EFFECTIVENESS OF DOUBLE FINES AS A SPEED CONTROL MEASURE IN SAFETY CORRIDORS

Final Report

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by

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16. Abstract

The use of elevated traffic fines, and specifically doubling of applicable traffic fines under certain conditions, is widely used in Oregon as a speed control measure. Double fines have applied to "safety corridors" in Oregon since 1999. Double fine signing in safety corridors has been used on a trial basis in two locations. While safety advocates promote the use of signing to alert drivers of double fines, there has been little if any compelling evidence produced to date that it is effective in crash reduction. This research effort is based on a telephone survey of 651 adult Oregon drivers, who were asked about their decision to speed in a variety of different situations, to determine whether their judgments differed from one situation to another. The results were used to infer indirectly whether double fine signing was influencing their judgments. The analysis of the survey results showed that when considering safety corridors, people do not report the same elevated perception of crash risk that they report for work zones and school zones. They also do not have the same elevated perception of citation or fine risk. If it is recommended that double fine signing in safety corridors be retained, the report concludes that other countermeasure enhancements should also be considered to achieve more effective speed control in safety corridors.

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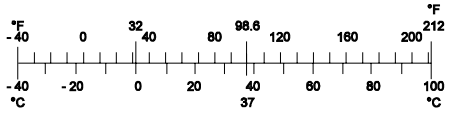
SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
LENGTH				
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
AREA				
in^2	square inches	645.2	millimeters squared	mm^2
ft^2	square feet	0.093	meters squared	m^2
yd^2	square yards	0.836	meters squared	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	kilometers squared	km^2
VOLUME				
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	meters cubed	m^3
yd^3	cubic yards	0.765	meters cubed	m^3
NOTE: Volumes greater than 1000 L shall be shown in m^3.				
MASS				
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2000 lb)	0.907	megagrams	Mg
TEMPERATURE (exact)				
°F	Fahrenheit temperature	5(F-32)/9	Celsius temperature	°C

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
LENGTH				
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
AREA				
mm^2	millimeters squared	0.0016	square inches	in^2
m^2	meters squared	10.764	square feet	ft^2
ha	hectares	2.47	acres	ac
km^2	kilometers squared	0.386	square miles	mi^2
VOLUME				
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	meters cubed	35.315	cubic feet	ft^3
m^3	meters cubed	1.308	cubic yards	yd^3
MASS				
g	grams	0.035	ounces	oz
kg	kilograms	2.205	pounds	lb
Mg	megagrams	1.102	short tons (2000 lb)	T
TEMPERATURE (exact)				
°C	Celsius temperature	1.8C + 32	Fahrenheit	°F



* SI is the symbol for the International System of Measurement (4-7-94 jbp)

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DISCLAIMER

EFFECTIVENESS OF DOUBLE FINES AS A SPEED CONTROL MEASURE IN SAFETY CORRIDORS

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1.0 INTRODUCTION

1.1 PROBLEM STATEMENT

The use of elevated traffic fines, and specifically doubling of applicable traffic fines under certain conditions, is widely used in Oregon as a speed control measure. Double fines have applied to road construction zones in Oregon since 1995. Similar legal authority was extended to school zones in 1997 and to selected safety corridors in 1999.

While safety advocates promote the use of signing to alert drivers of double fines, there has been little if any compelling evidence produced to date that it is effective in crash reduction. In fact it is generally very difficult to measure the effectiveness of traffic signing. Studies that rely on measured crash reduction must address a long list of methodological issues, such as regression to the mean, endogeneity and rare event issues such as censoring. In addition, studies that rely on crashes and other location-specific measures of the effectiveness of signing ignore more general potential effects such as public education that may be effective but are not site specific.

In order to circumvent these pitfalls, this effort is based on a telephone survey of 651 adult Oregon drivers. Surveys of course have their own methodological limitations, not the least of which is that they rely on attitudes and self-reported behavior which may or may not fully reflect behavior behind the wheel. Furthermore, it would be naive to assume that we can determine whether people are influenced by signs simply by asking. What this project has done instead is to ask about their decision to speed in a variety of different situations, to determine whether their judgments differ from one situation to another, and thereby to infer indirectly whether double fine signing is influencing their judgments. In other words, the approach lets survey subjects serve as their own controls. This approach, while still having limitations, is capable of providing much more plausible and compelling evidence about the effectiveness of double fine signing. The focus of interest in this study is their effectiveness in "safety corridors" relative to their effectiveness in work zones and school zones.

1.2 WHAT IS A SAFETY CORRIDOR?

Oregon's Corridor Safety Improvement Program (CSIP) was established in 1993. Corridor safety programs are intended to address safety problems on relatively long stretches of arterial highways. These "problem" corridors are characterized as free access, high volume facilities with speeds of 40 mph (64 km/h) or more, and often adjacent to commercial strip development (*Hunter-Zaworski and Price 1998*). In Oregon, most safety corridors have tended to be in relatively rural and suburban locations with relatively sparse commercial development, and to involve higher speeds. An essential element of a CSIP is a comprehensive analysis of safety issues within the corridor that considers a substantial list of low-cost countermeasures. Measures may include (1) improved access control, (2) upgraded signing and pavement markings, (3)

reductions in the posted speed, (4) mandatory daytime headlights or running lights (5) rumble strips, (6) enhanced speed enforcement and (7) public information and education. Double fines were added, as an additional countermeasure, in two specific safety corridors in 1999.

1.3 THE USE OF DOUBLE FINES IN OREGON

As noted before, double fines have been in use in road construction zones in Oregon since 1995, in school zones since 1997 and in selected safety corridors since 1999. Double fines are applicable in work zones with or without signing. However, double fines only apply in school zones and safety corridors if signing is present to warn motorists. In addition, at least on longer-term state highway projects, signs that warn motorists of double fines in work zones are ubiquitous. As of this date, double fine warning signs in school zones are used throughout Portland and Beaverton, and at scattered locations throughout the state. Table 1.1 summarizes the current status of double fine laws in Oregon.

Table 1.1: Double fine laws in Oregon

Context	Applicability of double fines	Actual use of double fine warning signs
School Zone	Applicable only if signed	Rare
Safety Corridor	Applicable only if signed	Rare
Work Zone	Applicable if signed or not	Common

Double fine signing in safety corridors has been used to date only on a trial basis in two locations. One of those locations is on the Mount Hood Highway (US 26) for approximately 28 miles (45 km) from Sandy to Mount Hood. The other is on Oregon 18, for approximately 16 miles (26 km) from Grand Ronde to Bellevue. These two routes serve as the primary access between the populous urban areas of the northern and central Willamette Valley, and recreation opportunities on and around Mount Hood or on the Oregon coast. About 70 percent of Oregonians live in the northwest quadrant of the state, and it is likely that a substantial percentage of them have traveled through one of these corridors at least once in the past year. Consequently, even though double fine signs in safety corridors are rare, significant numbers of Oregonians may still be aware of them.

2.0 OTHER RESEARCH

2.1 DETERRENCE

The viability of double fine signing relies on a simplistic model of human behavior that assumes the threat of a larger traffic fine will motivate drivers to slow down. A number of researchers, most notably Ross (*1982: 8-19*) have looked at traffic safety countermeasures, and particularly drinking driver countermeasures, in terms of the concept of deterrence. Ross notes that deterrence has three components, severity, certainty and celerity (swiftness). Regarding these Ross notes:

> More information is available on perceived severity of threat in the drinking and driving literature, and it is not favorable to this component of the deterrence model. Innovations limited to increasing only the severity of punishment can be associated with little or no change in the indicators of drinking and driving, but rather with unforeseen and disturbing changes in the functioning of the legal system. However, the literature on drinking-and-driving-law innovations encounters increases of severity only in situations where the certainty of punishment is extremely low. Since it is reasonable to expect some interaction between these variables, the negative findings on severity must be understood as limited to extremely low levels of certainty as a background condition (*Ross 1882: 105*).

In other words, increased severity, or stiffer fines in this case, may have little or no influence on behavior in so far as drivers believe the risk of being stopped and/or cited to be acceptably low.

