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RESEARCH PROJECT TITLE

Safety Analysis of Low-Volume Rural Roads in Iowa

SPONSORS

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Safety Analysis of Low-Volume Rural Roads in Iowa

tech transfer summary

By identifying safety concerns on low-volume rural roads, local agencies can cost-effectively prioritize mitigative action.

Objectives

The objectives of the research are to investigate low-volume rural road safety in Iowa, identify safety concerns, and propose safety mitigation strategies to address the identified problems.

Problem Statement

Traditionally, because many fatal crashes occur on high-speed, higher-volume roads, most previous mitigation strategies have targeted high-crash locations on these roads. From 2001 to 2007, over 6,000 fatal and major injury crashes were observed on undivided two-lane rural roads in Iowa. Over 4,000 of these major crashes occurred on two-lane local roads, while less than 2,000 took place on two-lane state-owned (primary) roads. Half of the rural local road major crashes were on facilities with an annual average daily traffic (AADT) of 400 or less. Local roads in Iowa comprise the majority of the rural surface transportation system, with approximately 90,000 miles of roads. Because traffic volumes on these roads are low and they cover a very large area, the traditional black spot approach to addressing safety problems is not as cost-effective as on other roads. Due to the random nature of low-volume road crashes, a more systemic or mass-action approach is necessary.



Key Findings

Test of Proportions

Ten different secondary road categories were compared to comparable groups (e.g., paved and unpaved secondary roads in varying AADT ranges compared to all undivided two-lane rural primary roads). A test of proportions identified crash characteristics that were overrepresented on low-volume rural roads as compared to the comparable group. One of the categories found to be overrepresented on low-volume rural roads was crashes involving younger drivers (drivers 19 and younger). Therefore, mitigation strategy that is a prime candidate for action is to provide young drivers with practical experience driving on unpaved roads and to focus on the dangers of, and recovery from, excessive speed.

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Crash-Level Model

A statistical (ordered probit) model was developed to identify the most significant causal factors for crashes on rural roads with 400 AADT or less (2001-2007). The following factors were found to increase the severity of crashes (excluding crashes at intersections with roads carrying any higher traffic):

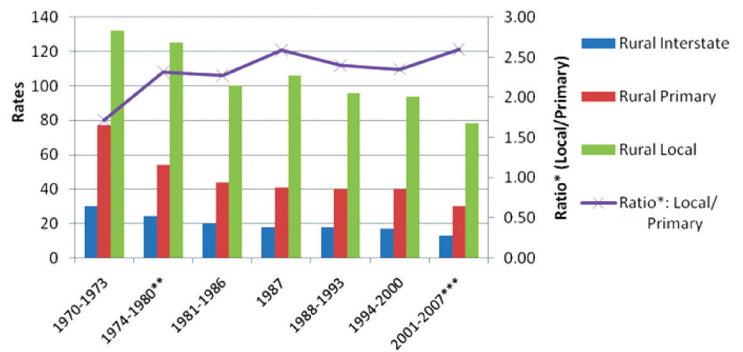
- Paved surfaces
- Spring/summer months (April through September)
- Weekends
- Fixed objects struck
- Overturn/rollover crashes
- Multi-vehicle broadside collisions
- Impaired driving, including both alcohol and/or drug involvement
- Daytime
- Speeding
- Younger (≤ 19) and older (≥ 65) driver involvement
- Counties with lower total rural population* and lower vehicle miles traveled (VMT) per rural population*
- Counties with positive traffic control at intersections* (information was available for 73 of Iowa's 99 counties)

