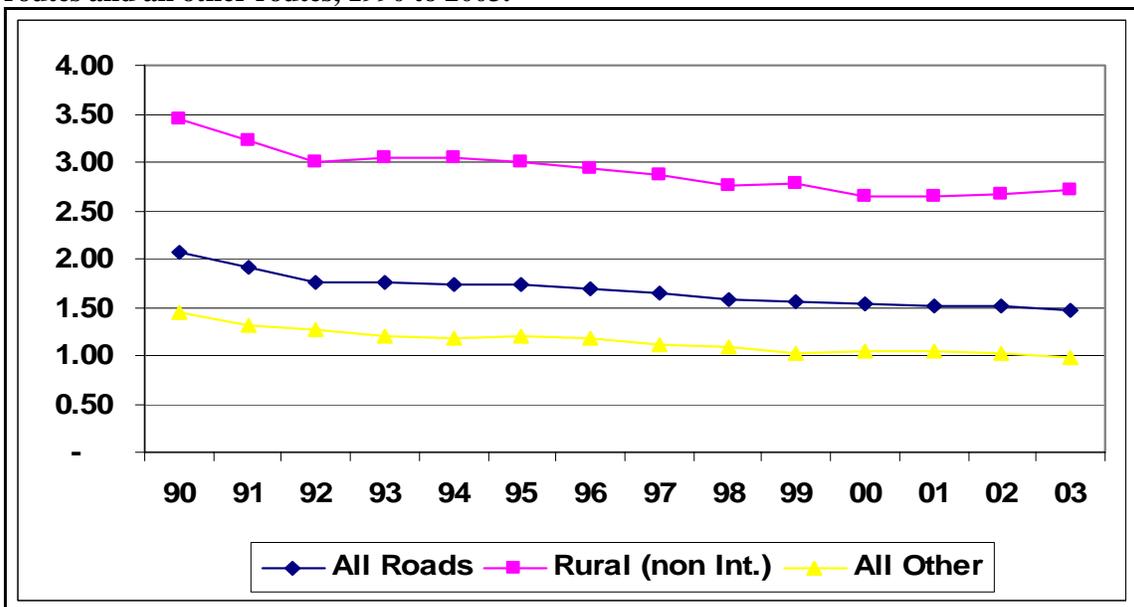
**Source: TRIP analysis of National Highway Traffic Safety Administration data**

While more than half of the nation's traffic fatalities from 1990 to 2003 occurred on rural, non-Interstate routes, only 28 percent of the nation's total vehicle travel occurred on these routes during this period. The high number of fatalities on rural, non-Interstate roads relative to the amount of traffic carried by these routes can be explained by the high rate of fatalities on these routes. The fatality rate on rural non-Interstate routes in 2003 was 2.72 deaths for every 100 vehicle miles of travel, more than two and a half times higher than the fatality rate on all other routes, which is 0.99 fatalities per 100 million vehicle miles of travel.<sup>20</sup> The combined fatality rate for all U.S. roads was 1.48 fatalities per 100 vehicle miles of travel.<sup>21</sup>

The reduction of the fatality rate on rural non-Interstate routes has lagged behind the safety improvements on all other routes since 1990. From 1990 to 2003, the fatality

rate on all roads, excluding non-Interstate rural roads, decreased by 32 percent from 1.45 fatalities per 100 million vehicle miles of travel to 0.99.<sup>22</sup> But on rural, non-Interstate routes, the traffic fatality rate has declined by only 21 percent, from 3.44 fatalities per 100 vehicle miles of travel to 2.72.<sup>23</sup> In fact, the fatality rate on rural, non-Interstate routes has actually increased from 2000 to 2003, from 2.65 fatalities per 100 million vehicle miles of travel to 2.72 in 2003.<sup>24</sup>

**Chart 4. Fatalities per 100 million vehicle miles of travel for all roads, rural, non-Interstate routes and all other routes, 1990 to 2003.**



Source: TRIP analysis of National Highway Traffic Safety Administration and Federal Highway Administration data

The state with the highest rate of traffic fatalities on its non-Interstate, rural routes in 2003 was Arizona, where there were 4.57 traffic fatalities per every 100 million vehicle miles of travel. The fatality rate on Arizona’s non-Interstate, rural roads was approximately triple the fatality rate on all other roads in the state, which was 1.54 deaths per 100 million miles of travel. Florida, South Carolina, Montana and Kentucky experienced the next highest rates of traffic fatalities on their non-Interstate, rural roads.

