

Establishing Safe and Realistic Speed Limits



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Traffic Services Section

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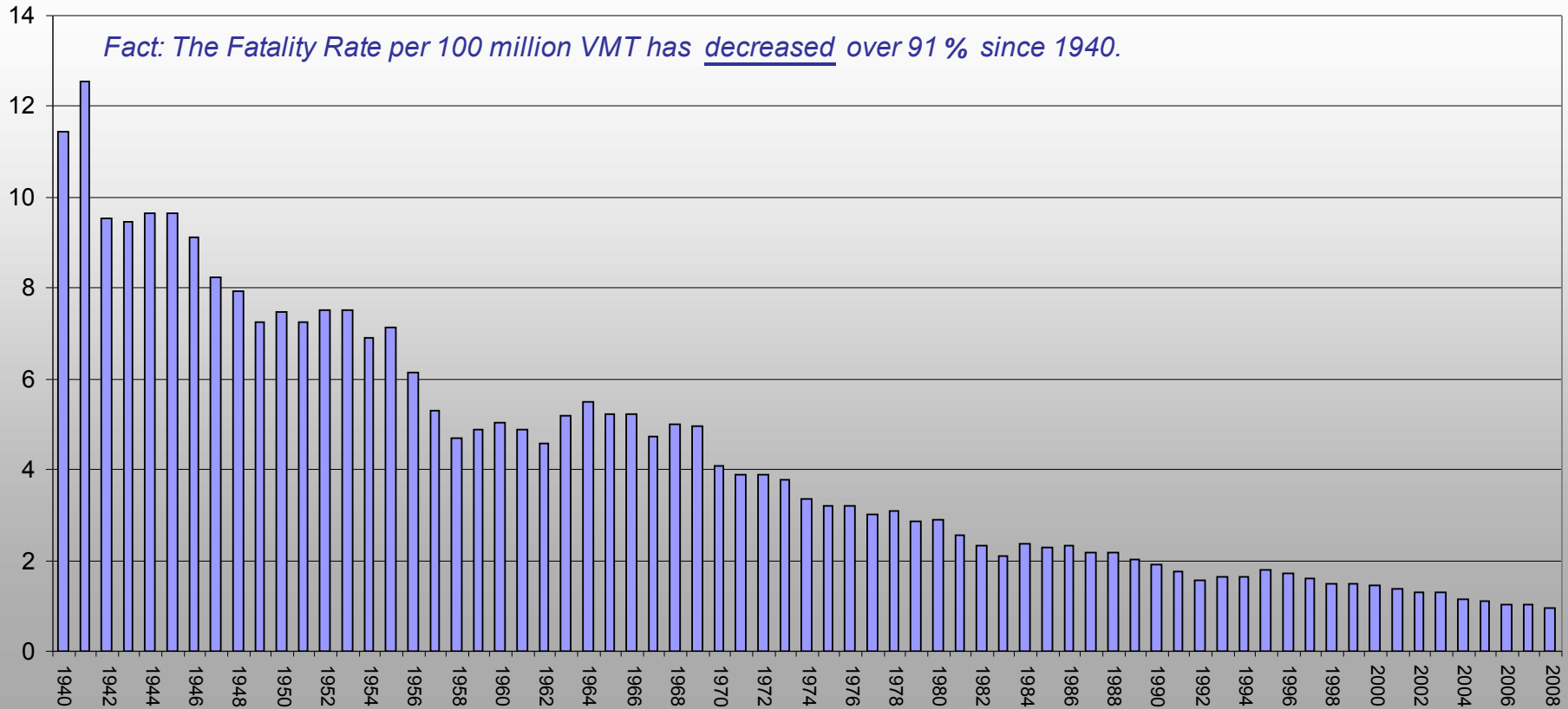
Our Goal is to Reduce the Number of Fatal and Serious Injury Crashes





1940-2008 Michigan Fatality Rate / 100 Million Vehicle Miles Traveled

Fact: The Fatality Rate per 100 million VMT has decreased over 91 % since 1940.



