THE RELATIONSHIP OF SEAT BELT LAW ENFORCEMENT TO LEVEL OF BELT USE

B. J. CAMPBELL

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by

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I. Introduction

In a state with a seat belt law, enforcement is generally thought to be an important factor in obtaining belt usage high enough to produce a discernible casualty reduction. This paper examines the relationship between level of enforcement activity and level of belt use in jurisdictions having belt use laws as of January, 1987. Three groupings of states were considered:

1. Eight states have primary enforcement policies in which the officer may stop a motorist solely on the basis of a seat belt law violation;

2. Twelve states follow secondary enforcement policies under which a belt law violation may be addressed only if the officer has stopped the motorist for some other purpose;

3. Five other secondary enforcement states, at the time of this survey, enforced their laws by issuing warning tickets only. In some cases this warning policy is prelude to a later period when regular citations will be issued.

II. Data Sources

ENFORCEMENT DATA

A survey was sent to the commander of the highway patrol or state police in states that have enacted a seat belt law. Virginia, Colorado, and Montana were not included because their enactments were so recent. The survey included questions on the effective date of the laws, number of warnings and citations issued, time period covered, and whether the law allowed primary or secondary enforcement. All jurisdictions returned the survey, a copy of which is included as Appendix 1.

The data are confined to statistics on *citations* and do not tell how many eventually resulted in convictions, the amount of the penalty, or other elements of the adjudication process. Also, the data are drawn only from state police agencies because local enforcement data is rarely assembled on a statewide basis. In North Carolina, for example, there are literally hundreds of police agencies, and it was beyond the scope of this survey to assemble enforcement activity data from such diverse sources across the nation.

Thus, the analysis reported here is confined to information from the state police

and implicitly assumes such state level enforcement to be indicative of enforcement by other police agencies within the state. Doubtless this assumption is more valid in some states than in others. Nevertheless, these numbers do reflect statewide enforcement by what is normally the largest single police agency in the state.

BELT USE DATA

A second survey was sent to the Governor's Highway Safety Representative in belt law states. For the reasons noted above, Virginia, Colorado, and Montana were excluded, as were New York, Michigan, and North Carolina, the latter three because the author had recent information from those states. The questionnaire (see Appendix 2) asked about the statewide belt usage rate from each state, effective date of the law, and effective date of full enforcement if different. All jurisdictions returned the survey.

It is clear that characterizing statewide belt use with a single percentage rate does not allow for important variation by time, place, vehicle type, and seated position. Some of the state data characterizes only driver belt use, while other states describe drivers plus front seat occupants. Even so, these numbers represent the most comprehensive data available for statewide belt use.

III. Results

ENFORCEMENT

To achieve a consistent description of enforcement level across the several states, the number of citations reported was annualized by projecting upward or downward to a one year basis. The annual estimate was then expressed as the number of citations per 100,000 population. Table 1 shows these enforcement values for the various states, and a more detailed reference table is included as Appendix 3.

There was considerable variation in the level of enforcement reported by state police, ranging from as few as ten tickets per 100,000 in Idaho to as many as 878 per 100,000 in Hawaii. Note that the data presented here are based on varying lengths of time. For example, Utah shows 418 citations per 100,000 population with data annualized from a two month period. Extrapolating from this short period is more subject to error than using the full year of data available from Texas, for example. Also, annualizing from the first few months of experience may yield a spuriously high enforcement number if police initially enforce a new law more heavily.

Enforcement contacts per capita are generally higher in states where only warning tickets are given. In four of the five such states, officers give out those tickets at a rate greater than 1,000 per 100 thousand population -- some *considerably* greater. On the other hand, no state issues actual tickets at such a high rate.