**Chart 5. States with highest rate of traffic fatalities on rural, non-Interstate routes per 100 million vehicle miles of travel in 2003 and fatality rate on all other roads in the state in 2003**

State	Non-Interstate rural	All other roads
Arizona	4.57	1.54
Florida	3.70	1.23
South Carolina	3.60	0.70
Montana	3.45	1.17
Kentucky	3.32	0.95
South Dakota	3.21	1.45
Pennsylvania	3.20	0.82
Missouri	3.19	1.04
New Jersey	3.12	0.90
California	3.11	1.00

**Source: TRIP analysis of National Highway Traffic Safety Administration and Federal Highway Administration data**

State-by-state data on traffic fatality rates on rural, non-Interstate routes and all other routes can be found in Appendix B.

### **Traffic Safety Factors**

There are several key factors that contribute to fatal traffic accidents; these factors include human behavior, the safety features of the vehicle, the medical care of the victims and the safety design of the actual roadway.<sup>25</sup> Human behavioral issues include whether safety belts are used, whether a driver is impaired by alcohol or drugs, whether a driver is distracted or drowsy or whether a driver is speeding. Both safety belt usage rates and impaired driving rates are similar between urban and rural accidents.<sup>26</sup> Because rural roads have fewer intersections than urban roads and are more likely to provide travel

between urban areas, they often have higher speed limits than many urban routes. From 1999 to 2003, 66 percent of the traffic fatalities that occurred on non-Interstate rural roads were in accidents on routes with speed limits 55 miles per hour or higher.<sup>27</sup> But only 40 percent of traffic fatalities on all other routes occurred on roads or highways with a speed limit of 55 miles-per-hour or higher.<sup>28</sup>

Because rural traffic accidents often occur in more remote locations than urban accidents, emergency medical care following a serious accident is often slower, contributing to a higher traffic fatality rate on rural roads. In about 30 percent of fatal rural traffic accidents in 2002, victims who died did not reach a hospital within an hour of the crash, whereas only eight percent of people injured in fatal, urban traffic accidents did not reach a hospital within an hour.<sup>29</sup>

## **Rural Road Design**

Traffic fatality rates on rural roads are also higher than on urban roads, partly because rural roads are less likely to have adequate safety features and are more likely than urban roads to have two-lanes. Seventy percent of the nation's non-freeway, urban roads have two-lanes, but 94 percent of rural, non-freeway roads are two-lane routes.<sup>30</sup> Rural routes have often been constructed over a period of years and as a result, often have inconsistent design features for such things as lane widths, curves, shoulders and clearance zones along roadways.<sup>31</sup> Many rural roads have been built with narrow lanes, limited shoulders, excessive curves and steep slopes alongside roadways.<sup>32</sup> Significant rural roads are less likely than significant urban roads to have adequate lane widths. A

desirable lane width for collector and arterial roadways is at least 11 feet. But 26 percent of rural collector and arterial roads have lane widths of 10 feet or less, while 19 percent of urban collector and arterial roads have lane widths of 10 feet or less.<sup>33</sup> With passenger vehicle, heavy truck and commercial farming traffic increasing, the safety inadequacies of these rural roads are contributing to the higher rate of fatal accidents on rural roads.

