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RESEARCH RESULTS
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PUBLIC EDUCATION AND ENFORCEMENT RESEARCH STUDY – MACOMB, IL, ANALYSIS

SUMMARY

The Public Education and Enforcement Research Study (PEERS) was a collaborative effort of the U.S. Department of Transportation's Federal Railroad Administration (FRA), the Illinois Commerce Commission, and three communities in the State of Illinois. The purpose of the project was to promote safety at highway-rail grade crossings by reducing incidents, injuries, and fatalities. FRA tasked the John A. Volpe National Transportation Systems Center (Volpe Center) with conducting a field operational test to determine the effectiveness of the education and enforcement programs (Figure 1). The focus of this study was to compare the results of the PEERS program in Macomb, IL, with the results in Arlington Heights, IL.

The effectiveness of the PEERS activities was determined by counting the number of highway users that violated the crossing warning devices during three project phases. Cameras collected video images of the crossings when warning devices were activated. The video data was collected for 16 months: 2 months of pretest data, 12 months of test data, and 2 months of posttest data. The violation counts were standardized by the number of occasions highway users approached an active crossing. The violation rates were compared by time period to identify any change in behaviors.

A study of the PEERS program completed in 2006 focused on the community of Arlington Heights, IL [1]. Arlington Heights had a significant decrease in violations from the pretest to the posttest period. The results from Macomb were compared with Arlington Heights. The findings from Macomb were not comparable to the results from Arlington Heights. Highway-user behavior in Macomb was unchanged during the study period. The different population demographics, characteristics of the crossings, and program activities likely contributed to the differing results.

Figure 1. Truck Violates the Warning Devices at Lafayette Street in Macomb, IL

BACKGROUND

In 2004, the Secretary of the U.S. Department of Transportation issued an *Action Plan on Highway-Rail Grade Crossing Safety and Trespass Prevention* [2]. It identified education and enforcement as key initiatives in reducing incidents, injuries, and fatalities at highway-rail grade crossings. To determine the effectiveness of education and enforcement as safety countermeasures, FRA conducted before-during-after field operational tests in Illinois communities. These communities actively participated in enhanced grade crossing education and enforcement activities.

The first stage of this project was completed in 2006. The research focused on three highway-rail grade crossings in Arlington Heights, IL. The results showed that overall violations were reduced nearly 31 percent, and the most risky pedestrian violations were reduced 76 percent. The next stage of work was designed to compare the results from Arlington Heights with the results from another community. Macomb, IL, a rural college town, which provides a good contrast to Arlington Heights, a suburb of Chicago.

OBJECTIVES

There were three objectives to this research. The first objective was to monitor highway-rail grade crossings as education and enforcement campaigns were conducted and to provide FRA with research data that supports the development of education and enforcement effectiveness measures to be used in current and future rulemaking.

The second objective was to conduct a field operational test to determine whether community education efforts and enforcement activities were successful in reducing violations at highway-rail grade crossings in Macomb, IL.

The third objective was to compare the results of the field operational tests for Macomb and Arlington Heights, IL, to determine whether the results of the program were comparable.

RESEARCH METHODS

The effectiveness of the education and enforcement programs in Macomb were analyzed by comparing the frequency of violations in each study period. The reduction in violations from the pretest period to the posttest period was used as a measure of the programs' successes. The violation data was categorized by several characteristics to provide additional information about the crossing users and what types of behavior were most affected by the PEERS programs.

To reduce the workload and the cost of analyzing Macomb data, a sampling of train events was used. The researchers used a statistically significant sample size at the 95-percent confidence level. Because variations in the data were expected both for each crossing and over time, a stratified random sample was chosen.

The results from Arlington Heights and Macomb were compared to determine whether the PEERS programs had the same effect in different communities. Any differences were evaluated using knowledge of the programs and communities.

RESULTS

Macomb Results

Over the course of the study, overall violation rates at the three crossings in Macomb increased. When the data was examined in 2-month time periods, it revealed an increase in violation rates in the posttest period (see Table 1.) Approximately one-half of the population in Macomb is composed of students at the local university. Every September, approximately 25 percent of the students are new to Macomb. These new students were not exposed to the PEERS programs during the test period. The population shift affects the results of the PEERS activities.

Table 1. Violation Counts and Rates by 2-Month Periods

		Violation Count	Train Events	Violation Rate
Pre-test	7/1/03-8/31/03	6,151	2,453	2.51
Test Case	9/1/03-10/31/03	2,906	1,260	2.31
	11/1/03-12/31/03	2,719	1,423	1.91
	1/1/04-2/29/04	1,069	770	1.39
	3/1/04-4/30/04	3,961	1,450	2.73
	5/1/04-6/30/04	5,172	1,461	3.54
	7/1/04-8/31/04	4,236	1,468	2.89
Post-test	9/1/04-10/31/04	4,323	1,463	2.95

Because of the little pedestrian activity at crossings in Macomb, the focus of the Macomb results was on motorist violations. To better understand motorist behavior, the data was stratified by crossing. Each crossing has different demographics and traffic characteristics (see Table 2).