Table 1
Annual Seat Belt Citations per 100,000 Population

State	primary vs secondary enf.	tickets per year per 100,000 population	
California	S	637	
Connecticut	P	175	
Colorado	law not yet in effect		
D.C.	S	753	
Florida	S		(2,419 warnings only)
Hawaii	P	878	
Idaho	S	10	
Illinois	P	38	
Indiana	law not yet in effect		
Iowa	P	706	
Kansas	S		(1,779 warnings only)
Louisiana	S	54	
Maryland	S	466	
Massachusetts	S	468	
Michigan	S	254	
Minnesota	S		(1,414 warnings only)
Missouri	S		(3,728 warnings only)
Montana	law not yet in effect		
Nebraska	S	46	
New Jersey	S	159	
New Mexico	P	102	
New York	P state police	79	
	local police	314	
North Carolina	P	542	
Ohio	S	846	
Oklahoma	law just underway		
Tennessee	S		(670 warnings only)
Texas	P	513	
Utah	S	418	
Virginia	law not yet in effect		
Washington	S	300	

It is likely that the level of formal enforcement will decrease upon the transition from warning tickets to citations. In North Carolina, during the warning ticket phase, 1,854 warnings per 100 thousand were issued. Once into the full enforcement phase this number decreased to 542 per 100 thousand. This decline is not surprising. Officers may be willing to issue a warning under circumstances in which a full citation would not be appropriate. (Total enforcement contacts may, however, be unaffected

since no record is made of verbal admonitions.)

BELT USE

Table 2 is a summary of the belt use survey results from 27 belt law states:

Table 2
Belt Use Survey Results by State

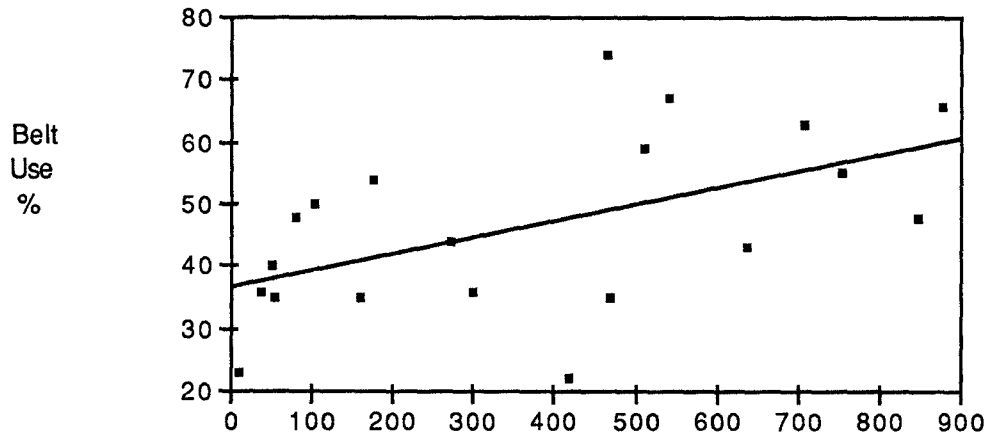
State	highest belt use %	latest belt use %	
California	47	43	
Connecticut	54	54	
Colorado			
D.C.	55	55	
Florida	60	60	
Hawaii	73	66	
Idaho	25	23	
Illinois	40	36	
Indiana (pre-law)	20	20	
Iowa	63	63	
Kansas	24	24	
Louisiana	35	35	
Maryland	74	74	
Massachusetts	37	25	(repeal)
Michigan	58	44	
Minnesota	33	32	
Missouri	34	34	
Montana			
Nebraska	45	29	(repeal)
New Jersey	42	35	
New Mexico	53	50	
New York	57	48	
North Carolina	77	67	
Ohio	48	48	
Oklahoma (pre-law)	41	41	
Tennessee	19	19	
Texas	66	59	
Utah	22	22	
Virginia			
Washington	36	36	
ABOVE STATES, POPULATION WEIGHTED		**45%**	

Table 2 shows the highest usage value reported and the most recent value available at the time of the survey. Table 2 is derived from the more complete table in Appendix 4. As may be seen, there was considerable variation in the levels of belt use most recently reported. Five states report use in the 60-74% range, while 10 other belt law states report use less than 40%. The population weighted average of all the most recent values in Table 2 is 45%.