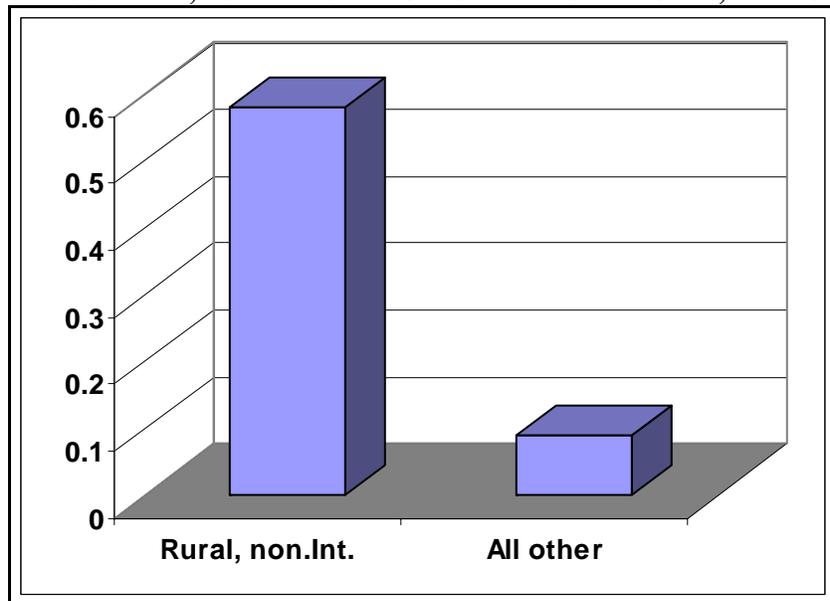
### **Rural Traffic Accident Factors**

More than half – 54 percent – of traffic fatalities on non-Interstate rural roads from 1999 to 2003 occurred in single-vehicle accidents, with the remaining fatalities occurring in multiple-vehicle accidents (59,805 out of 110,636 fatalities).<sup>34</sup> This rate is similar to all other routes, where 54 percent of traffic fatalities during the same period occurred in single-vehicle crashes (55,268 out of 100,870).<sup>35</sup>

But rural motorists and their passengers were also less likely to be killed in an accident that occurred while a vehicle was traveling straight on a road and less likely than drivers on other routes to be killed in accidents at intersections. From 1999 to 2003, 63 percent of driver and occupant deaths in non-Interstate rural accidents were in vehicles that were going straight, whereas 67 percent of motorists and occupants killed on all other routes during this period were in vehicles going straight.<sup>36</sup> Similarly, only 22 percent of fatal non-interstate accidents from 1999 to 2003 occurred at intersections and interchanges, whereas 34 percent of fatal traffic accidents on all other routes occurred at either intersections or interchanges.<sup>37</sup>

Vehicles driving on rural roads were much more likely than vehicles on all other roads to be involved in a fatal traffic accident while attempting to negotiate curves. From 1999 to 2003, 23 percent of all vehicle occupants killed in rural, non-interstate accidents, died in crashes that involved a vehicle attempting to negotiate a curve, while only 11 percent of vehicle occupants killed in all other accidents died in crashes that involved a vehicle attempting to negotiate a curve. Motorists are approximately six-and-a-half times more likely to be killed while attempting to negotiate a curve on rural, non-Interstate routes than on all other roads. From 1999 to 2003, the rate of fatalities per 100 million miles of travel from accidents involving negotiating curves on rural, non-Interstate routes was 0.58, compared to 0.09 on all other routes.

**Chart 6. Fatality rate per 100 million vehicle miles of travel from accidents involving negotiating curves on rural, non-Interstate routes and all other routes, 1999 to 2003**



Source: TRIP analysis of National Highway Traffic Safety Administration data

Vehicles driving on non-Interstate rural roads are far more likely than vehicles traveling on all other roads to be involved in a fatal collision with another vehicle going

in the opposite direction. During 2002 and 2003, 51 percent of all fatal multi-vehicle collisions involved vehicles going in opposite directions, compared to 33 percent of all fatal multi-vehicle collisions on all other routes. Motorist are approximately four times more likely to be involved in a fatal collision between vehicles going in opposite directions while traveling on a rural, non-Interstate route than on any other roads. In 2002 and 2003, the rate of fatal accidents per 100 million vehicle miles of travel involving vehicles going in opposite directions was 0.50 on rural, non-Interstate routes and 0.12 on all other roads.