How are Speed Limits Established?

- A speed study is completed (*85th percentile speed determined*)
- Traffic crash data is analyzed (*number/rate and types of crashes*)
- Roadside environment is assessed (*residential, commercial, rural, etc.*)
- Roadway configuration is considered (*number of lanes, length of road, etc.*)
- All other factors that influence traffic and pedestrian movement are included in the **“Engineering and Traffic Investigation”**

How is a Speed Study Completed?

- Conducted during ideal driving conditions (*dry roads with free flow traffic*)
- Vehicle speeds are recorded away from influencing factors (*railroad crossings, signalized intersections, curves in the roadway, etc.*)
- Completed using a LIDAR (laser) in an unmarked vehicle parked in an inconspicuous location, or with automated tube counters

What is “85th Percentile Speed”?

- The speed that 85 percent of the vehicles are traveling at or below
- Ideal speed to set as the maximum limit:
 - Provides the lowest speed variance between vehicles, and thus provides the lowest crash numbers
 - Provides optimum enforceability
- The **SAFEST** speed limit

What is “Variance”?

- A statistical indicator of the overall uniformity of the data set
- In the case of a speed study, variance provides a measure of the uniformity of traffic flow
- Proportional to speed differentials and resulting conflicts between vehicles
- Minimum variance = greatest uniformity and maximum orderly traffic flow

What is “Average Speed”?

- The sum total of the speeds in the sample divided by the number of speed data points in the sample
 - *Not particularly relevant for speed limit setting, but a conventional measure that people are comfortable with*