ASSOCIATION OF ENFORCEMENT AND BELT USE

From the figures given in Tables 1 and 2, the statistical association between enforcement and belt use was determined. Figure 1 below is a scatter plot showing enforcement and usage data from 20 primary and secondary enforcement states combined. Kendall's Tau, a non-parametric version of a correlation coefficient, was calculated, and was found to be +.42, a value significantly different from zero. Thus, there was a definite association between enforcement and belt usage, but with the primary and secondary state data aggregated there was considerable variability around the regression line.

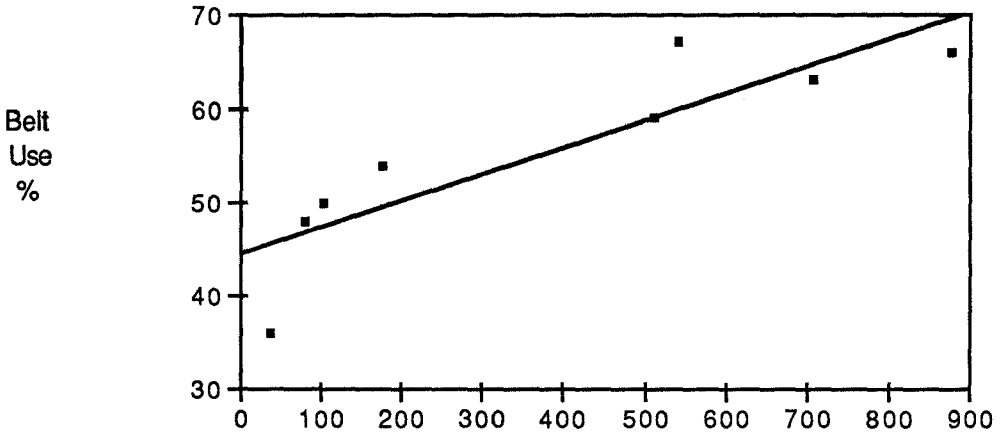
Figure 1: Belt Usage vs Enforcement for 20 Primary and Secondary Enforcement States



intercept value : 36.7% p<.01
slope value : .027
Kendall's Tau : +.42 p<.01

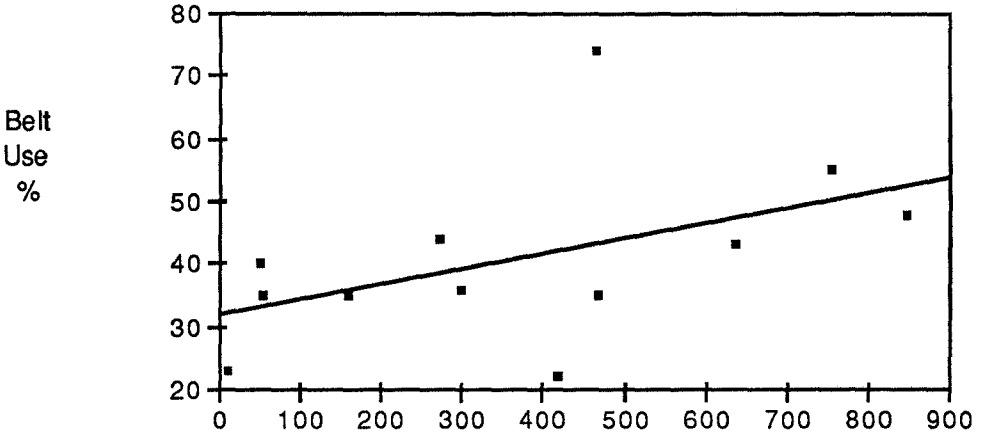
A clearer relationship emerges when primary and secondary enforcement states are considered separately. Figure 2 is confined to the eight primary enforcement states, and Figure 3 covers the 12 secondary enforcement states.