While the vast majority of rural roads are two-lane facilities, very few rural traffic fatalities occurred while one vehicle was trying to pass another. From 1999 to 2003, only three percent of all vehicle occupants killed in rural, non-Interstate accidents died in crashes where one vehicle was trying to pass another vehicle. This percentage is only slightly higher than the two percent of vehicle occupants who were killed in accidents on all other routes, which involved one vehicle trying to pass another vehicle.

A 2003 report on head-on collisions by the National Cooperative Highway Research Program found that “most head-on crashes are likely to result from a motorist making an ‘unintentional’ maneuver – the driver falls asleep, is distracted, or travels too fast in a curve.”<sup>38</sup>

## **Making Rural Roads Safer**

A 2004 report on rural road safety by the United States General Accounting Office (GAO) found that there are several factors that hinder efforts to improve rural road safety. The GAO found that these challenges include the large number of rural roads and the relatively low volume of traffic they carry combined with the high cost of some desirable improvements, which make it difficult to pay for them. The GAO also found federal highway funding cannot be used on many rural roads, most of which are the responsibility of local governments, which may have limited resources. The report also found that many state governments lack adequate information upon which to make informed decisions on potential road safety solutions.<sup>39</sup>

A variety of design improvements can help improve rural road safety. These improvements have as a goal keeping vehicles in the correct lane and minimizing the consequences of vehicles leaving the roadway.

The type of safety design improvement that is appropriate for a section on rural road will depend partly on the amount of funding available and the nature of the safety problem on that section of road. Several studies have classified rural safety improvements by both their effectiveness and their cost. These improvements include:

### **Low cost:**

**Rumble strips** – Rumble strips have been found to reduce run off the road crashes by between 25 to 43 percent.<sup>40</sup> Rumble strips are raised or grooved patterns constructed on the roadway's shoulder.

**Centerline rumble strips** – Several states have started to install centerline rumble strips to alert drivers who may be encroaching or have strayed into an opposing lane.

**Improved signage and pavement markings** – 42 percent of traffic fatalities on rural, non-Interstate routes from 1999 to 2003 occurred while it was dark.<sup>41</sup> Traffic signs and pavement markings represent the first line of crucial information for drivers and can help improve night-time visibility. Signs with greater retroreflectivity, more visible pavement markings and raised, reflective lane markings can all assist drivers to stay on a roadway, particularly at night.

**Install lighting** – A recent study of the addition of street lighting at 49 isolated rural intersections in Minnesota found that nighttime crashes decreased by 35 percent after the addition of lighting.<sup>42</sup> Forty-two percent of all traffic fatalities on rural, non-Interstate routes from 1999 to 2003 occurred while it was dark.<sup>43</sup>

**Removing or shielding road-side obstacles** – Trees, large rocks, utility poles, heavy mail boxes and other road-side objects can be shielded, moved or moved back to reduce the likelihood of a vehicle leaving the roadway from striking these objects.

**Upgrade or add guardrails** – Adding or improving guardrails has been found to reduce traffic fatality rates by between 50-58 percent.<sup>44</sup>

**Chevrons and post-mounted delineators along curves** – The use of chevrons or post-mounted delineators has been found to be effective in reducing accidents at curves by providing drivers with better visual cues about the presence and geometry of a curve.<sup>45</sup>

### **Moderate cost:**

**Install median barriers** – Median barriers have been found to reduce traffic fatality rates by 65 percent.<sup>46</sup>

**Adding turn lanes at intersections** – the addition of left turn lanes at rural intersections was found to reduce accidents by between 33 and 48 percent.<sup>47</sup> The addition of right turn lanes at intersections was found to reduce accidents by between eight and 26 percent.<sup>48</sup>