2.2 APPLICABLE RESEARCH ON EFFECTIVENESS OF SPEED COUNTERMEASURES

Sisiopiku and Patel (*1999*) evaluated the effects of police presence on vehicular speeds. They also wanted to determine if there were lasting effects on driver behavior after enforcement was gone. The test site was on a 29-mile (47-km) westbound section of I-96 in Ionia County, Michigan. The speed limit on this section was 70 mph (113 km/h) for cars, and 55 mph (88 km/h) for trucks. County police cars patrolled for a six-day period in both directions of the Interstate within the study segment limits. Four magnetic imaging traffic recorders positioned at intervals throughout the 29-mile (47-km) section recorded vehicle speeds. Sisiopiku and Patel considered in their analysis net speed reductions at distances of 1, 2, and 3 miles (1.6, 3.2 and 4.8 km) upstream and downstream from each recorder. They determined that average speed reductions were greatest when police were patrolling and issuing citations within 1 mile (1.6 km)

(on either side) of the recorder. However, as police further broadened their patrol pattern from the recorder, average speeds increased. Sisiopiku and Patel noted:

> Drivers that are speeding reduce their speed, but as they get further and further away, they again accelerate to their normal speed (*Sisiopiku and Patel 1999: 33*).

Additionally, in evaluating the continuing effect of police enforcement 1-3 hours after the police had departed, Sisiopiku and Patel found that there was no lasting effect. Thus, one can conclude that the spatial and temporal effects of an active police presence on speed reduction are limited.

Pesti and McCoy (*2000*) evaluated the effectiveness of speed monitoring displays (SMDs) along I-80 between Omaha and Lincoln, Nebraska. Three SMDs operated for a 5-week period in a 2.7-mile (4.3-km) section between two work zones on I-80, divided four-lane highway. In the work zones, the two-lane roadway section in one direction was closed, while the other two-lane section was converted to a two-way roadway. The researchers collected mean, 85th percentile, and standard deviation of vehicle speeds, as well as the percentage of vehicles complying with the 55 mph (88 km/h) speed limit. The SMDs' use resulted in lowering mean and 85^{th} percentile speeds by 3-4 mph (4.8-6.4 km/h) and 2-7 mph (3.2-11.3 km/h) respectively. In addition, the displays were effective in decreasing speed variance, and increasing speed-limit compliance. Pesti and McCoy also assessed the carryover effect of the SMDs after they were removed. One week after the removal of the SMDs, they determined that there were still statistically significant speed reductions and compliance increases, although the speed reductions were less than what was observed during the deployment.

Kamyab and others (*2001*) reported on a survey of state and toll road authority traffic engineers to determine their policies and practices for speed control speed in work zones. Thirty-four agencies responded to the survey. The survey did not address specifically "double fine" signs, but did focus on a variety of countermeasures. The most widely used strategy was regulatory signs. Although being used by 28 of the 34 agencies as an enforcement strategy, only two of the respondents indicated posting regulatory signs was effective in reducing work zone speeds. The most effective speed reduction strategy reported by the survey respondents (17 of 25) was actual police enforcement in the work zone.

Bloch (*1998*) compared the effectiveness of speed display boards and photo-radar over a 4-week evaluation period on three similar city streets in Riverside, California. Site 1 employed photo-radar; at Site 2 a display board was used; and at Site 3 a display board operated in conjunction with intermittent law enforcement. Bloch collected data at two locations at each site: (1) alongside the device, and (2) 0.32 km (0.2 mi) downstream from the device. Baseline speed data was collected in the first two weeks of the evaluation period. In the third week the devices and law enforcement were deployed, and vehicle speeds recorded for the 7-day test period. During the fourth week no devices or law enforcement were in place, but speeds were monitored to evaluate any "carryover" effect.

Bloch reported that during the test period, the devices without enforcement significantly reduced vehicle speeds, as well as the number of vehicles traveling 16 km/h (10 mph) or more over the posted limit. At Site 1, speed reductions alongside the photo radar were 8.3 km/h (5.2 mph) and 6.6 km/h (4.1 mph) downstream. Speed reductions at Site 2 were 9.7 km/h (6.0 mph) at the

display board and 4.7 km/h (2.9 mph) downstream. At Site 3, presence of law enforcement supplementing the display board resulted in the greatest reductions in speed: 9.8 km/h (6.1 mph) alongside and 9.5 km/h (5.9 mph) downstream. In the carryover evaluation seven days after the devices and enforcement were removed, the greatest reduction in speed – 2.7 km/h (1.7 mph) – was observed at Site 2 where the display board had been deployed. Bloch concluded:

> While both photo-radar and display boards appear effective in reducing vehicle speeds, display boards offer better overall results (*Bloch 1998: 35*).

In making this assessment, Bloch took into account the in-place performance of the two devices, their purchase and operating costs, as well as the cost of a police officer to operate the photo-radar.

2.3 EFFECTIVENESS OF SIGNING

Ullman and others (*2000*) investigated the effects of the double-fine law in work zones, which were implemented in Texas in January 1998. The Texas law applies when workers are present in the work zone. The researchers conducted speed studies at ten work zones two months prior to, and five months after, the effective date of the law. Speed data analyses showed that traffic speeds in the work zones after the law was in place did not appreciably change from before the law was enacted. Even with warning signs posted in each of the work zone sites, two-thirds of the drivers were still exceeding the posted speed limit at seven of the ten work zone sites.

The researchers also reviewed traffic citation data for the same work zones for a six-month period before, and after the law's implementation. The number of citations issued did decrease slightly (6%) after the law was in place. The researchers also discovered that when motorists were issued a citation after the double-fine law was in place, a lower proportion of drivers pled guilty, and more drivers opted to take defensive driving training in order to have their ticket subsequently dismissed. Regarding this finding, the researchers noted the following, however:

> It was not possible to determine whether this was due to a potentially higher fine or some other reason unrelated to the double fine law (*Ullman, et. al 2000: 29*).

Khorashadi (*1997*) examined the impact of the double fine zone legislation on road safety. Accident and enforcement data were collected from three pilot projects in California. The data and other factors were evaluated, including construction improvement projects, traffic control measures, special enforcement programs, special events, changes in speed limit, and weather conditions. Based on the analysis of one year's worth of data, Khorashadi suggests that double fine zones may help in reducing accident rates.

In summary, past research on speed countermeasures has been limited. Studies have focused on police presence, speed monitoring displays, photo radar, signs, and a combination of these measures. The findings have been mixed, with speed monitoring displays showing some effectiveness in lowering speeds, limited benefits from police presence, and uncertain effects from signs.

3.0 METHODS

The data for this study was collected using a telephone survey of 651 adult Oregon drivers. A rough survey instrument was developed by Oregon Department of Transportation (ODOT) Research Group staff. The Oregon Survey Research Lab (OSRL) at the University of Oregon further developed and refined the instrument and contracted for the balance of work related to completion of the telephone survey, including sampling, interviewer training, pretesting, data collection and initial data cleaning and reduction.

3.1 RESEARCH DESIGN

The initial instrument included questions about driving behavior, speed citation history, perceptions of speed enforcement, and awareness of laws and practices regarding double fines. It also included a specific series of 20 questions about the decision to speed or, more specifically, about the risk factors that the respondent considers in deciding whether or not to speed. Questions were worded to apply whether the respondent ever speeds, or not. For each risk factor, five specific questions were included, to vary the context or situation where speeding might occur. This resulted in 20 measures of each respondent's relative evaluation of risk factors in different settings.

These 20 questions can be viewed as a two-factor, repeated measures experimental design. Each respondent constitutes a single replication. One factor, *risk type*, has four levels. The second factor, *context*, has 5 levels. Table 3.1 provides additional information about these 20 measures.