Figure 2: Belt Usage vs Enforcement for Eight Primary Enforcement States



intercept value : 44.5% p<.01
slope : .029
Kendall's Tau : + .86 p<.01

Figure 3: Belt Usage vs Enforcement in 12 Secondary Enforcement States



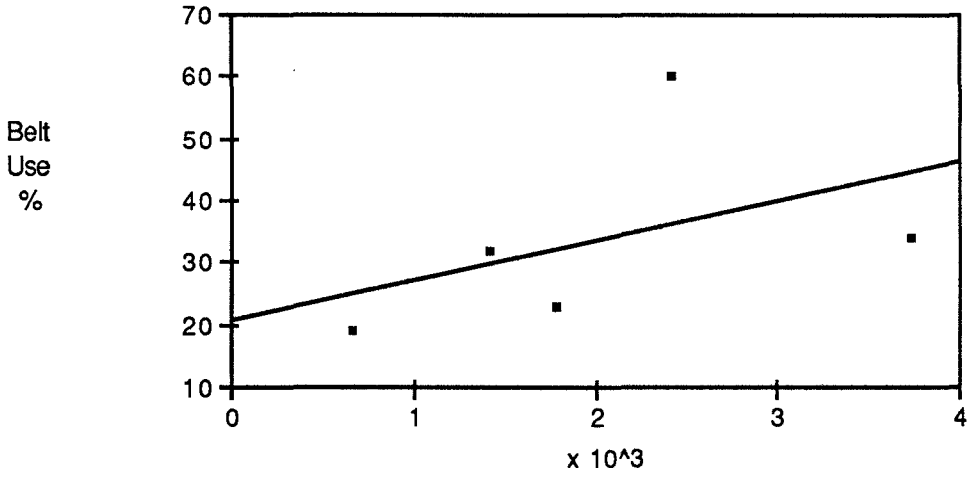
intercept value: 31.9% p<.01
slope : .024
Kendall's Tau : .43 p<.03

Before describing the regression relationships one should be reminded that only a relatively few plotting points are available. At the same time, most of the individual data points should be rather stable because most are based on thousands of observations. Once the data were disaggregated, it was found that for primary enforcement states, the association between enforcement and belt use was much stronger, with a Tau of +.86. Also note that the intercept point is at 45% belt use. This becomes more noteworthy when contrasted with Figure 3 which is the scatter plot for secondary enforcement states. For secondary enforcement states the Tau is +.43 and the intercept value is 32%.

Thus, there are interesting points of comparison between the primary and secondary enforcement states. First, the regression slope of the primary states is steeper than that of the secondary states -- .029 vs .024. Second, the intercept values are different -- 45% vs 32 %. Third, both Kendall Tau values are substantial and each is significantly different from zero, though for primary enforcement states the Tau value is considerably greater. Indeed, for the primary enforcement states, there is a remarkably clear relationship between enforcement level and belt use level.

Finally, consider the same data relationship for the five states that enforce only by use of warning tickets. See Figure 4.

