Establishing Safe and Realistic Speed Limits



Lt. Gary Megge Michigan State Police Traffic Services Section <u>michigan.gov/msp-traffic</u>

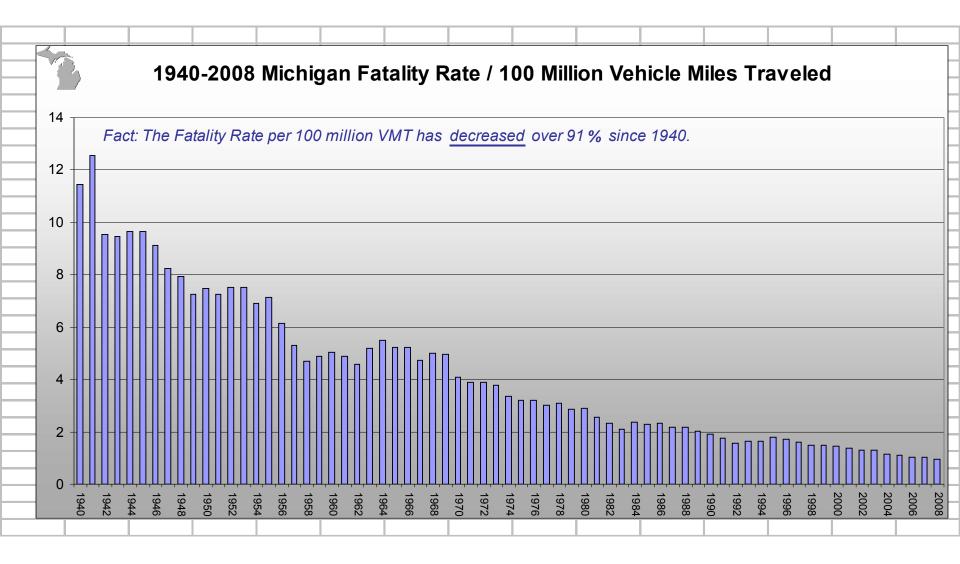
Our Goal is to Reduce the Number of Fatal and Serious Injury Crashes











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 <u>SAFEST</u> 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

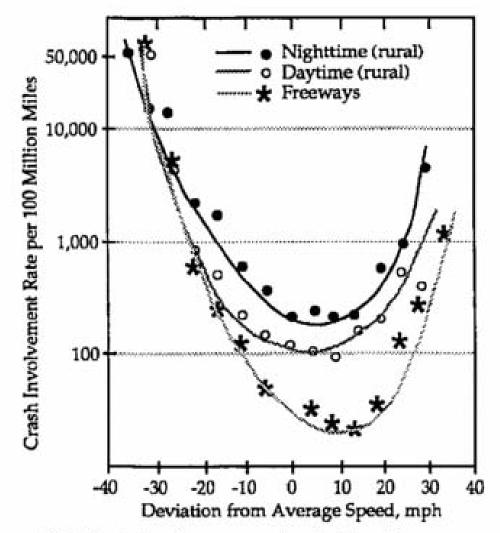


Figure B-2 Crash involvement rate by deviation from average traffic speed (Solomon 1964; Cirillo 1968 in Stuster and Coffman 1997, 4). 1 mph = 1.609 km/h.

Six Lane Urban Freeway



Speed	Number of Vehicles	Additional
55 <		
56		
57		
58		
59		
60		
61		
62		
63		
64		
65		
66		
67		
68		
69		
70		
71		
72		
73		
74		
75		
76		
77		
78		
79		
80		
81	II	
82		
83	1	
84 +		

Speed	Number of Vehicles	Additional
55 <		Speed Limit (2.4%)
56		
57		
58		
59		
60		
61		
62		
63		
64		
65		
66		
67		
68		
69		
70		
71		
72		
73		
74		
75		
76		
77		
78		
79	11111	
80		
81	II	
82		
83	I	
84 +		

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	II	
82		
83	1	
84 +		

Speed	Number of Vehicles	Additional
55 <		
56	I	
57		
58		
59		
60		
61		
62		
63		
64		
65		
66		
67		
68		
69		
70		
71		
72		
73		
74		
75		
76		
77		
78		
79		
80	I	
81	1	
82		
83	1	
84 +		

Speed	Number of Vehicles	Additional
55 <		
56	Π	
57		
58		
59		
60		
61		
62		
63		
64		
65		
66		
67		
68		
69		
70		Speed Limit
71		
72		
73		
74		
75		
76		
77		
78		
79		
80	I	
81	1	
82		
83	1	
84 +		

Speed	Number of Vehicles	Additional
55 <		
56	Π	
57		
58		
59		
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	II	1.1% @ 80+ mph
81	1	
82		
83	1	
84 +		

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	1111111	
78	111111	
79	11111	
80		2.1% @ 80+ mph
81	Ш	
82		
83	1	
84 +	11	
	658 Vehicles, 17 minute	study