Crash Involvement vs. Speed

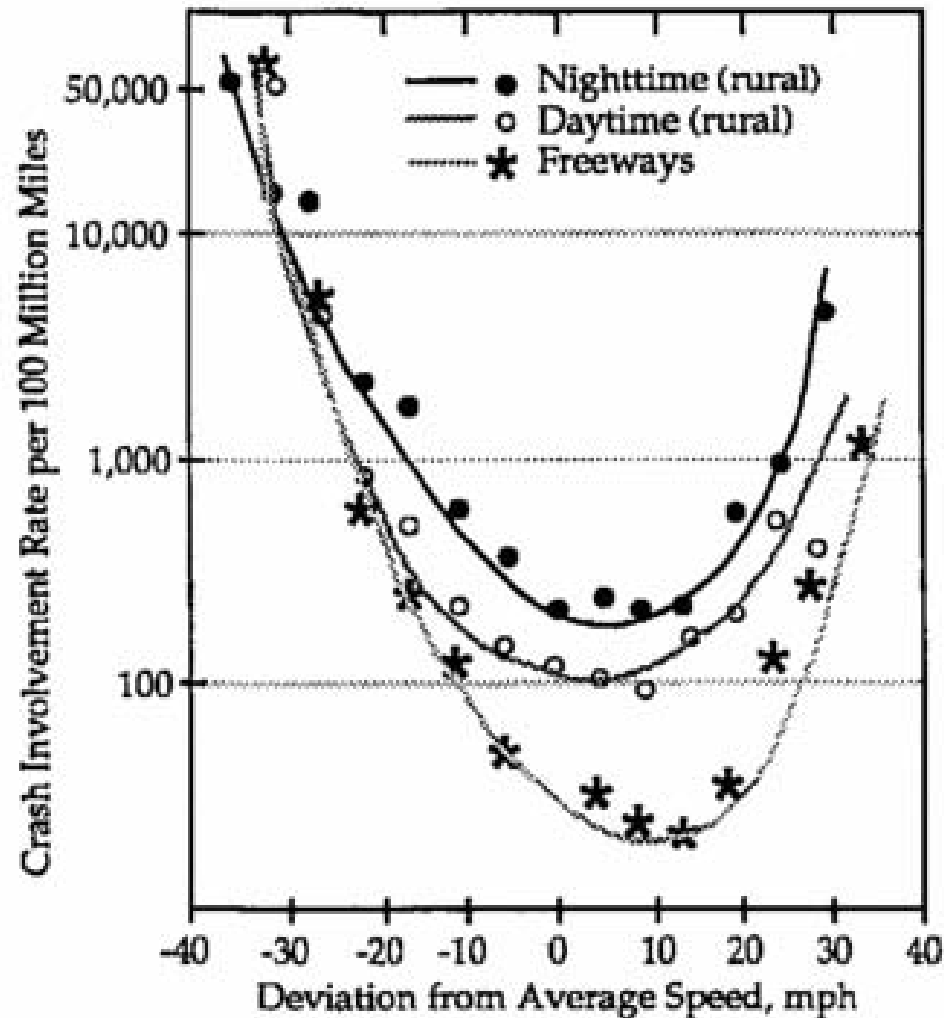


Figure B-2 Crash involvement rate by deviation from average traffic speed (Solomon 1964; Cirillo 1968 in Stuster and Coffman 1997, 4). 1 mph = 1.609 km/h.

Six Lane Urban Freeway



SPEED STUDY, FREEWAY

Speed	Number of Vehicles	Additional
55 <		
56		
57		
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78		
79		
80		
81		
82		
83		
84 +		

658 Vehicles, 17 minute study

SPEED STUDY, FREEWAY

Speed	Number of Vehicles	Additional
55 <		Speed Limit (2.4%)
56		
57		
58		
59		
60		
61		
62		
63		
64		
65		
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75		
76		
77		
78		
79		
80		
81		
82		
83		
84 +		

658 Vehicles, 17 minute study

SPEED STUDY, FREEWAY

Speed	Number of Vehicles	Additional
55 <		Speed Limit (2.4%)
56		
57		
58		
59		
60		
61		
62		
63		
64		
65		
66		50 th Percentile
67		
68		
69		
70		
71		
72		
73		85 th Percentile
74		
75		
76		
77		
78		
79		
80		2.1% @ 80+ mph
81		
82		
83		
84 +		

658 Vehicles, 17 minute study

SPEED STUDY, FREEWAY

Speed	Number of Vehicles	Additional
55 <		
56		
57		
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62		
63		
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78		
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80		
81		
82		
83		
84 +		

721 Vehicles, 18 minute study

SPEED STUDY, FREEWAY

Speed	Number of Vehicles	Additional
55 <		
56		
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61		
62		
63		
64		
65		
66		
67		
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70		Speed Limit
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80		
81		
82		
83		
84 +		

721 Vehicles, 18 minute study

SPEED STUDY, FREEWAY

Speed	Number of Vehicles	Additional
55 <		
56		
57		
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60		
61		
62		
63		
64		
65		
66		
67		
68		50 th Percentile
69		
70		Speed Limit
71		
72		85 th Percentile
73		
74		
75		
76		
77		
78		
79		
80		1.1% @ 80+ mph
81		
82		
83		
84 +		

721 Vehicles, 18 minute study

Speed Studies of Same Road with 55mph Speed Limit and 70mph Speed Limit

Average = 66.4mph Variance = 36.1

Average = 67.7mph Variance = 27.8 (-33%)

SPEED STUDY, FREEWAY

Speed	Number of Vehicles	Additional
55 <		Speed Limit (2.4%)
56		
57		
58		
59		
60		
61		
62		
63		
64		
65		
66		50 th Percentile
67		
68		
69		
70		
71		
72		
73		85 th Percentile
74		
75		
76		
77		
78		
79		
80		2.1% @ 80+ mph
81		
82		
83		
84 +		