Figure 4:Belt Usage vs Warning Tickets in Five States

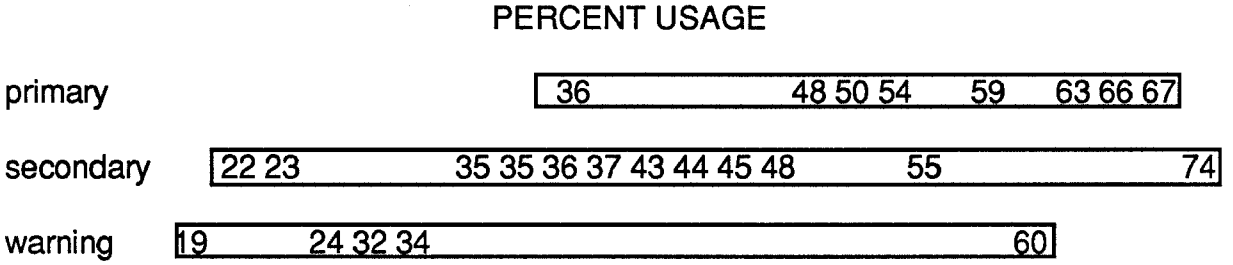


intercept value:		20.9%	p=.28
slope	:	.006	
Kendall's Tau	:	.60	p=.07

Here, the intercept is lower -- about 21%, and is not significantly different from zero. The slope of the regression is shallow and not significantly different from zero. The Tau value, though a high +.60 has a *p* value greater than .05. Thus, level of warning ticket enforcement does not show as strong an association with belt usage as do

the other enforcement modes.

To summarize the differences in belt use level among the three enforcement modes, note the pattern below when the belt usage levels are ranked within each of the three state groupings:



IV. DISCUSSION

The foregoing analysis suggests two additive factors at work. First, in both primary and secondary enforcement states, belt usage is higher in the presence of higher levels of enforcement. Second, for a given level of enforcement, usage is higher in primary than in secondary enforcement states. For primary enforcement states the regression slope is steeper and the intercept value is higher by 13 percentage points. Also, the Kendall Tau values were a substantial +.86 for primary states and +.43 for secondary states.

Though both of these findings are really no more than common sense would suggest, the surprise to this author is that the relationships are as strong as they are. Since there are presumably many other factors that mediate the level of belt usage, it would not be surprising if the relationship between enforcement and usage were more tenuous than seen here. On the other hand, it is also possible that some of these other factors act in concert with enforcement. It is possible, and in fact, likely that states with high levels of enforcement may also have a more active public information program and other elements associated with increased belt use. Since the analysis herein is a measure of association between enforcement and belt use, one cannot rule out the possibility that related factors may contribute to the strength of that association.

The important difference between primary and secondary enforcement is highlighted even more when Illinois is considered in more detail. The results presented here included Illinois as a primary enforcement state because there is nothing in the Illinois statute that specifically makes it a secondary enforcement state. However, it is clear that the belt law is enforced in Illinois on a secondary basis. In view of that it is interesting to note the changes in the regression analyses when Illinois is removed from the primary state group and inserted into the secondary state group.

The table below shows the changes:

	Illinois included as primary		Illinois included as secondary	
	primary	secondary	primary	secondary
intercept	44.5%	31.9%	48.6%	32.5%
slope	.029	.024	.022	.023
Tau	.86	.43	.81	.42

As can be seen, the effect of shifting Illinois into the secondary states where it more nearly belongs is a sharpening the difference between the two groups of states. The intercept values are now 49% vs 32%, a difference of 17% rather than the 13% seen when Illinois is in the primary group. Also the two slopes become more nearly identical. With Illinois in the secondary group one can say that the increment of belt use with incremental enforcement is much the same for the two state groupings except that in primary states there is a 17% advantage at any level of enforcement observed here.

With regard to warning tickets, the data indicate a much weaker relationship with level of compliance. However, it seems inappropriate to dismiss the use of warning tickets when issued as a prelude to later enforcement with a fine. In North Carolina there was a 15-month period when warning tickets only were issued, before advent of full enforcement. During that time, belt use was stable at about 42-44%, accompanied by a rather high level of such warning ticket enforcement. Once full enforcement took effect, belt use increased from 44% to 77% (later falling to 67%). One might hypothesize that the warning tickets contributed to a perception of enforcement which, while not directly translating into increased belt use, nevertheless may have facilitated higher use rates once the fine took effect.