Table 3.1: Evaluation of risk in the context of the decision to speed

Context	Applicability of double fines	Actual use of Double fine warning signs	Risk Factor			
			Acci-dent	Cit-ation	Fine	Insur-ance
Transition from Rural to Urban Freeway	Not applicable	N/A	Y_{11}	Y_{21}	Y_{31}	Y_{41}
Approaching a Rural Congested Area	Not applicable	N/A	Y_{12}	Y_{22}	Y_{32}	Y_{42}
School Zone	Applicable only if signed	Rare	Y_{13}	Y_{23}	Y_{33}	Y_{43}
Safety Corridor	Applicable only if signed	Rare	Y_{14}	Y_{24}	Y_{34}	Y_{44}
Work Zone	Applicable if signed or not.	Common	Y_{15}	Y_{25}	Y_{35}	Y_{45}

Five "contexts" for speeding were identified. Note that for two of these contexts, double fines are never used, and for two others, double fines have had more recent and somewhat restricted

applicability. In the case of work zones, double fines have been used with wide-spread consistency for more than 5 years. Our central hypothesis is that if double fines are having the expected deterrent effect, we should expect respondents to give relatively more consideration or weight to fines in the context of a work zone, and to give the least consideration to fines in those contexts where double fines do not apply. This difference in the relative weight given to risk factors should take the form of an interaction effect. There may be a similar, but weaker pattern with regard to citations, to the extent that it is difficult to separate the risk of a citation from that of a fine. Because the driving public has had more limited exposure to double fines in the context of school zones and safety corridors it seems less likely that fines will be perceived as disproportionately salient in either of those contexts. However, the design provides a basis for testing that hypothesis as well.

3.2 SAMPLING AND DATA COLLECTION

The sampling frame was adult Oregon drivers age 18 and older who drive 75 miles (121 km) or more per week. Households were contacted using a random dialing scheme intended to produce a representative household sample. A screening question identified a potential respondent within the household meeting the screening criteria. The net response rate was 72%, with 4% refusals.

Interviews were completed via a computer assisted telephone interviewing (CATI) system. Use of the CATI system allowed incorporation of randomization in the presentation of the 20 questions described in Table 3.1. Randomization helps to minimize problems related to carry-over or latent effects, and other threats to independence which result when a respondent is presented with a series of similar questions. Full randomization would have been confusing to respondents, so a limited scheme of randomization was adopted.

Each respondent was read 4 sets of five questions, each set pertaining to a risk type (accident, citation, fine, insurance). Within each set were 5 questions pertaining to five contexts (rural congestion, rural to urban freeway, school zone, work zone, safety corridor.) The placement of the set pertaining to fines was randomized with respect to the other risk types. Within sets, context was randomized once at the interview level, but to avoid confusing the respondent, contexts within sets were presented in a consistent order within a single interview. Another way to describe randomization is that for each interview, the rows and columns in Table 1 were randomized, first by columns, and then by rows.

Additional questions were included to determine whether or not respondents were aware of the risk of double fines in work zones, school zones, and safety corridors. However, these questions were asked near the end of the interview, after questions about the respondent's decision process had been completed.

4.0 ANALYSIS

4.1 GENERAL CHARACTERISTICS OF THE SAMPLE

Table 4.1 provides a "profile" of the 651 subjects in our survey sample. Because this is an experimental study, a high level of representativeness is not critically important, but it is important to have within the subject pool, variability that is sufficient to generally reflect the diversity of the adult drivers in Oregon.

With regard to population distribution regionally, the sample slightly under-represents the Portland area (38% vs. 42%), and over-represents southwest Oregon (16% vs. 13%), when compared to Census figures. Other regions are within 1 percent of the 2000 Census, as reported by Oregon's Population Research Center (*Cai 2000: 8*).

Table 4.1: General social and demographic characteristics of subjects in the sample

VARIABLE	N	PCT.	VARIABLE	N	PCT.
Age Group			Education		
18-24	56	8.6%	Less than High School	54	8.3%
25-34	104	16.0%	High School Diploma	154	23.7%
35-54	313	48.1%	Some College	218	33.5%
55-64	107	16.4%	Bachelor's Degree	145	22.3%
65+	68	10.4%	Graduate Degree	75	11.5%
Missing	3	0.5%	Other	4	0.6%
Total	651		Missing	1	0.2%
			Total	651	
Gender			Employment Status		
Male	343	52.7%	Employed	473	72.7%
Female	304	46.7%	Retired	88	13.5%
Missing	4	0.6%	Looking for Work	24	3.7%
Total	651		Student	13	2.0%
Residence			Keeping House	26	4.0%
Urban	184	28.3%	Other	27	4.1%
Suburban	204	31.3%	Total	651	
Rural	253	38.9%	Region		
Missing	10	1.5%	Portland Area	249	38.2%
Total	651		Northwest Oregon	210	32.3%
Child < 18 in Household?			Southwest Oregon	106	16.3%
Yes	260	39.9%	Central Oregon	52	8.0%
No	391	60.1%	Eastern Oregon	32	4.9%
Missing	0	0.0%	Missing	2	0.3%
Total	651		Total	651	

With regard to age, compared to Oregon's 2000 population, the sample under-represents both younger and older persons, and over-represents people 35-54. Also, while 49 percent of adult Oregonians are men, the sample is almost 53 percent male (*Cai 2000: 21-23*). These differences are consistent with the likely effects of screening criteria that disqualified non-drivers and low mileage drivers.

According to the Census, 31 percent of households include children under 18, but our sample includes children in almost 40 percent of households (*U.S. Census Bureau 2001: Table DP-1*). This suggests a bias that goes beyond the effects of our screening criteria, but may be more typical of bias due to non-response in even well designed and executed telephone surveys.

Educational attainment is higher in the sample (considering only respondents over age 25, to be consistent with Census results) than in the 2000 Census for Oregon, with only 31% (vs. 41 percent from the 2000 Census) having attained a high school diploma or less (*U.S. Census Bureau 2001a: Table QT-02*).

All things considered, our sample appears to be somewhat more middle aged and more educated than adult Oregon drivers as a group, but in other respects the sample seems substantially representative.

4.2 GENERAL SPEEDING ATTITUDES AND BEHAVIOR

Tables 4.2 through 4.5 present survey responses to several questions about speeding. These questions were included to address two issues. First, it was important to know whether or not respondents do in fact exceed the speed limit. This is important because our research design assumes that drivers adapt their behavior to conditions and assess risk in deciding whether or not to speed. If a driver is what we could call a principled non-speeder, then the context and risks associated with speeding become irrelevant for that person. Consequently this experiment is more apt to succeed if most subjects regard speeding as an option under at least some conditions.

Second, it was important to determine how, in general, people tend to evaluate or weight specific risks associated with speeding, in order to learn whether those relative weights shift from one context to another.

Table 4.2 summarizes results from a series of questions about the respondent's actual past speeding behavior. Note that more than 90 percent admit to having exceeded the speed limit in the past three years, and that 71 percent have been stopped for speeding by a police officer at some point in their driving career. In addition, among those who admit to speeding, most people concede to speeding to match the flow of other traffic (91.5%) and to pass another vehicle (91.8%). Large minorities also report speeding because the limit is set too low (45%) or because everyone else speeds (49%).

Table 4.3 presents result from a question that was designed to ascertain people's perception of leniency in speed enforcement. Results suggest that many people do believe the police in Oregon are at least somewhat lenient with speeders, to the extent that more than 82% believe

they can exceed the speed limit by at least 5 mph (8 km/h) and not be cited, while a full third believe they can exceed the limit by *more than* 5 mph (8 km/h) and not be cited.

Table 4.2: Self-reported speeding behavior

	Yes	No	Missing	Total
"In the past three years, have you ever driven faster than the posted speed in Oregon?"	588 (90.3%)	60 (9.2%)	3 (0.5%)	651
"Have you ever been stopped for speeding by a police officer?"	462 (71.0%)	189 (29.0%)	0 (0.0%)	651
"Have you received a citation for speeding in the past three years in Oregon?"	113 (17.4%)	537 82.5%)	1 (0.1%)	651
"Have you ever driven faster than the speed limit:				
because the flow of traffic was going faster?"[1]	538 (91.5%)	49 (8.3%)	1 (0.2%)	588
for a short time to pass another vehicle?" [1]	540 (91.8%)	48 (8.2%)	0 (0.0%)	588
because the limit is set too low?" [1]	262 (44.6%)	323 (54.9%)	3 (0.5%)	588
because everyone else does?" [1]	290 (49.3%)	294 (50.0%)	4 (0.7%)	588

[1] These four questions were only asked of the 588 people who answered yes to the question: "In the past three years have you ever driven faster than the speed limit in Oregon?

