

Safety Impacts of Signalization Improvements and Removing Unwarranted Signals

61st Annual Ohio Transportation Engineering Conference

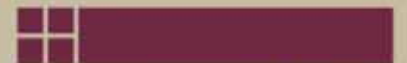
Randy Kill, PE, PTOE



BURGESS & NIPLE

Purpose

Present the findings of a before and after crash study that examined the effects of signalization upgrades and signal removals. The study examined crash frequency, crash type and severity.



Study Project

City of Warren Citywide Traffic Signal Upgrade Project

- Upgrade existing signalized intersections
- Remove unwarranted signals
- Install new signals at unsignalized locations



City of Warren General Information

- Located in Trumbull County in northeast Ohio
- Population just over 45,000



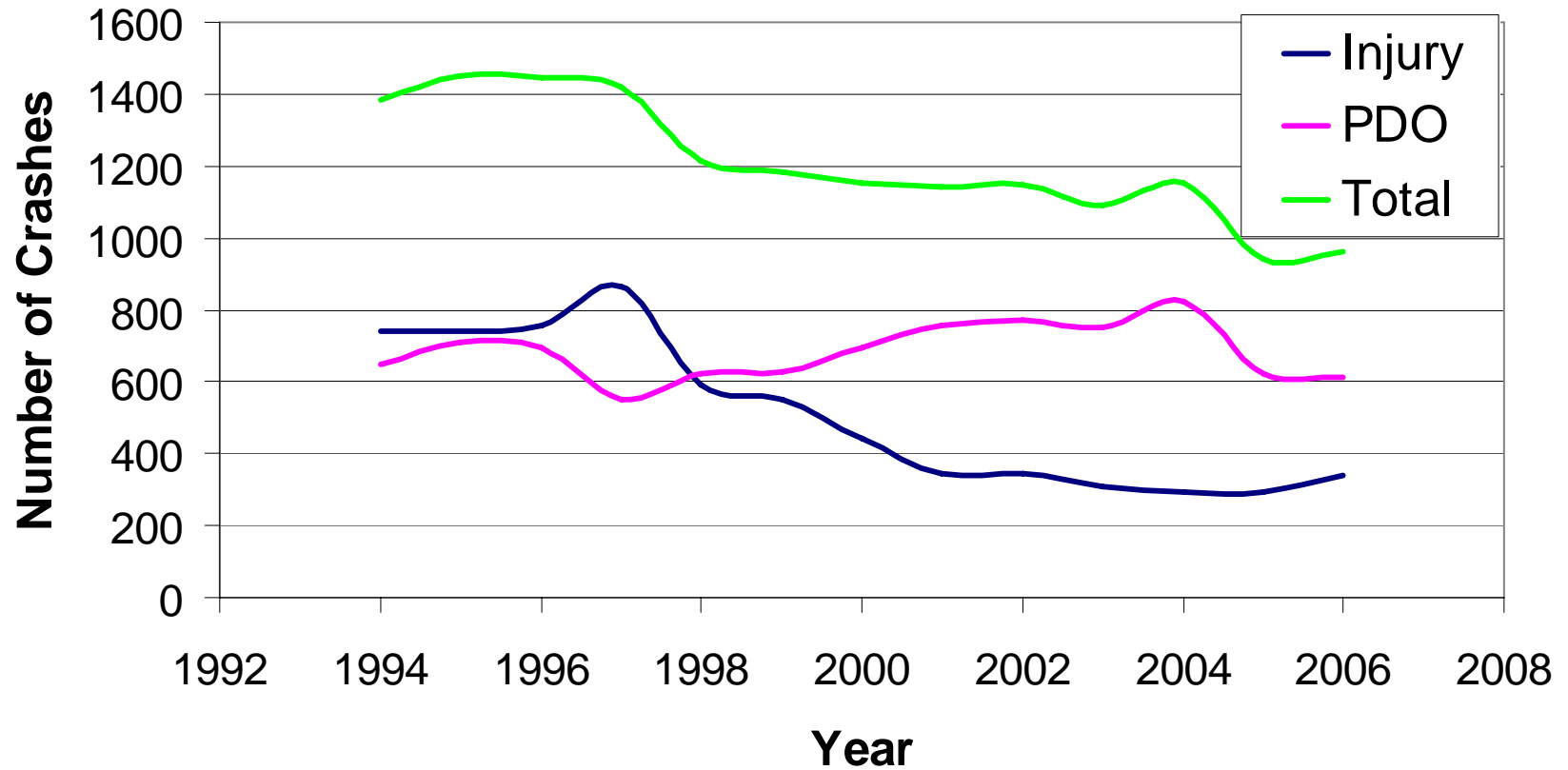
Project Information

- 82 Signalized intersections prior to project
 - 18 Intersections reconstructed
 - 37 Intersections with equipment upgrades
 - 3 New traffic signal installations
 - 23 Unwarranted signals removed
 - 4 Intersections removed from project
- 62 Signalized intersections after the project
- \$3.1 Million construction cost

Crash Analysis Methodology

- Crash record summaries obtained from Ohio Department of Public Safety
 - Data sorted to include only crashes with a location code of intersection
 - Of the intersection crashes, fixed object and parking related crashes were removed unless they could be determined to be intersection related
- Before Years of Study are 2002 and 2003
- Construction and removal occurred in 2004
- After Years of Study are 2005 and 2006