Enforcement levels vary widely from state to state in the USA. Seven of the 20 states issue 500 or more citations per year per hundred thousand population, while eight other states are below 200. In two Australian states, where belt use is reported in the 90% range, enforcement was 365 tickets per 100,000 in New South Wales, and 1,331 per 100,000 in Queensland. In the latter the fine is rather low relative to the other Australian states (Milne, 1986 reported in Campbell and Campbell, 1986). In Sweden, where belt use is reported at or above 85%, the enforcement rate was reported between 650 and 1,300 per 100,000 population (Vaaje, 1986 reported in Campbell and Campbell, 1986). The point is that, notwithstanding the overall statistical relationship between enforcement and belt use, some foreign countries have much higher use than is so far seen in the USA at a given enforcement level. One must presume that other factors are also of considerable importance. It is sometimes said that *perception* of enforcement may be more important than the actual enforcement activity level. Such perception is presumably based on public information as well as the enforcement activities themselves.

In Elmira, NY, where a special enforcement and publicity effort was undertaken, belt use increased from 49% to 77% and had declined only to 66% a few months later. During said project the enforcement level at that time was about 540 per 100,000 population, well within the range seen elsewhere in the USA (re-calculated from Williams, Preusser, Blomberg, and Lund, 1986, reported in Campbell and Campbell, 1986). Publicity during this campaign was quite intense by almost any standard.

In summary, across the country the population-weighted belt use averages about 45% in belt law states. [Incidentally this value agrees rather closely with the 47% figure cited for the belt law cities among NHTSA's 19 city survey (Goryl, Michael, et al., 1987)]. Belt usage is higher in primary enforcement states, and lower where a secondary enforcement policy prevails, particularly, one would think, when knowledge of that secondary policy is widespread. Likewise, regardless of the state's primary or secondary enforcement status, when enforcement level is low, belt usage tends to be low. Clearly both of these situations can be remedied by leadership action in the respective states. The importance of the issue is obvious: It will not be possible to achieve the desirable casualty-reducing benefits of the laws if the population belt use rate is low. Raising belt usage level seems clearly associated with higher levels of enforcement, presumably accompanied by enough public information to sustain an appropriate public perception.

V. REFERENCES

Campbell, B.J. and Campbell, Frances A. (1986) Seat belt law experience in four foreign countries compared to the United States, AAA Foundation for Traffic Safety, Falls Church, Virginia.

Goryl, M.E. and Bowman, B.L. (1987) Restraint system usage in the traffic population, Goodell-Grivas, Southfield Michigan, NHTSA Report DOT HS 807 080, Washington D.C.

Milne, P.W. (1986) Summary of current situation related to restraint usage in Australia. Personal communication.

Vaaje, T. (1986) Effectiveness of safety belt use laws: A multinational examination. Washington, D.C.: National Highway Traffic Safety Administration [DOT HS 807 018].

Williams, A.F., Preusser, D.F., Blomberg, R.D., et al. (1986) Results of a seat belt use law enforcement and publicity campaign in Elmira, N.Y. Washington D.C.: Insurance Institute for Highway Safety.

APPENDIX 1

UNC Highway Safety Research Center
Seat Belt Enforcement Questions

1. Does your seat belt statute allow primary enforcement, or must you confine belt law enforcement to situations in which the motorist has already been stopped for some other reason? (secondary)?

Primary _____
Secondary _____

Comments:

2. If your law permits primary enforcement, is that the way it is actually handled, or do your officers tend to enforce the belt law secondary to other offenses?

Comments:

3. Level of Enforcement:

Could you give me seat belt law enforcement figures? Please tell me the period covered and the number of tickets your organization has issued.

Number of citations for belt law violations _____

Time period of above figures _____

Number of warning tickets _____

Time period of above figures _____

If I have questions may I have name and phone number of someone I can contact in your organization?

Contact person:

Telephone number:

Thank you!

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Seat Belt Law Survey Form

If possible I hope you are willing to provide information on your state seat belt law. The information will be used in a national research project to evaluate benefits of said laws. If you have any questions, or if there are problems with providing this information, I hope you will call me.

Thank you very much.