Table 4.3: How many miles per hour do you think you can drive and not be cited, even if a police officer sees you speeding, where speed signs say 55 miles per hour?

		Number	Percent
55	(none)	23	3.5%
56-59	(1-4 mph)	72	11.1%
60	(5 mph)	315	48.4%
61-64	(6-9 mph)	109	16.7%
65	(10 mph)	88	13.5%
66+	(more than 10 mph)	23	3.5%
Other	(depends)	6	0.9%
Missing		15	2.3%
At least 5 mph over:		535	82.1%
More than 5 mph over:		220	33.8%
Total		651	100.0%

Table 4.4 presents results from a series of questions designed to identify the risks that people may consider when they decide to speed. It is interesting that more people consider being cited by the police than consider causing an accident.

This suggests that people may not necessarily connect speed with a significant crash risk. It also may illustrate the psychological tradeoff between considerations of severity and certainty alluded to in the discussion of deterrence theory above, to the extent that they perceive a citation as less severe but considerably more probable than a crash. Fewer people report obeying speed signs because of the cost of a traffic fine, than because of the risk of a citation. It seems likely that people see a citation entailing a fine, as well as other direct and indirect sanctions like embarrassment, time loss, insurance cost, and/or potential licensing sanctions.

Table 4.4: Reasons for obeying speed limits

		Yes	No	Missing	Total
"Do you obey speed signs:					
because of the risk of causing an accident?"	N	528	120	3	651
	(%)	(81.1)	(18.4)	(0.5)	(100)
because of the risk of receiving a traffic citation from the police?"	N	541	108	2	651
	(%)	(83.1)	(16.6)	(0.3)	(100)
because of the cost of a traffic fine?"	N	423	222	6	651
	(%)	(65.0)	(34.1)	(0.9)	(100)
to get better gas mileage?"	N	196	452	3	651
	(%)	(30.1)	(69.4)	(0.5)	(100)

4.3 AWARENESS OF DOUBLE FINES

In order for drivers to be motivated by the threat of double fines, they must at least be aware that double fines might apply. As noted earlier, double fines in work zones have been applicable since 1995, and warning signs are used consistently on state highway construction projects, so we would expect public awareness to be relatively high. The law enabling double fines in school zones was effective in 1997, but is only applicable if warning signs are in place. The extent of use of double fine warning signs in school zones is unknown, but sporadic. Double fines in safety corridors became legal in 1999, but only on a test basis in two locations.

Table 4.5, along with Figures 4.1 and 4.2, summarize the self-reported awareness of the applicability of double fines in work zones, school zones and safety corridors. Respondents report being most aware of double fines as they apply to work zones, and least aware of double fines in safety corridors. It is also interesting that many more respondents claim to be aware of double fines in school zones than claim to have seen a double fine sign in a school zone.

It should be noted that these reported levels of awareness are probably overstated. Each series of questions opens with the question. *"Do you know that traffic fines double in (work zones/school zones/safety corridors)?*" Of course they know, now that we've told them. Results in Table 4.5, Figure 4.1 and Figure 4.2 are intended and can probably only be interpreted as relative indicators and not absolute measures of awareness of double fine laws.

There are two safety corridors with double fine signing in place; one on Oregon 18 in Polk and Yamhill Counties, and one on the Mount Hood Highway in Clackamas County (US 26 from Sandy to Mount Hood.) Results show that awareness of double fine signing in safety corridors is higher in the eight counties nearest these two corridors, than in the rest of the state. In those nearby counties 56.9 percent report knowing that fines double in safety corridors, compared to 49.5% in the balance of the state.

Table 4.5: Awareness of double fines

		In Work Zones?		In School Zones?		In Safety Corridors?	
		N	PCT	N	PCT	N	PCT
Do you know that traffic fines double?	Yes	609	93.5%	493	75.7%	338	51.9%
	No/Don't know	41	6.3%	158	24.3%	312	47.9%
	Missing	1	0.2%	0	0.0%	1	0.2%
	Total	651	100%	651	100%	651	100%
Have you noticed signs along the highway warning that traffic fines double?	Yes	586	90.0%	312	47.9%	266	40.9%
	No/Don't know	23	3.5%	181	27.8%	71	10.9%
	Not aware of double fines	42	6.5%	158	24.3%	313	48.2%
	Missing	0	0.0%	0	0.0%	1	0.2%
	Total	651	100%	651	100%	650	100%
How much do those signs influence how fast you decide to drive?	A lot	334	51.3%	189	29.0%	130	20.0%
	Some	129	19.8%	44	6.8%	65	10.0%
	A little	56	8.6%	28	4.3%	26	4.0%
	Not at all	66	10.1%	48	7.4%	44	6.8%
	Never noticed signs	65	10.0%	339	52.0%	385	59.1%
	Missing	1	0.2%	3	0.5%	1	0.2%
	Total	651	100%	651	100%	651	100%

Figure 4.2 summarizes results of three questions about how much double fine signs influence speeding. Note that these results come from the lower portion of Table 4.5, and that the percentages are based on all 651 respondents, reflecting the net influence, or that persons who never noticed the signs could not be influenced by them. In fact, respondents who said that they had not noticed double fine signs were not asked how the signs influence their speeding. When the analysis is limited to drivers who say they noticed the signs, the influence on behavior is fairly similar across the three contexts, as shown in Figure 4.3.