658 Vehicles, 17 minute study

SPEED STUDY, FREEWAY

Speed	Number of Vehicles	Additional
55 <		
56		
57		
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60		
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62		
63		
64		
65		
66		
67		
68		50 th Percentile
69		
70		Speed Limit
71		
72		85 th Percentile
73		
74		
75		
76		
77		
78		
79		
80		1.1% @ 80+ mph
81		
82		
83		
84 +		

721 Vehicles, 18 minute study

Three Lane Residential Trunk Line



SPEED STUDY

Speed	Number of Vehicles	Additional
<25		
25		
26		
27		
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48		
49		
50		

155 vehicles, 15 minute study

SPEED STUDY, POSTED 25MPH ROAD

Speed	Number of Vehicles	Additional
<25		
25		Speed Limit
26		
27		
28		
29		
30		
31		
32		
33		
34		
35		
36		
37		
38		
39		
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41		
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45		
46		
47		
48		
49		
50		

155 vehicles, 15 minute study

SPEED STUDY, POSTED 25MPH ROAD

Speed	Number of Vehicles	Additional
<25		
25		Speed Limit
26		
27		
28		
29		
30		
31		
32		
33		
34		
35		+10mph
36		85th Percentile
37		
38		
39		
40		+15mph
41		
42		+17mph
43		
44		
45		+20mph
46		
47		
48		
49		
50		

155 vehicles, 15 minute study

SPEED STUDY

Speed	Number of Vehicles	Additional
<25		
25		
26		
27		
28		
29		
30		
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32		
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46		
47		
48		
49		
50		

168 vehicles, 12 minute study

SPEED STUDY, POSTED 35MPH ROAD

Speed	Number of Vehicles	Additional
<25		
25		
26		
27		
28		
29		
30		
31		
32		
33		
34		
35		Speed Limit
36		
37		
38		
39		
40		
41		
42		
43		
44		
45		
46		
47		
48		
49		
50		

168 vehicles, 12 minute study

SPEED STUDY, POSTED 35MPH ROAD

Speed	Number of Vehicles	Additional
<25		
25		
26		
27		
28		
29		
30		
31		
32		
33		
34		
35		Speed Limit
36		85th Percentile
37		
38		
39		
40		+5mph
41		
42		+7mph
43		
44		
45		+10mph
46		
47		
48		
49		
50		

168 vehicles, 12 minute study

Speed Studies of Same Road with 25mph Speed Limit and 35mph Speed Limit

Average = 32.8mph Variance = 10.9

Average = 32.4mph Variance = 11.2

SPEED STUDY, POSTED 25MPH ROAD

Speed	Number of Vehicles	Additional
<25		
25		Speed Limit
26		
27		
28		
29		
30		
31		
32		
33		
34		
35		+10mph
36		85 th Percentile
37		
38		
39		
40		+15mph
41		
42		+17mph
43		
44		
45		+20mph
46		
47		
48		
49		
50		

155 vehicles, 15 minute study

SPEED STUDY, POSTED 35MPH ROAD

Speed	Number of Vehicles	Additional
<25		
25		
26		
27		
28		
29		
30		
31		
32		
33		
34		
35		Speed Limit
36		85 th Percentile
37		
38		
39		
40		+5mph
41		
42		+7mph
43		
44		
45		+10mph
46		
47		
48		
49		
50		

168 vehicles, 12 minute study

A Proper Speed Limit

- 5 lane roadway
- Mixed business with some residential
- Traffic Control Order for 45 miles per hour was implemented in 1963

Five Lane Urban County Road



SPEED STUDY

Waverly south of Michigan

Speed	Number of Vehicles	Additional
30		
31		
32		
33		
34		
35		
36		
37		
38		
39		
40		
41		
42		
43		85th Percentile
44		
45		Speed Limit
46		
47		
48		
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51		
52		
53		
54		
55		
56		

258 vehicles, 20 minute study
(OVER CAST/DRY ROAD)