B.J. Campbell, Director
(919) 962-2202
March 18, 1987

STATE _____

1. Please provide the name, address, and phone number of your state seat belt coordinator:

2. Please enclose a copy of your adult seat belt law.

3. What was the effective date of your law?_____

4. When did enforcement begin (as opposed to warning tickets only)?_____

5. Please provide the name address and phone number of the person responsible for technical aspects of your on-the-road belt use surveys:

6. My information on seat belt use in your state is shown below. Would you verify and correct it? Cross it out if it is wrong, and add in any data (recent or otherwise) that I don't have.

This survey completed by:

seat belt coordinator (see other page)_____

technical sampling person (see other page)_____

name and phone number of person providing this information if not otherwise provided:

Appendix 3: SEAT BELT ENFORCEMENT SURVEY

State	Population	Citations Issued		Time Period	Annual per 100,000	Warning Tickets	Time Period	Annual Per 100,000	Comment
California	26,365,000	S	140,038	3/1/86 to 12/31/86 10 months	637	NA	-- --verbal warnings only Jan-Feb 86		
Connecticut	3,174,000	P	5,094	2/1/86 to 12/31/86 11 months	175	357	same	12	
District of Columbia	626,000	S	4,717	calendar yr. 1986	753	2,936	same	469	
Florida	11,366,000	S	NA	---	---	114,556	7/1/86 to 11/30/86 5 months	2,419	warning tickets are "verbal only"
Hawaii	1,054,000	P	10,214	12/85 to 2/7/87 13.25 months	878	2,151	same	185	
Idaho	1,005,000	S	50	7-12, 1986 6 months	10	NA	---	---	
Illinois	11,535,000	P	2,565	7/1/86 to 1/31/87 7 months	38	60,237	same	895	state police have adopted secondary enforcement policy
Indiana				Law not yet in effect					
Iowa	2,884,000	P	1,697	January, 1987 1 month	706	46,251	7/1/86 to 1/31/87 7 months	2,749	

S = Secondary enforcement P = Primary enforcement

State	Population		Citations Issued	Time Period	Annual per 100,000	Warning Tickets	Time Period	Annual Per 100,000	Comment
Kansas	2,450,000	S	NA	—	—	25,430	7/1/86 to 1/31/87 7 months	1,779	warnings only through 6/30/87
Louisiana	4,481,000	S	1,008	8/86 to 12/86 5 months	54	NA	—	—	warning tickets are "verbal only"
Maryland	4,392,000	S	8,527	8/1/86 to 12/31/86 5 months	466	9,925	7/1/86 to 12/31/86 6 months	452	
Massachusetts	5,822,000	S	25,000	1/1/86 to 12/4/86 11 months	468	20,000	same	375	repeal of law took effect on 12/4/86
Michigan	9,088,000	S	30,827	7/85 to 10/86 15 months	254	NA	—	—	
Minnesota	4,193,000	P	—	—	—	24,709	8/1/86 to 12/31/86 5 months	1,414	
Missouri	5,029,000	S	—	—	—	250,000	9/1/85 to 12/31/86 16 months	3,728	enforcement begins 7/1/87
Nebraska	1,606,000	S	865	9/1/85 to 10/31/86 14 months	46	16,713	same	892	repealed 11-86
New Jersey	7,562,000	S	23,290	3/1/85 to 2/8/87 23.25 months	159	NA	—	—	—