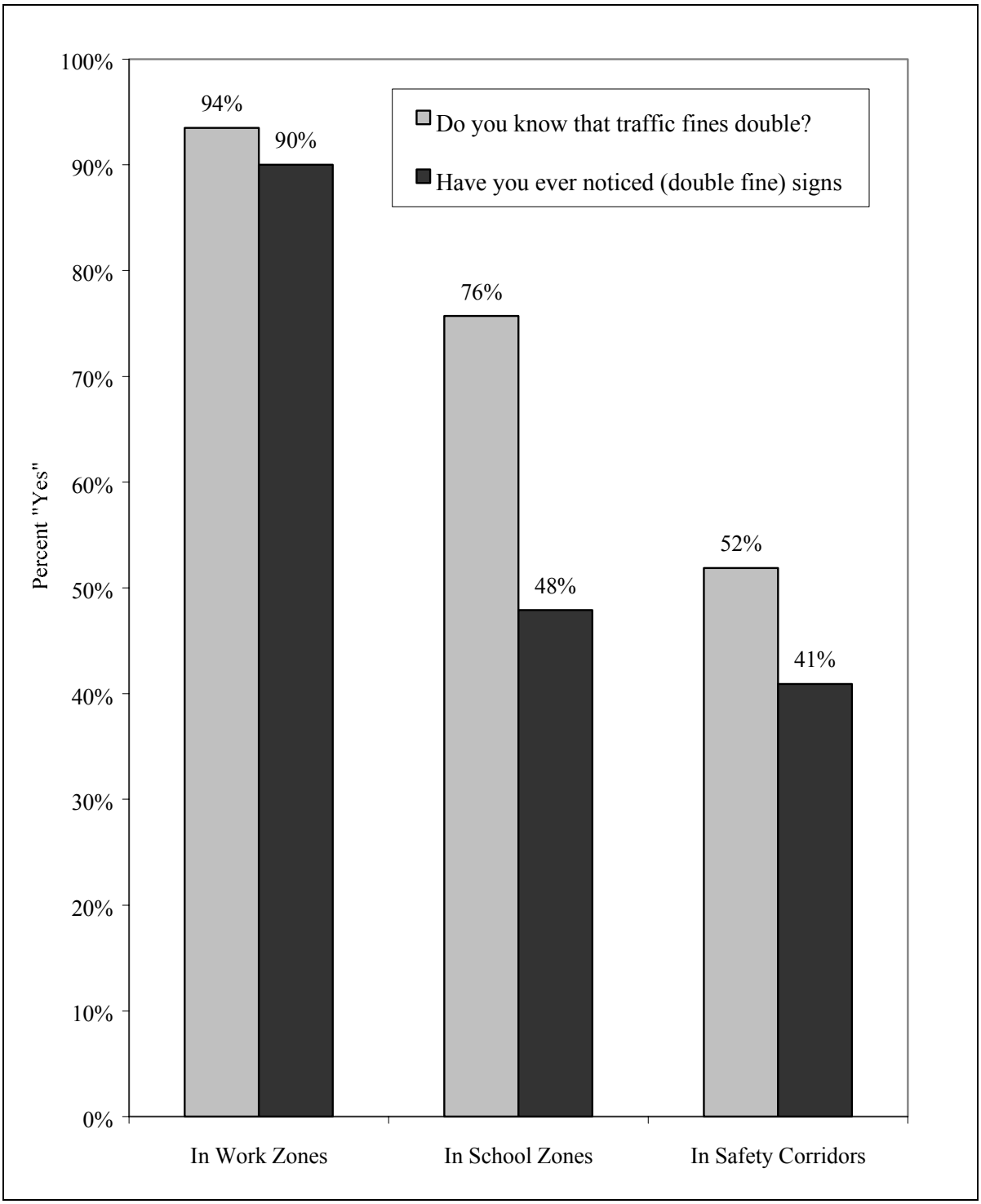

Figure 4.1: Awareness of double fines

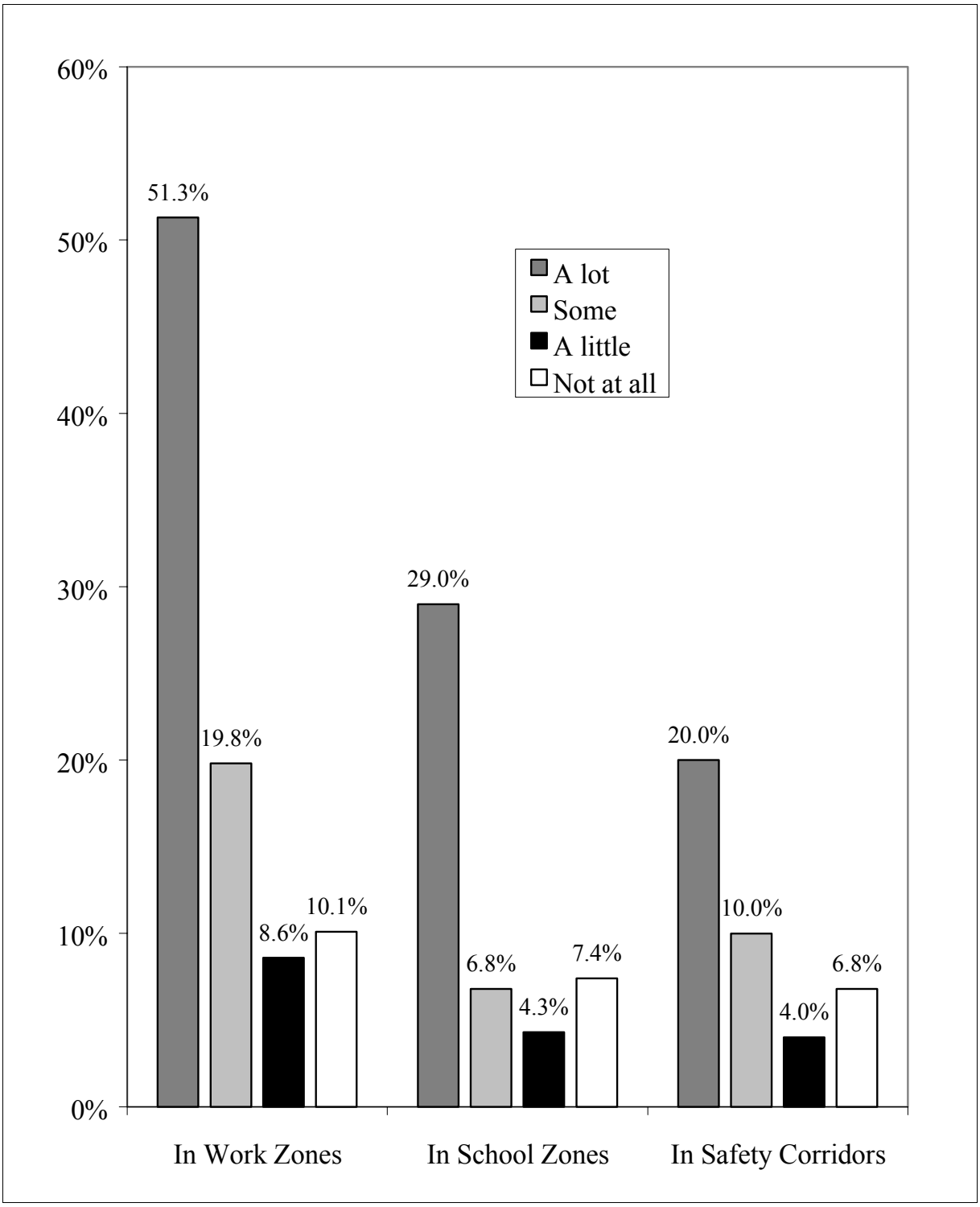

Figure 4.2: How much do those signs influence how you drive?