SPEED STUDY, FREEWAY

Speed	Number of Vehicles	Additional
55 <		
56	Π	
57		
58		
59		
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	II	1.1% @ 80+ mph
81	1	
82		
83	1	
84 +		

Three Lane Residential Trunk Line



SPEED STUDY

Speed	Number of Vehicles	Additional
<25		
25	II	
26	1	
27		
28	111111	
29	1111	
30		
31		
32		
33		
34		
35		
36		
37	111111	
38	111111	
39		
40	1	
41		
42	1	
43		
44		
45	1	
46		
47		
48		
49		
50		
L	155 vahialas 15 minuto at	

SPEED STUDY, POSTED 25MPH ROAD

Speed	Number of Vehicles	Additional
<25		
25	II	Speed Limit
26	1	
27		
28		
29		
30		
31		
32		
33		
34		
35		
36		
37		
38		
39		
40	1	
41		
42	1	
43		
44		
45	Ι	
46		
47		
48		
49		
50		

SPEED STUDY, POSTED 25MPH ROAD

Speed	Number of Vehicles	Additional
<25		
25		Speed Limit
26	1	
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	1	+20mph
46		
47		
48		
49		
50	vehielee 45 minute	

SPEED STUDY

<25 III 25 I 26 IIIII 27 IIIII 28 II 29 IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	Speed	Number of Vehicles	Additional
26 IIII 27 IIII 28 I 29 IIIIIIIIIII 30 IIIIIIIIIIII 31 IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	<25		
27 IIII 28 II 29 IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	25		
28 II 29 IIIIIIIIIII 30 IIIIIIIIIIIII 31 IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	26		
29 IIIIIIIIIII 30 IIIIIIIIIIIII 31 IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	27		
30 IIIIIIIIIII 31 IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	28	II	
31 IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	29		
32 IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	30		
33 IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	31		
34 IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	32		
35 IIIIIIIIIIIII 36 IIIIIIIIIII 37 IIIIIIIII 38 II 39 III 40 I 41 I 42 I 43 I 44 I 45 I 46 I 47 I 48 I 49 I	33		
36 IIIIIIIIII 37 IIIIIIIII 38 II 39 III 40 I 41 I 42 I 43 I 44 I 45 I 46 I 47 I 48 I 49 I	34		
37 IIIIIIII 38 II 39 III 40 I 41 I 42 I 43 I 44 I 45 I 46 I 47 I 48 I 49 I	35		
38 II 39 III 40 I 41 I 42 I 43 I 44 I 45 I 46 I 47 I 48 I 49 I	36		
39 III 40 I 41 I 42 I 43 I 44 I 45 I 46 I 47 I 48 I 49 I	37		
40 I 41 I 42 I 43 I 44 I 45 I 46 I 47 I 48 I 49 I	38		
41 1 42 1 43	39		
42 I 43	40		
43 43 44 44 45 1 46 46 47 48 49 49	41		
44	42		
45 I 46	43		
46 47 47 48 49 49	44		
47 48 49	45		
48 49	46		
49	47		
	48		
50	49		
	50		

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		
	vohiolog 12 minute	

SPEED STUDY, POSTED 35MPH ROAD

<25 III 26 IIIII 27 IIIII 28 II 29 IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	Speed	Number of Vehicles	Additional
26 IIIII 27 IIIII 28 II 29 IIIIIIIIIIII 30 IIIIIIIIIIII 31 IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	<25		
27 IIIII 28 II 29 IIIIIIIIIIII 30 IIIIIIIIIIIII 31 IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	25	1	
28 II 29 IIIIIIIIIII 30 IIIIIIIIIIII 31 IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	26		
29 IIIIIIIIIII 30 IIIIIIIIIIII 31 IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	27		
30 IIIIIIIIIIII 31 IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	28	II	
31 IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	29		
32 IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	30		
33 IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	31		
34 IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	32		
35 IIIIIIIIIIII Speed Limit 36 IIIIIIIIII 85 th Percentile 37 IIIIIIII 38 38 II	33		
36 IIIIIIIIII 85 th Percentile 37 IIIIIIIII 38 38 II 39 40 I +5mph 41 41 42 42 I +7mph 43 44 44 45 I +10mph 46 47 48 49	34		
37 IIIIIIIII 38 II 39 III 40 I 41 +5mph 42 I 43 - 44 - 45 I 46 - 47 - 48 - 49 -	35		Speed Limit
38 II 39 III 40 I +5mph 41	36		85 th Percentile
39 III 40 I +5mph 41	37		
40 I +5mph 41 - - 42 I +7mph 43 - - 44 - - 45 I +10mph 46 - - 47 - - 48 - - 49 - -	38		
41	39		
42 I +7mph 43 - - 44 - - 45 I +10mph 46 - - 47 - - 48 - - 49 - -	40		+5mph
43	41		
44	42		+7mph
45 I +10mph 46	43		
46 47 47 48 49 49	44		
47 48 49	45		+10mph
47 48 49	46		
49	47		
	48		
50	49		
	50		