*Counterintuitive results that may warrant further study

Implementation Readiness

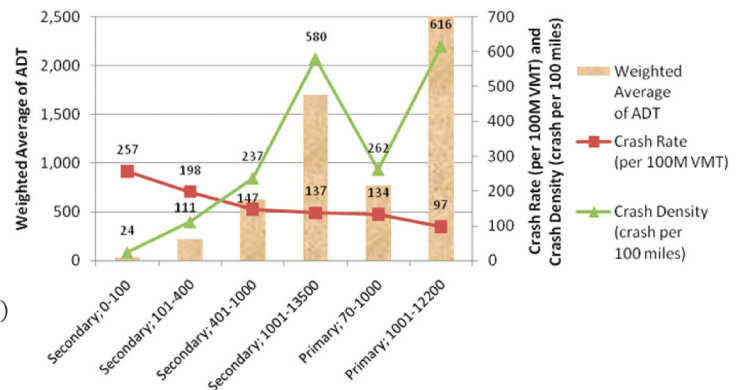
The findings of this study should permit local agencies to prioritize mitigative action in the most cost-effective manner. Results indicate that county engineers, law enforcement, and educators should especially consider safety needs on unpaved local roads with traffic volumes of 101 to 400 AADT. By considering safety needs on these relatively limited mileage roads, agencies can achieve cost-effective results when deploying low-cost safety improvements such as signing upgrades, higher maintenance levels, and spot improvements. Especially effective may be targeted signing programs for curves on gravel roads.

Law enforcement agencies will want to consider directing appropriate resources to local roads with high incidence of crashes involving impaired, speed-related, and other driver behavior-related incidents. Driver educators could present crash statistics for novice drivers and offer instruction for driving on unpaved surfaces, in an effort to reduce speed and vehicle control-related crashes. Parents could also be encouraged to provide supervised driving experience on these roads. Finally, the Iowa Department of Transportation and the Institute for Transportation's (InTrans) Iowa Traffic Safety Data Service (ITSDS) could step up outreach and crash data sharing to local agencies, focusing especially on 101-400 AADT unpaved local roads where cost-effectiveness is expected to be high.



*Ratio of fatal and injury crash rate on rural local roads to fatal and injury crash rate on rural primary roads. **Because of the unavailable crash data for 1976, summary totals and rates don't include 1976 data. ***For 2001, approximately 2000 crashes are missing due to a significant crash report form change and resultant database repository changes.

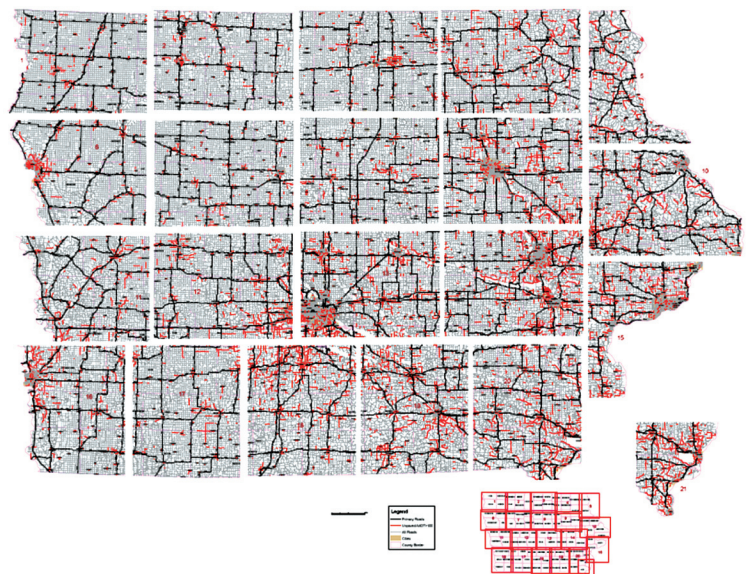
Safety performance of road classes in Iowa, by AADT range



Historical trend of fatal and injury crash rates on rural roads in Iowa (per 100 million VMT)

Implementation Limitations

As the statistical model was based on crashes rather than locations/road features, its application is limited to the identification of important contributing factors to crashes on low-volume roads in general, rather than the identification of high-crash locations. A location-based model is the subject of a follow-up study, currently underway, of low-volume roads in Iowa.



Tiled PDF map of >100 AADT unpaved local roads, available from ITSDS at InTrans