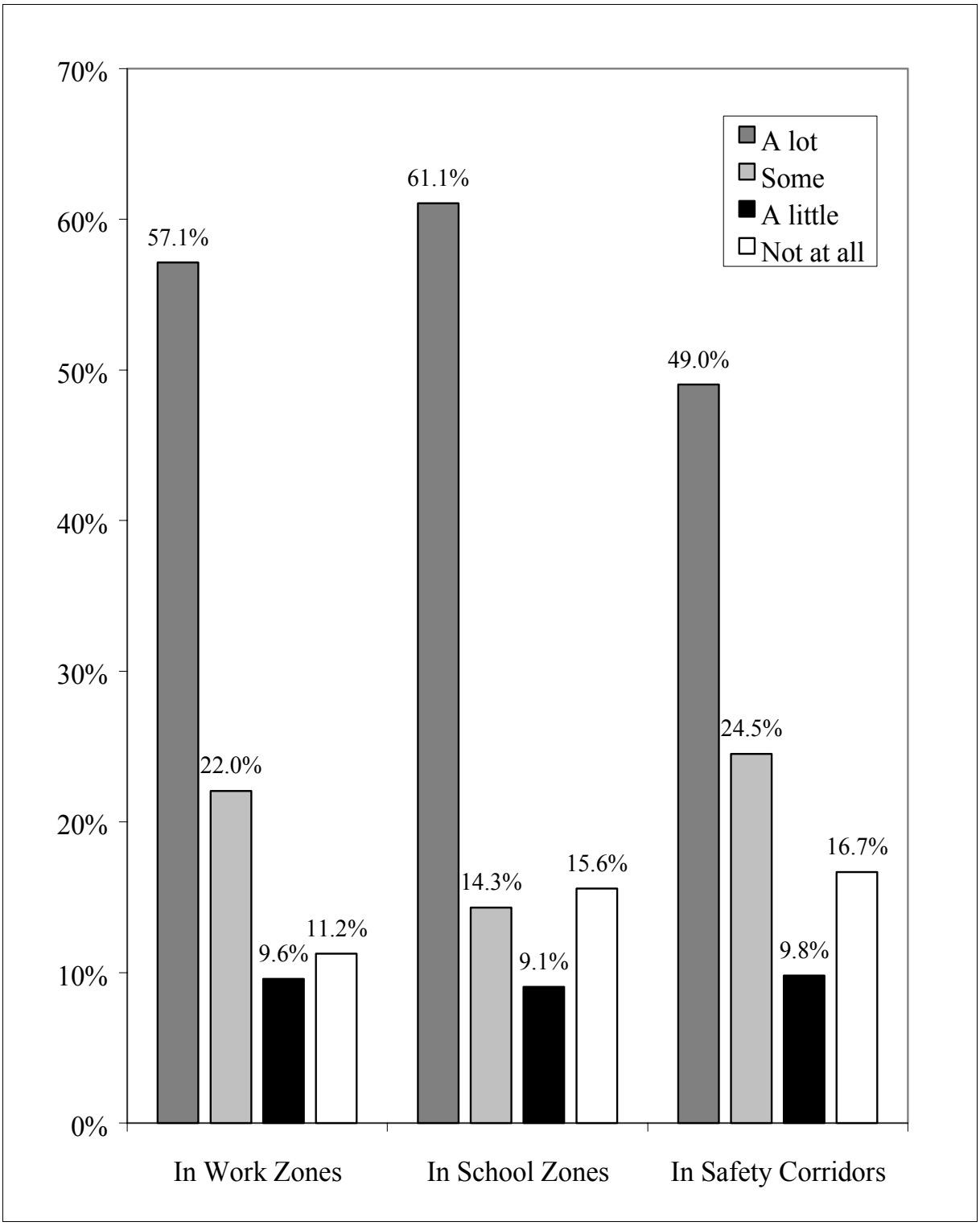

Figure 4.3: Influence of signs on driving behavior among those who noticed them

4.4 SPEEDING BY CONTEXT AND BY RISK TYPE

4.4.1 Speeding Context

Table 4.6 presents results from a series of 10 questions about the inclination to speed across varying contexts. Five contexts are identified, and each is addressed in terms of the respondent's behavior, and the respondent's perception of the behavior of others. Figures 4.4 and 4.5 are based on Table 4.6, and are intended to draw out some key implications from Table 4.5.

Table 4.6: Speed compliance by driving context (How often does self/others obey signs to reduce speed)

			Always	Most of the time	Some-times	Hardly Ever	Missing	Total
School Zone	Self	N	531	101	14	4	1	651
		(%)	(81.6)	(15.5)	(2.2)	(0.6)	(0.2)	(100)
	Other	N	78	346	148	71	8	651
		(%)	(12.0)	(53.1)	(22.7)	(10.9)	(1.2)	(100)
Work Zone	Self	N	420	188	35	8	0	651
		(%)	(64.5)	(28.9)	(5.4)	(1.2)	(0.0)	(100)
	Other	N	55	308	196	84	8	651
		(%)	(8.4)	(47.3)	(30.1)	(12.9)	(1.2)	(100)
Urban Area	Self	N	211	312	111	15	2	651
		(%)	(32.4)	(47.9)	(17.1)	(2.3)	(0.3)	(100)
	Other	N	7	199	311	117	17	651
		(%)	(1.1)	(30.6)	(47.8)	(18.0)	(2.6)	(100)
Congested Rural Area	Self	N	278	286	68	13	6	651
		(%)	(42.7)	(43.9)	(10.4)	(2.0)	(0.9)	(100)
	Other	N	24	257	256	94	20	651
		(%)	(3.7)	(39.5)	(39.3)	(14.4)	(3.1)	(100)
Safety Corridor	Self	N	245	269	94	31	12	651
		(%)	(37.6)	(41.3)	(14.4)	(4.8)	(1.9)	(100)
	Other	N	22	210	266	121	32	651
		(%)	(3.4)	(32.3)	(40.9)	(18.6)	(4.9)	(100)

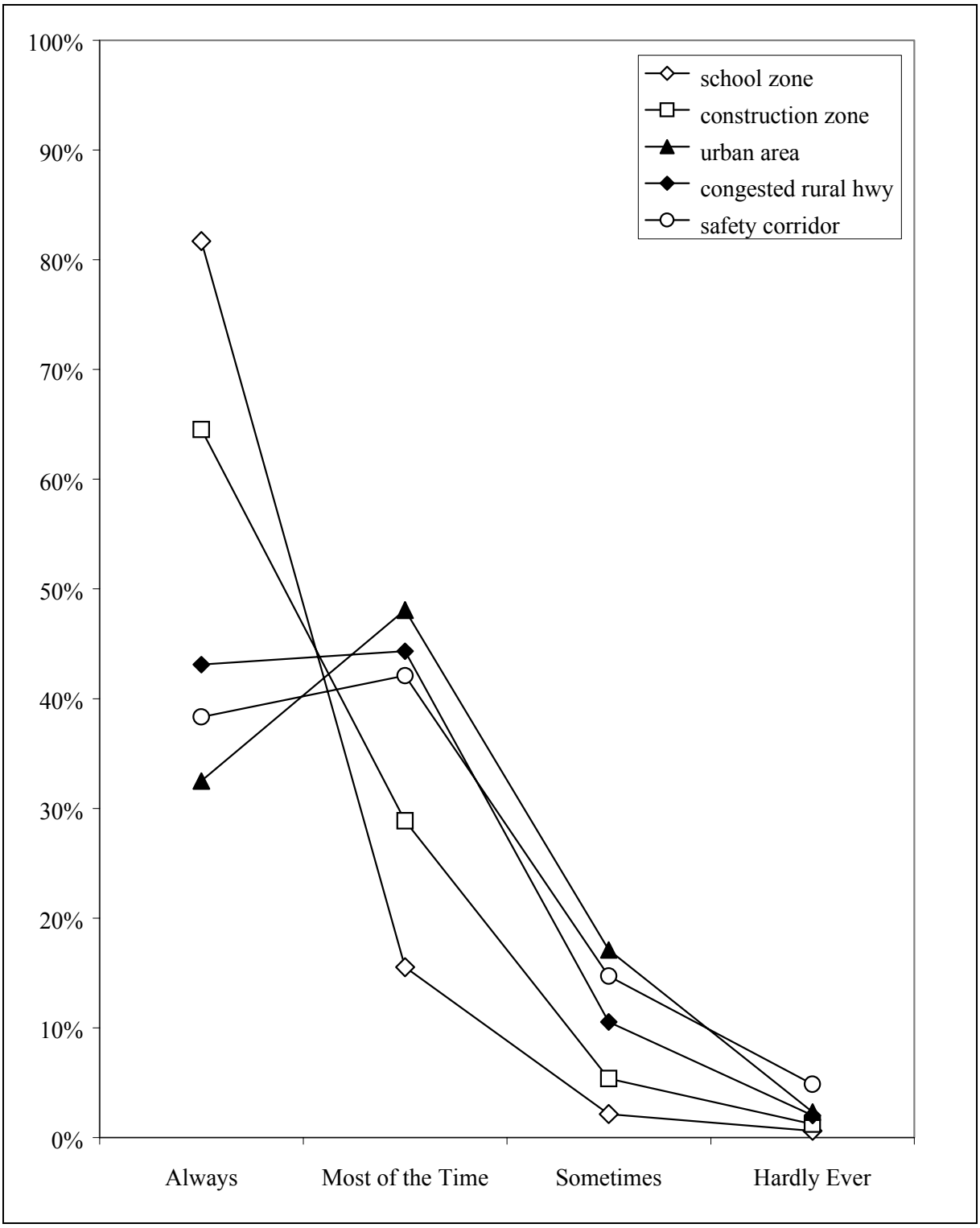

Figure 4.4: How often do you completely obey signs that tell you to reduce your speed?

