

Injuries and Costs from Motor Vehicle Crashes into Fixed Objects

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Importance of Fixed Objects as a Factor in Crash Outcomes

- Fixed objects have been found to be related to severity of injury in crashes.
- Fixed objects related crash injuries can be remediated through highway design and redesign.
- Do significant crash outcome differences exist between crashes involving fixed objects and those which do not?
- Do significant crash outcome differences exist between crashes involving specific kinds of fixed objects?

Wisconsin CODES Data

- 1994-1995 Motor Vehicle Crash Data with VINs
- 1994-1995 Hospital Discharge Data
- No EMS or ED Data available

Data Linkage Based On:

- ❖ Zipcode of Residence
- ❖ Date of Crash/Hospital Admission
- ❖ Birthdate
- ❖ Sex

Data linked via probabilistic linkage using Automatch

Outcomes

Hospitalization

Brain Injury

Death

Hospital Charges

- Evaluate outcomes for all fixed object crashes vs. other crashes.
- Evaluate outcomes for specific fixed object crashes.

Basic Information on Crashes and Outcomes, Wisconsin, 1994-1995

Total Number of Crashes	690,539
Fixed Object Crashes	84,210
Other Crashes	615,015
Total Number Hospitalized	7,685
Total Number with Brain Injury	1,399
Total Number Died	1,231

Outcomes for Fixed Object and Other Crashes, Wisconsin, 1994-1995

	Fixed Object Crashes	Other Crashes	Risk Ratio
# Hospitalized	2,663 .92%	5,022 3.16%	3.85
# with Brain Injury	511 .61%	877 .14%	4.36
# Died	404 .48%	827 .13%	3.69
Average Hospital Charge	\$ 540	\$ 163	

All differences are significant at the .001 Level

Results for Crashes involving Fixed Objects vs. Other Crashes

- Compared to other crashes, crashes involving fixed object pose significantly higher risks to crash occupants. These higher risks range between 3.7 and 4.4 for the three outcomes.
- Fixed object crashes have average hospital charges which are \$377 more per crash occupant than do other crashes.

Specific Fixed Object Data Available in 1994-1995 Wisconsin Crash Data

Guardrail Fence (Comparison Group)

Traffic Signal

Bridge/Pier Abutment

Traffic Sign Post

Bridge Rail

Utility Pole

Fence

Light Support

Culvert

Other Post

Ditch

Tree

Curb

Mailbox

Embankment

Guardrail End

Fence

Median Barrier

Other Fixed Object

Variables Included in Logistic Regression Models for Specific Fixed Object Outcomes

- Type of Fixed Object (comparison group is guardrail fence)
- Size/Type of Vehicle (comparison group is sub-compact cars)
- Posted Speed Limit (comparison group is posted speed less than 35 mph).
- Rural Crash Location (comparison group is urban location)
- Type of Road (comparison group is local roads)

Relative Risk Ratios for Likelihood of Hospitalization, Wisconsin, 1994-1995

Culvert	4.77
Tree	3.17
Embankment	2.82
Guardrail End	2.66
Utility Pole	2.53
Ditch	2.00
Bridge Rail	1.90
State Road	1.28
County Road	1.37
Posted Speed 35-50	1.27
Posted Speed 55+	1.38

All differences are significant at the .01 level

Additional Hospital Charges Over Comparison Group, Wisconsin, 1994-1995

	Additional Charges
Bridge/Pier Abutment	\$1,456
Culvert	998
Tree	780
Guardrail End	632
Utility Pole	387
County Road	353

All differences are significant at the .01 level

Relative Risk Ratios for Likelihood of Brain Injury, Wisconsin, 1994-1995

Culvert	5.11
Tree	3.56
Embankment	2.91
Utility Pole	2.45
County Road	1.56
Posted Speed 35-50	1.67
Posted Speed 55+	1.56

All differences are significant at the .01 level

Relative Risk Ratios for Likelihood of Death, Wisconsin, 1994-1995

Culvert	4.78
Guardrail End	4.77
Embankment	3.98
Tree	3.42
Rural Area	1.55
County Road	1.37
Posted Speed 35-50	1.94
Posted Speed 55+	1.87

All differences are significant at the .01 level

CONCLUSIONS

- Compared to other crashes, crashes involving fixed object pose significantly higher risks to crash occupants. These higher risks range between 3.7 and 4.4 for the three outcomes. Additionally, fixed object crashes cost significantly more per crash occupant than do other type of crashes.
- Several groups of fixed objects pose greater risk for all outcomes to crash occupants compared to guardrail fencing. These are:

Culverts

Trees

Guardrail Ends

Embankments

Whenever reasonable, the use of guardrail fencing to protect vehicle occupants should be implemented.