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	II	Speed Limit
26	1	
27		
28		
29		
30		
31		
32		
33		
34		
35		+10mph
36		85 th Percentile
37		
38		
39	1111	
40	1	+15mph
41		
42	1	+17mph
43		
44		
45	1	+20mph
46		
47		
48		
49		
50		
4.5.5	vohiclos 15 minuto	a for all a

SPEED STUDY, POSTED 35MPH ROAD

Speed	Number of Vehicles	Additional
<25	III	
25	I	
26		
27		
28		
29		
30		
31		
32		
33		
34		
35		Speed Limit
36		85 th Percentile
37		
38		
39		
40	1	+5mph
41		
42	1	+7mph
43		
44		
45	I	+10mph
46		
47		
48		
49		
50		
	68 vehicles 12 minute	

155 vehicles, 15 minute study

49		0
50	Π	2
51		7
52		5
53		14
54		34
55	IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	59
56		93
57		110
58		169
59		210
60		212
61		207
62		190
63		165
64		108
65	IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	87
66		62
67		40
68		29
69		26
70		16
71		15
72		15
73		10
74		6
75	III	3
76		5
77		0
78	II	2
79	Ι	1
80		1867

US-127 speed study totals, July 16, 2007 Start 11:00am – Stop 3:15pm (actual 2 hours 38 minutes) 8 locations, approximately 1,867 vehicles

55mph or less 117 vehicles 6.3 percent 60mph or less 867 vehicles 46.4 percent 65mph or less 1649 vehicles 88.3 percent 70mph or less 1810 vehicles 97.0 percent 71mph or moreTotal57 vehicles1,8673.0 percent

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	111	
31		
32		
33		
34		
35		
36		
37		
38		
39		
40		
41	111111111111	
42		
43		85th Percentile
44	1111111	
45		Speed Limit
46		
47	II	
48		
49		
50	1	
51		
52		
53		
54		
55	1	
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, <u>Travel speeds don't change</u>
- That perception of reduced safety can actually enhance safety by causing users to <u>reduce risk</u> <u>taking behavior</u>

Jolly Road @ 55mph

	Jolly Road at West Driveway Posted 55 mph			
Spee		of Vehicles Additional		
35	1			
36				
37	1			
38	II			
39	11111			
40	1111111			
41				
42				
43				
44				
45				
46				
47				
48				
49				
50				
51				
52		85% Patrol Car		
53				
54				
55		Speed Limit		
56	1111			
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 Ш П Ш **Speed Limit** 85% Patrol Car

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

Jolly	Road at West Drivewa	y
	Posted 45 mph	

Speed	Number of Vehicles	Additional
35	1	
36		
37	1	
38	П	
39		
40		
41	11111	
42		
43		
44		
45		
46		
47		
48		
49		
50		
51		
52	1111111	85% Patrol Car
53		
54	11111	
55	1111111	Speed Limit
56	1111	
57		
58		
59		
60		
61	1	

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

Speed	Number of Vehicles	Additional
	11	
	11	
	111	
	1	
	1111111	
		Speed Limit
		85% Patrol Car
	1111111111	
	111111	
	11111111	
	11111	
	11	
	11	
	1	
	1	
	Speed	Speed Number of Vehicles II II II II III III III III III III III III IIIIIII IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII

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



Enforcement Effect

SPEED STUDY Saginaw Hwy west of Abbott Fully Marked Patrol Car

Speed	Number of Vehicles	Additional
30	III	
31		
32		
33	111111	
34	111111	
35	111111	
36		
37		
38		
39		
40		
41		
42		
43	111111	
44		
45	III	
46		
47	1	
48	1	
49		
50		
51		
52		
53		
54		
55		
56	140 vehieles 40 minute et	_

SPEED STUDY Saginaw Hwy west of Abbott

Speed	Number of Vehicles	Additional
30	11	
31	II	
32	III	
33	III	
34	11111	
35	111111	
36		
37		
38		
39		
40		
41		
42		
43		
44	11	
45	11111	
46	III	
47	III	
48	II	
49	1	
50		
51		
52		
53		
54		
55		
56		

140 vehicles, 10 minute study

Enforcement Effect?

SPEED STUDY Saginaw Hwy west of Abbott Fully Marked Patrol Car

Speed	Number of Vehicles	Additional
30	III	
31		
32		
33	111111	
34	111111	
35	11111	Speed Limit
36		
37		
38		
39		
40		
41		
42		85 th Percentile
43		
44	11111	
45	111	
46		
47	1	
48	1	
49		
50		
51		
52		
53		
54		
55		
56		

SPEED STUDY Saginaw Hwy west of Abbott

Speed	Number of Vehicles	Additional
30	11	
31	II	
32		
33	III	
34	11111	
35	111111	Speed Limit
36		
37		
38		
39		
40		
41		
42		
43		85 th Percentile
44	11	
45	11111	
46	111	
47		
48	II	
49		
50		
51		
52		
53		
54		
55		
56		

140 vehicles, 10 minute study



Thank You



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