S = Secondary enforcement P = Primary enforcement

State	Population		Citations Issued	Time Period	Annual per 100,000	Warning Tickets	Time Period	Annual Per 100,000	Comment
New Mexico	1,450,000	P	1,479	calendar yr. 1986	102	177	same	12	
New York	17,783,000	P	St. Pol. Local 28,171 111,829	1985 and 1986 2 years	St. Pol Local 79 314	none	—	—	rate is figured for both state police and local law enforcement
North Carolina	6,255,000	P	3,534	1/1/87 to 2/8/87 1.25 months	542	144,991	10/1/85 to 12/31/86 15 months	1,854	
Ohio	10,744,000	S	43,575	7/4/86 to 12/31/86 5.75 months	846	143,163	5/6/86 to 12/31/86 7.75 months	2,063	
Oklahoma				Law just took effect					
Tennessee	4,762,000	S	NA	—	—	24,609	4/1/86 to 1/12/87 9.25 months	670	
Texas	16,370,000	P	84,000	first year of law 12 months	513	NA	—	—	
Utah	1,645,000	S	1,145	Nov and Dec. 1986 2 months	418	16,118	5/86 to 12/86 8 months	1,470	
Washington	4,409,000	S	2,203	Jan. and Feb. 1987 2 months	300	4,138	10/1/86 to 2/31/87 5 months	225	citations issued starting 1/1/87

S = Secondary enforcement P = Primary enforcement

Appendix 4
SUMMARY OF STATEWIDE BELT USE SURVEY RESULTS FROM BELT LAW STATES

Shown for each state is the month of survey, and the overall % use
Also shown is the law's effective date, and the date enforcement began, if different

CA	6-85 18%	11-85 26%	Law1-86	2-86 47%	enf 3-86	6-86 47%	11-86 43%		
CN	12-85 25%	Law 1-86	Enf 2-86	6-86 54%					
DC	law 12-85	4-86 30%	enf 6-86	7-86 55%	12-86 55%				
FL	3-85 22%	2-86 28%	law 7-86	9-86 41%	enf 1-87	1-87 60%			
HI	12-85 33%	law/e 12-85	1-86 73%	6-86 68%	1-87 66%				
ID	6-86 16%	law/e 7-86	7-86 24%	8-86 25%	9-86 22%	11-86 23%	1-87 21%	2-87 24%	3-87 23%
IL	4-85 16%	law 7-85	7-85 40%	4-86 36%	10-86 36%				
IN	5-85 20%	law 7-87							
IA	7-85 18%	6-86 27%	law 7-86	9-86 46%	enf 1-87	4-87 63%			
KA	11-85 10%	law 7-86	10-86 24%	enf 7-87					
LA	12-85 12%	law 7-86	enf 8-86	12-86 35%					
MD	5-86 30%	law 7-86	7-86 60%	enf 8-86	8-86 70%	10-86 73%	12-86 74%		
MA	12-85 20%	law 1-86	2-86 37%	8-86 35%	repeal 11-86	12-86 25%			
MI	12-84 20%	4-85 26%	law 7-85	7-85 58%	12-85 43%	4-86 44%	7-86 45%	12-86 44%	
MN	6-86 20%	law 8-86	8-86 33%	11-86 32%					
MO	6-84 10%	7-85 12%	law 9-85	10-85 19%	8-86 34%	enf 7-87			
NE	11-83 11%	8-85 23%	9-85 law/e	11-85 45%	3-86 38%	6-86 37%	10-86 40%	repeal 11-86	2-87 29%
NJ	2-85 18%	law /e3-85	7-85 42%	7-86 35%	1-87 35%				
NM	7-83 12%	12-85 25%	law/e 1-86	3-86 53%	9-86 50%				
NY	10-84 16%	law 12-84	4-85 57%	9-85 46 %	9-86 48%				
NC	9-85 25%	law 10-85	11-85 42%	11-86 44%	enf 1-87	1-87 77%	3-87 71%	4-87 67%	
OH	early 84 15%	mid-85 16%	law 5-86	6-86 38%	enf 7-86	9-86 47%	3-87 48%		
OK	5-86 16%	law 2-87	3-87 41%						
TN	law 4-86	11-86 19%	enf 1-87						
TX	6-85 15%	law 9-85	enf 12-85	6-86 66%	1-87 59%				
UT	4-86 18%	law 5-86	enf 10-86	3-87 22%					
WA	law 6-86	10-86 36%	enf 1-87						

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