**Resurfacing pavements** – Resurfaced pavements have been found to result in a 25 percent reduction in fatal crashes.<sup>49</sup>

### **Moderate to high cost:**

**Add or pave shoulders** – Paving or widening shoulders has been found to reduce traffic fatality rates by 10 to 35 percent, depending on the width of the widening and the location.<sup>50</sup>

**Improved roadway alignment** – Realigning roadways has been found to average a 50 percent reduction in traffic fatality rates.<sup>51</sup>

**Construct intermittent passing lanes or two-way left-turn lane** – Adding passing lanes has been found to reduce traffic fatality rates by 20 percent and the addition of a two-way left-turn lane has been found to reduce traffic fatality rates by 30 percent.<sup>52</sup>

**Widen lanes** – Making lanes wider has been found to reduce traffic fatality rates by eight to 10 percent.<sup>53</sup>

**Add lanes** – A recent report on the likely safety benefit of converting two-lane rural roads into four-lane routes, found that traffic accident rates would be reduced by between 40 to 60 percent.

## What States are Doing to Improve Rural Traffic Safety

Numerous states are taking significant steps to try to reduce traffic fatalities, particularly on rural roads, where traffic fatality rates are much higher. States are becoming more aggressive at gathering data on fatal traffic accidents to allow them to identify high accident locations and corridors and determine which traffic safety improvements would be the most useful. State and local governments lack adequate funds to pay for many needed highway safety improvements, but are trying to spend their limited highway traffic safety money where and how it will provide the greatest increase in traffic safety. Some of the states that are taking significant steps to reduce rural, fatal traffic accidents include:

**California:** The California Highway Patrol is leading a task force to examine the safety of all state corridors and to identify the most high-risk corridors. The task force will recommend behavioral and infrastructure improvements that are needed on these high-risk corridors to improve traffic safety. Most of the corridors identified have been two-lane, rural roads. The California Department of Transportation also has formed a task force to identify locations where a high number of run-off-the-road crashes are occurring. About two-thirds of these locations identified in 2004 were rural. The agency plans to use cost-effective strategies to improve traffic safety at these locations.<sup>54</sup>

**Georgia:** The state is developing a plan to help reduce lane departure accidents. The plan calls for a combination of roadway design improvements, public education and enhanced law enforcement along key corridors. The state has begun adding shoulder rumble strips and centerline reflectors to help reduce run-off-the road crashes.<sup>55</sup>

**Mississippi:** The state has introduced a uniform crash reporting system to improve information on traffic accidents in the state to help identify roadway sections most in need of safety improvements. The state is also testing various rumble strip patterns to determine which pattern would provide the greatest safety benefit, if introduced on numerous state roads, particularly along rural, two-lane routes.<sup>56</sup>

**Pennsylvania:** Since 1997, Pennsylvania has been performing roadway safety audits along key stretches of state roads and highways to identify safety problems so that appropriate safety design improvements can be selected. The state has also installed 300 miles of centerline rumble strips to help warn drivers who have strayed into an oncoming lane.<sup>57</sup>

**Texas:** In 2004 the state identified 235 safety improvement projects that it planned to complete during the year, mostly on rural roads. These projects include intersection beacon lights, widening lanes, adding rumble strips and removing trees near roads. Texas is assessing roadway safety needs along 30,000 miles of rural, two-lane roads, checking the appropriateness of speed limits, the condition of signs and pavement markings and assessing pavement edge drop-offs or curve warnings. Based on these assessments, changes will be made to address the most important findings.<sup>58</sup>

## **Conclusion**

Rural roads are a critical link in the nation's transportation system, increasingly providing access between urban areas and the U.S. Heartland. Rural roads are the backbone of the country's food distribution system and the primary means of travel for

the more than 60 million Americans who live in rural areas and for those who visit these areas. But traffic fatalities on rural roads are occurring at a rate approximately three-times higher than on all other roads. Meeting the growing demand for safe and efficient mobility in rural America will require a significant increase in the commitment to improving the design and efficiency of the nation's rural road system.

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