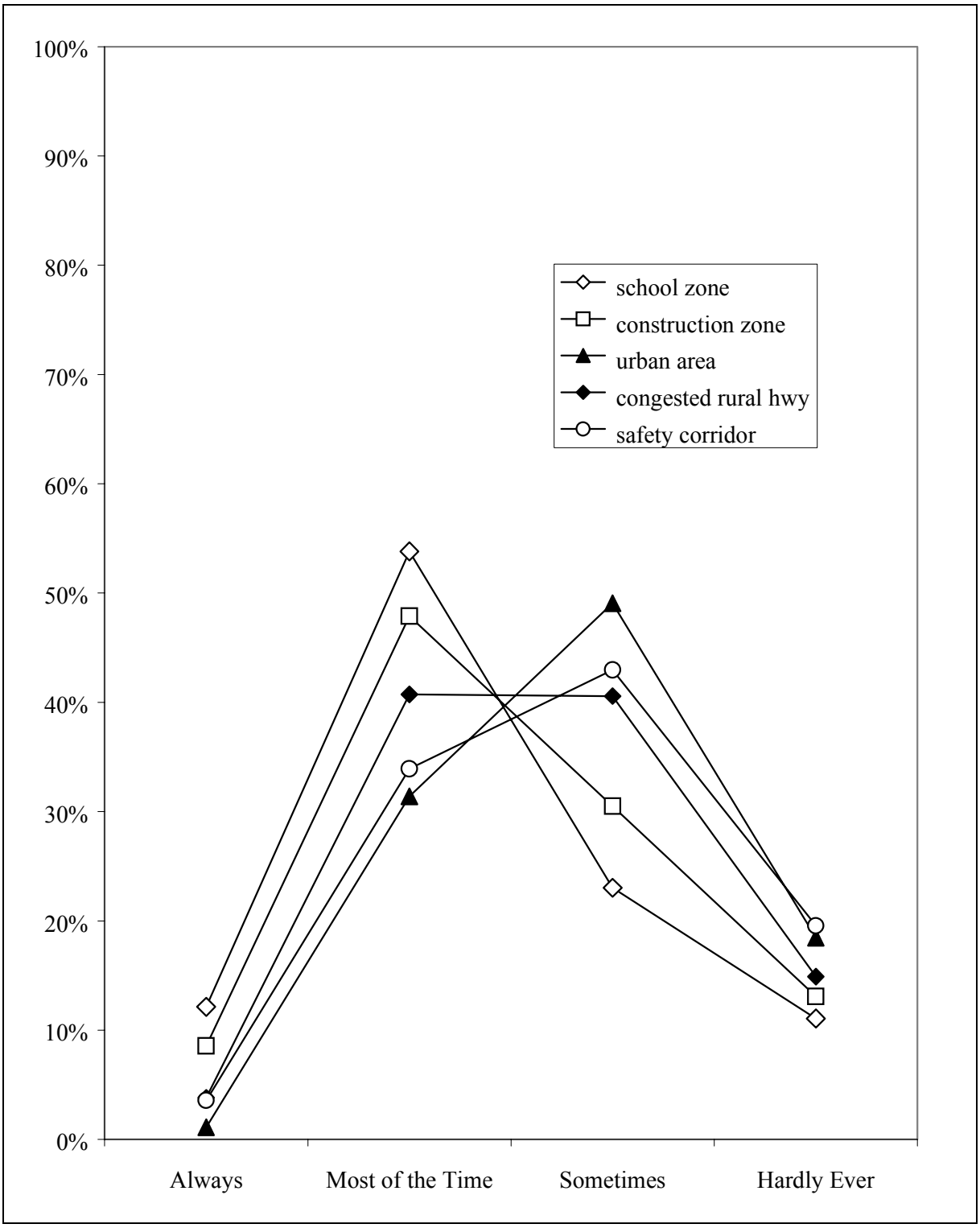

Figure 4.5: How often do other drivers obey signs to reduce speed?

There are perhaps two key observations to be drawn from Table 4.5 and the accompanying Figures 4.4 and 4.5. First, as is readily evident comparing the two graphs, respondents consistently see others as less likely than themselves to comply with speed limits. Second, when considering their own behavior (Fig. 4.4), respondents see compliance as highest in school zones, followed closely by compliance in work zones. Speed limit compliance on congested rural highways, the transition to urban freeways, and in safety corridors are not very different from one another, but substantially lower than in school and work zones. The same ordering of compliance by context apparent in Figure 4.4 appears to hold for respondents' assessment of the behavior of others (Fig. 4.5), but the gap between contexts is less pronounced.

4.4.2 Baseline Comparisons.

Our basic research design incorporated a two factor repeated measures design, with four risk types making up one factor, and three speeding contexts making up the second factor (see Table 3.1). Twenty questions, with identical form and response categories, make up the 20 measures in the design. All 20 questions take the general form:

> *"When you drive in a (context), how often does the risk of (risk type) influence you to obey the speed limit?"*

Response categories were "Always," "Most of the time," "Sometimes," "Hardly ever" and "Never."

Of the five contexts, two were selected to represent a control, or baseline condition. These represent fairly general driving situations, and double fines typically would not apply. These are "driving on urban freeway," and "driving through a congested area along a rural highway." It is also notable that "driving through a congested area along a rural highway" is generally descriptive of most existing safety corridors in Oregon.

Because a 5 x 4 two factor model is very difficult to digest and interpret, models for this analysis were developed in smaller increments, starting with just the two control contexts. Analysis is based on a series of repeated measures analyses of variance (ANOVA). Profile plots of means are presented and discussed in the body of the paper, but each profile plot and its interpretation is supported by an analysis of variance. The analysis of variance is used to determine which observable differences and trends in the profile plots are statistically significant. Selected ANOVA results are presented in Appendix B. In the ANOVA results, "simple" contrasts are tested relative to traffic fines. The analysis was organized in this manner because one would expect the respondent's inclination to give relatively more weight to traffic fines as a risk factor in those situations where double fines apply. Consequently, contrasts of fines with other risk types are the primary focus of the analysis, and contrasts between other risk types are of only incidental interest.

Figure 4.6 presents a "profile plot" of the means for respondents' comparative weighting of risk types for urban freeways and congested areas along rural highways. Results can be summarized as follows. First, people give the different risk factors different weights, regardless of context. They give the most weight to the risk of "causing an accident," and the least to "cost of insurance." This is evident in the differences between lines in Figure 4.6.

Second, People generally perceive greater risk in congested rural areas than on urban freeways, without consideration of specific risk type. This is evident in the tendency for the lines in Figure 4.6 to slope consistently upward, from left to right.

Third, there is an interaction effect, which is that whereas people tend to associate speeding in congested rural areas with higher risks in all areas, there is disproportionate concern regarding the risk of causing an accident. This is evident from slope *differences* in Figure 4.6.

These baseline effects suggest that people *do* consider the context in the decision to follow speed limits. In comparing congested areas on rural highways to urban freeways, people tend to weight citation and fine risk factors somewhat more heavily, and the risk of causing an accident much more heavily.

4.4.3 Work Zones versus Baseline

Figure 4.7 is like Figure 4.6 except that the means from four questions regarding consideration of risk factors in work zones have been added. Several differences are apparent. First, with regard to speeding in work zones, people give considerably more consideration to the risk of causing an accident, the risk of receiving a traffic citation and the risk of receiving a traffic fine. However, the line representing risk of increased insurance cost of insurance is virtually flat, indicating that it receives about the same consideration regardless of the context.

Also, compared to speeding on congested rural highways, for work zones the three risk factors, accident, citation and fine, all increase by virtually identical amounts. However, comparing work zones to urban freeways, there is an interaction effect, in the form of a sharper increase in the consideration given to accidents.

More generally, the results suggest that people are more aware of the inherent dangers of speeding in construction zones, in the form of crash risk, and of the likelihood of being cited and fined for speeding through a work zone. It may imply further that efforts to control speed through construction zones are working, and these efforts include double fine signing but are perhaps also attributable to public information (*Give 'em a Brake*) and supplemental enforcement by the Oregon State Police. If the effect were due only or even primarily to double fines and double fine signing, we would have expected an *interaction in the other direction*, with weight given to risk of a traffic fine rising more sharply than either citation risk or crash risk.

4.4.4 School Zones versus Baseline

Figure 4.8 is like Figure 4.7, except that the means from four questions about risk considerations in school zones replace those for work zones. Responses relative to school zones are very similar to those relating to work zones, except that perceived risks appear generally to be higher. In school zones, consideration given to the risk of a fine is very similar to that for work zones. However, considerably more consideration is given to both accidents and citations, in the decision to speed in a school zone. Once again, consideration given to the cost of insurance is low and indifferent to the context.