The Ward Street crossing has the lowest average annual daily traffic and the lowest violation rates. Jackson Street and Lafayette Street are both main thoroughfares through Macomb. The highway traffic signals at Lafayette may explain why there are fewer violations at Lafayette than at Jackson. The crossing is equipped with preemption to clear the tracks when a train is on approach. Therefore, a driver would have to run a red light before violating the grade crossing.

The violations were categorized by the type of behavior. A type I violation occurred when the crossing warning lights are flashing, but the gates were vertical. A type II violation occurred when the gates were in motion. A type III violation occurred when the gates were in the horizontal position. The analysis of violation by type revealed that the majority of violations were type II violations. The motorists were frequently committing type II violations after the train had passed and the gates were still ascending. This behavior may be perceived as less risky than a type II violation before the train arrives.

Table 2. Violation Counts and Rates by Crossing

	Pretest	Test	Posttest
Ward			
Count	1120	3399	749
Rate	*1.55*	*1.26*	*1.53*
Jackson			
Count	2960	10469	2504
Rate	*3.82*	*4.35*	*5.11*
Lafayette			
Count	1772	5714	964
Rate	*1.86*	*2.10*	*1.97*

Arlington Heights Comparison

The PEERS activities in Arlington Heights and Macomb did not yield the same changes in highway-user behavior. In Arlington Heights, overall violations were reduced by nearly 31 percent from the pretest to the posttest period. In Macomb, there was an increase of 18.7 percent in overall violations between the two periods. These differences could be attributed to differences in the programs, communities, or crossing characteristics. A comparison of violation rates between the two communities is shown in Figure 2.

In Arlington Heights, the rail traffic was primarily commuter rail trains. In Macomb, almost all of the trains were freight trains. Freight trains can be long and generally operate at slower speeds. The warning devices in Macomb were active 76 percent longer than in Arlington Heights (3.7 versus 2.1 minutes). This may have resulted in more motorists violating the crossing warning devices in Macomb.

In Arlington Heights, the audience was primarily commuters who used the crossing daily. The student population in Macomb is constantly changing, and this may make it more difficult to achieve the level of awareness needed for behavior modification.

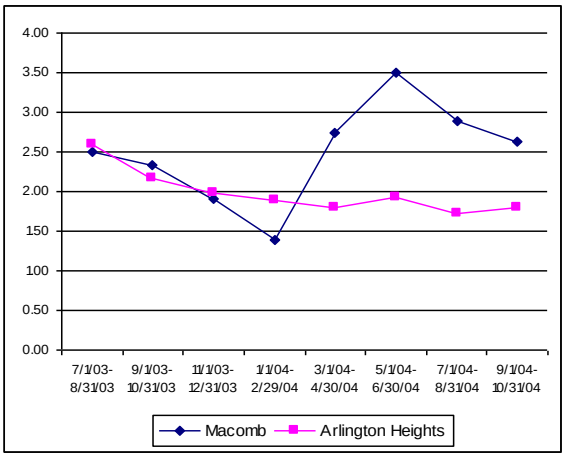

Figure 2. Violation Rates by 2-Month Periods, Macomb vs. Arlington Heights

The types of programs implemented in each community were different. In Arlington Heights, the program included frequent police presence at the crossings. Macomb adopted a campaign that centered on poster campaigns and passive means of spreading the safety message. The initiatives that specifically targeted crossing users were more successful.

CONCLUSIONS

The target audience and design of the PEERS programs are very influential in the programs' success. Citizens that use the crossing daily may be more likely to internalize the safety messages and to adjust their behavior. Initiating activities where crossing-users are receiving the safety message regularly and directly are more effective than passive projects dispersed throughout the community.

The effectiveness of highway-rail grade crossing safety education and enforcement can vary greatly based on program elements. The differences in Macomb and Arlington Heights illustrate that.

REFERENCES

[1] Sposato, S., Bien-Aime, P., & Chaudhary, M. (2006 Dec.). *Safety of highway-rail grade crossings: Public education and enforcement research study, final report* (Report No. DOT/FRA/ORD-06/27, DOT-VNTSC-FRA-06-03).

[2] U.S. Department of Transportation, Secretary of Transportation. (2004 June). *Secretary's action plan for highway-rail crossing safety and trespass prevention*.

CONTACT

Leonard W. Allen III
Federal Railroad Administration
Office of Railroad Policy and Development
1200 New Jersey Avenue, SE – Mail Stop 20
Washington, DC 20590
Tel: (202) 493-6329
Leonard.Allen@dot.gov

KEYWORDS

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