Public Perception

- Perception is that a higher speed limit will make the roadway less safe, because the public falsely thinks the actual travel speeds will increase
- Similarly, perception is that a lower speed limit will make the roadway safer, because the public falsely thinks the actual travel speeds will decrease

Reality

- The **perception** of the roadway becoming less safe is the only thing that changes significantly, *Travel speeds don't change*
- That perception of reduced safety can actually **enhance** safety by causing users to *reduce risk taking behavior*

Jolly Road @ 55mph

Jolly Road at West Driveway

Posted 55 mph

Speed	Number of Vehicles	Additional
35		
36		
37		
38		
39		
40		
41		
42		
43		
44		
45		
46		
47		
48		
49		
50		
51		
52		85% Patrol Car
53		
54		
55		Speed Limit
56		
57		
58		
59		
60		
61		

264 vehicles

85% Speed = 52 mph

Low Speed = 35 mph

High Speed = 61 mph

Patrol Car Speed = 52 mph

Compliance Rate = 95%

Jolly Road @ 45mph

Jolly Road at West Driveway

Posted 45 mph

Speed	Number of Vehicles	Additional
35		
36		
37		
38		
39		
40		
41		
42		
43		
44		
45		Speed Limit
46		
47		
48		
49		
50		
51		85% Patrol Car
52		
53		
54		
55		
56		
57		
58		
59		
60		
61		

330 vehicles

85% Speed = 51 mph

Low Speed = 36 mph

High Speed = 60 mph

Patrol Car Speed = 51 mph

Compliance Rate = 37%

Improper Change

Jolly Road at West Driveway
Posted 55 mph

Speed	Number of Vehicles	Additional
35		
36		
37		
38		
39		
40		
41		
42		
43		
44		
45		
46		
47		
48		
49		
50		
51		
52		85% Patrol Car
53		
54		
55		Speed Limit
56		
57		
58		
59		
60		
61		

264 vehicles
 85% Speed = 52 mph
 Low Speed = 35 mph
 High Speed = 61 mph
 Patrol Car Speed = 52 mph
 Compliance Rate = 95%

Jolly Road at West Driveway
Posted 45 mph

Speed	Number of Vehicles	Additional
35		
36		
37		
38		
39		
40		
41		
42		
43		
44		
45		Speed Limit
46		
47		
48		
49		
50		
51		85% Patrol Car
52		
53		
54		
55		
56		
57		
58		
59		
60		
61		

330 vehicles
 85% Speed = 51 mph
 Low Speed = 36 mph
 High Speed = 60 mph
 Patrol Car Speed = 51 mph
 Compliance Rate = 37%

NO
STOPPING
STANDING
PARKING

SPEED
LIMIT
35



Enforcement Effect

SPEED STUDY
Saginaw Hwy west of Abbott
Fully Marked Patrol Car

Speed	Number of Vehicles	Additional
30		
31		
32		
33		
34		
35		
36		
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41		
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43		
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51		
52		
53		
54		
55		
56		

140 vehicles, 10 minute study

SPEED STUDY
Saginaw Hwy west of Abbott

Speed	Number of Vehicles	Additional
30		
31		
32		
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51		
52		
53		
54		
55		
56		

158 vehicles, 13 minute study

Enforcement Effect?

SPEED STUDY
Saginaw Hwy west of Abbott
Fully Marked Patrol Car

Speed	Number of Vehicles	Additional
30		
31		
32		
33		
34		
35		Speed Limit
36		
37		
38		
39		
40		
41		
42		85 th Percentile
43		
44		
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48		
49		
50		
51		
52		
53		
54		
55		
56		

140 vehicles, 10 minute study

SPEED STUDY
Saginaw Hwy west of Abbott

Speed	Number of Vehicles	Additional
30		
31		
32		
33		
34		
35		Speed Limit
36		
37		
38		
39		
40		
41		
42		
43		85 th Percentile
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45		
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51		
52		
53		
54		
55		
56		

158 vehicles, 13 minute study



Thank You



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