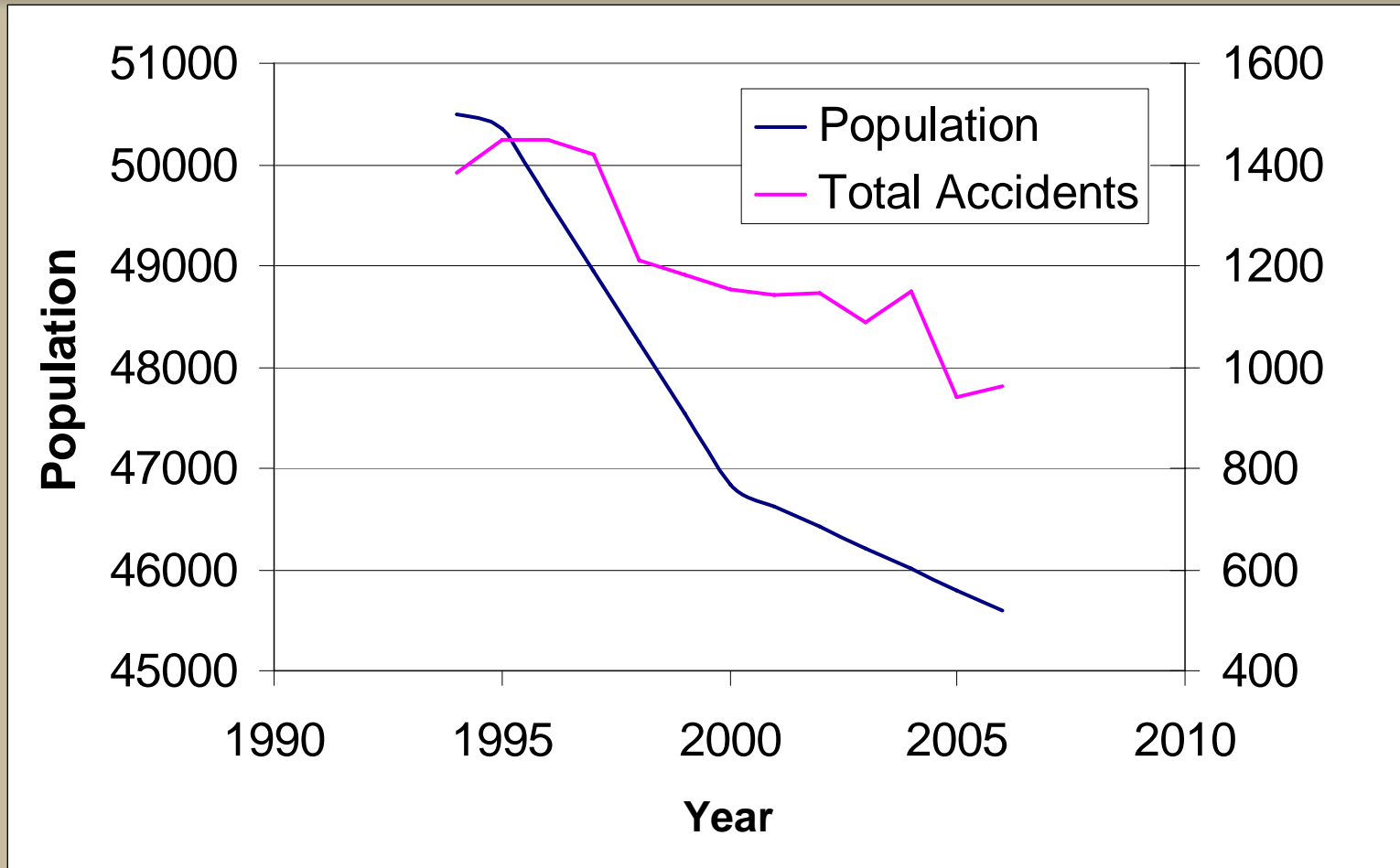
Citywide Crash History



Population History

Year	Population
1990	51,147
1995	50,343
2000	46,832
2005	45,796

Population and Crash Trends



Reconstructed Intersections



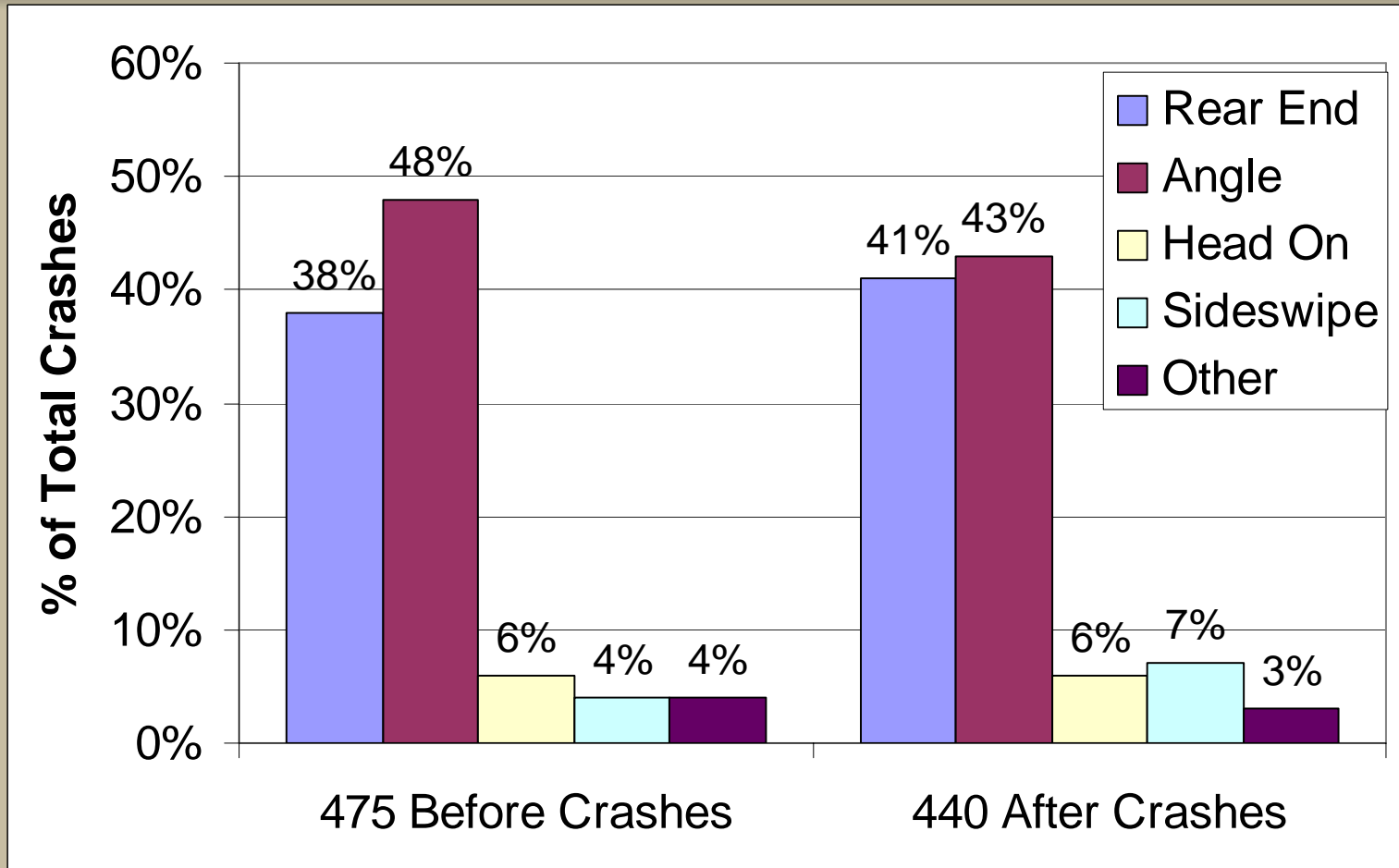
Upgraded Intersections



Reconstructed/Upgraded Intersections Before and After Crash Totals

Crash Severity	Before	After	Statistically Significant?
All Crashes	475	440	No
Injury	156	158	No
PDO	319	282	No

Reconstructed/Upgraded Intersections Percent Distribution by Crash Type



Signal Removal Intersections

- Most unwarranted intersections were located on a four or five-lane major road
- Minor street volumes very low
- Red light running observed at several intersections
- Converted to two-way stop control

Signal Removal Intersections Before and After Crash Totals

Crash Severity	Before	After	Statistically Significant?
All Crashes	99	55	Yes*
Injury	32	20 [#]	Yes*
PDO	67	35	Yes*

One fatality in after period

* Significant at a 95% Confidence Level

Signal Removal Intersections Crash Reduction Factors - Severity

- Used Simple Before and After Method

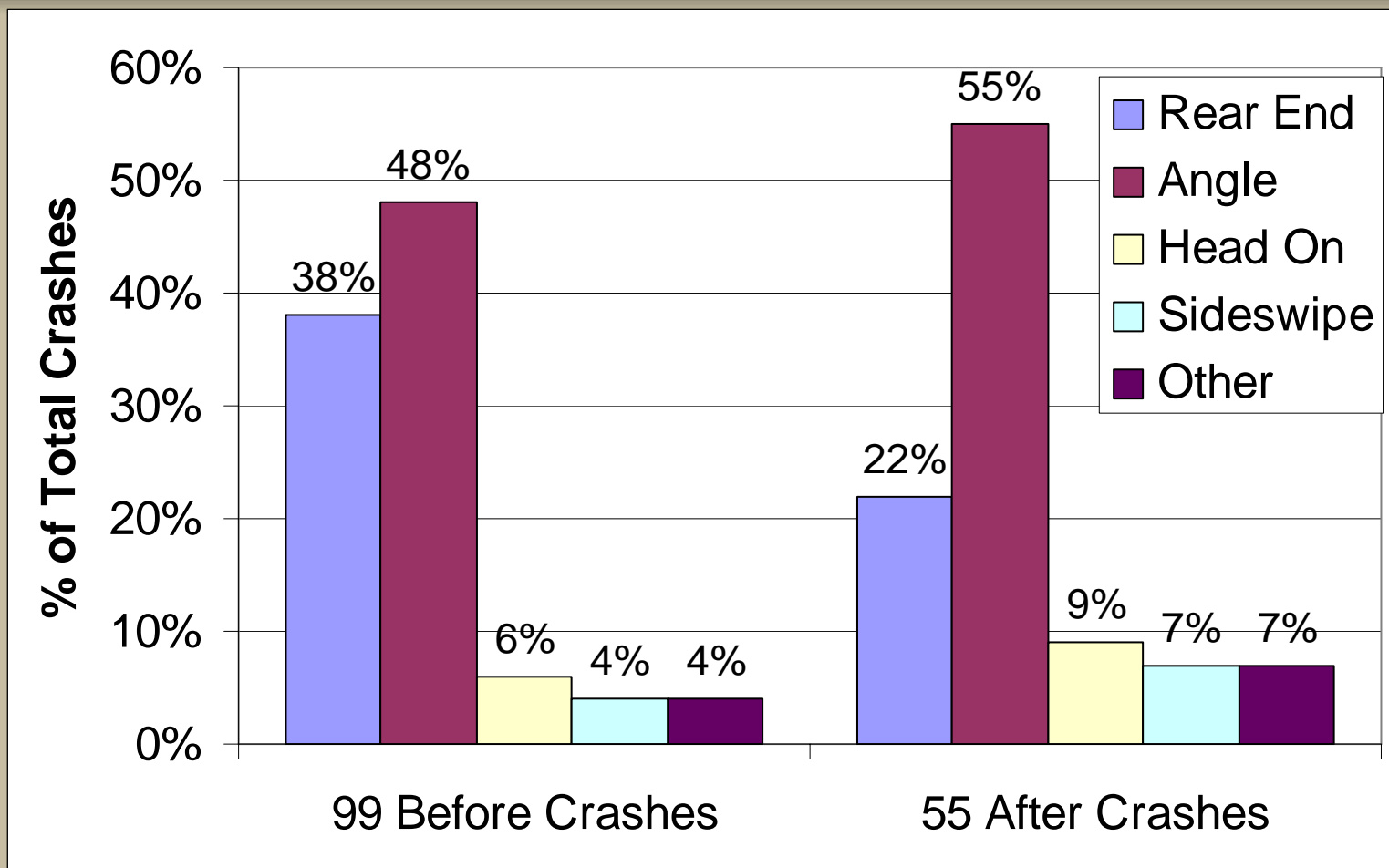
Severity	CRF
All	0.44
Injury	0.38
PDO	0.48

Signal Removal Intersections Crash Reduction Factors - Type

- Used Simple Before and After Method

Crash Type	CRF
Rear End	0.68
Angle	0.36

Signal Removal Intersections Percent Distribution by Crash Type



Previous Research

Crash Reductions Related to Traffic Signal Removal in Philadelphia

Persaud, B., E. Hauer, R. A. Retting, R. Vallurupalli, and K. Mucsi (1997)

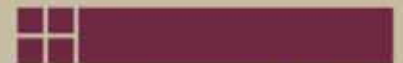
- Used Empirical-Bayes before and after to show a CRF of 0.24 for 199 signal removals in Philadelphia.
- Most intersections were on-way streets converted to four-way stops.
- Showed a decrease in rear end and angle crashes with the removal of traffic signals

Previous Research

Criteria for Removing Traffic Signals

Kay, J. L. et al. (1980)

- Showed that the overall crash frequency did not change with the removal of traffic signals
- Showed an increase in angle crashes and a decrease in rear end crashed with the removal of traffic signals



Next Steps

- Extend the analysis years for the before condition to 1998 if possible
- Add 2007 data to the after condition once it becomes available
- Use empirical-bayes analysis to further refine the crash reduction factors

Summary

For the study project

- Signal improvements did not have a significant impact on crash frequency or type
- Removing unwarranted signals had a significant reduction in crash frequency as well as rear end and angle type crashes
- Findings for unwarranted signals are consistent with previous research

Contact Information

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