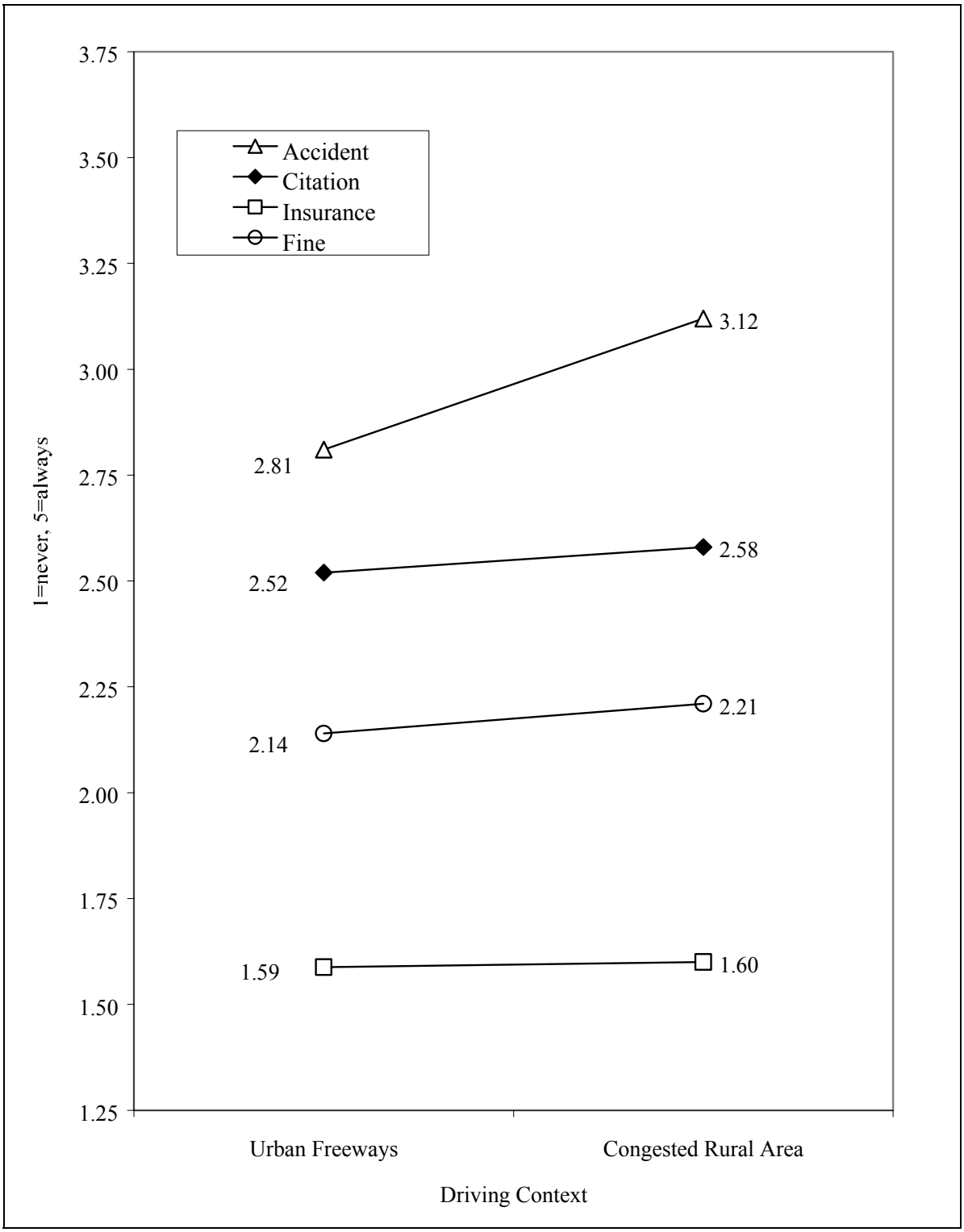

Figure 4.6: Average subjective weight of risk, by type of risk, comparing speed reductions approaching urban freeways, and approaching congested rural areas

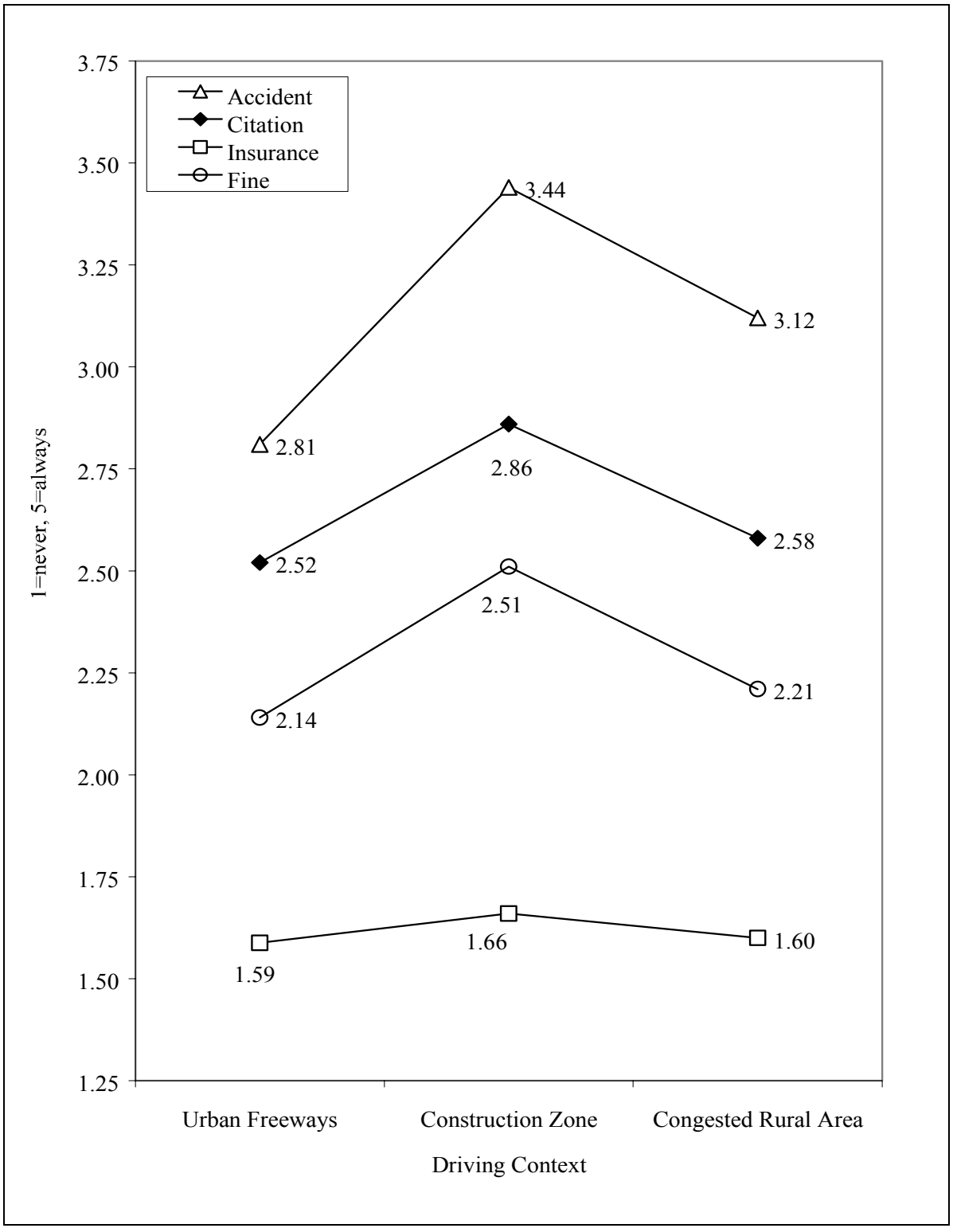

Figure 4.7: Average subjective weight of risk, by type of risk, comparing speed reductions in ***work zones*** to speed reductions on urban freeways, and in congested rural areas

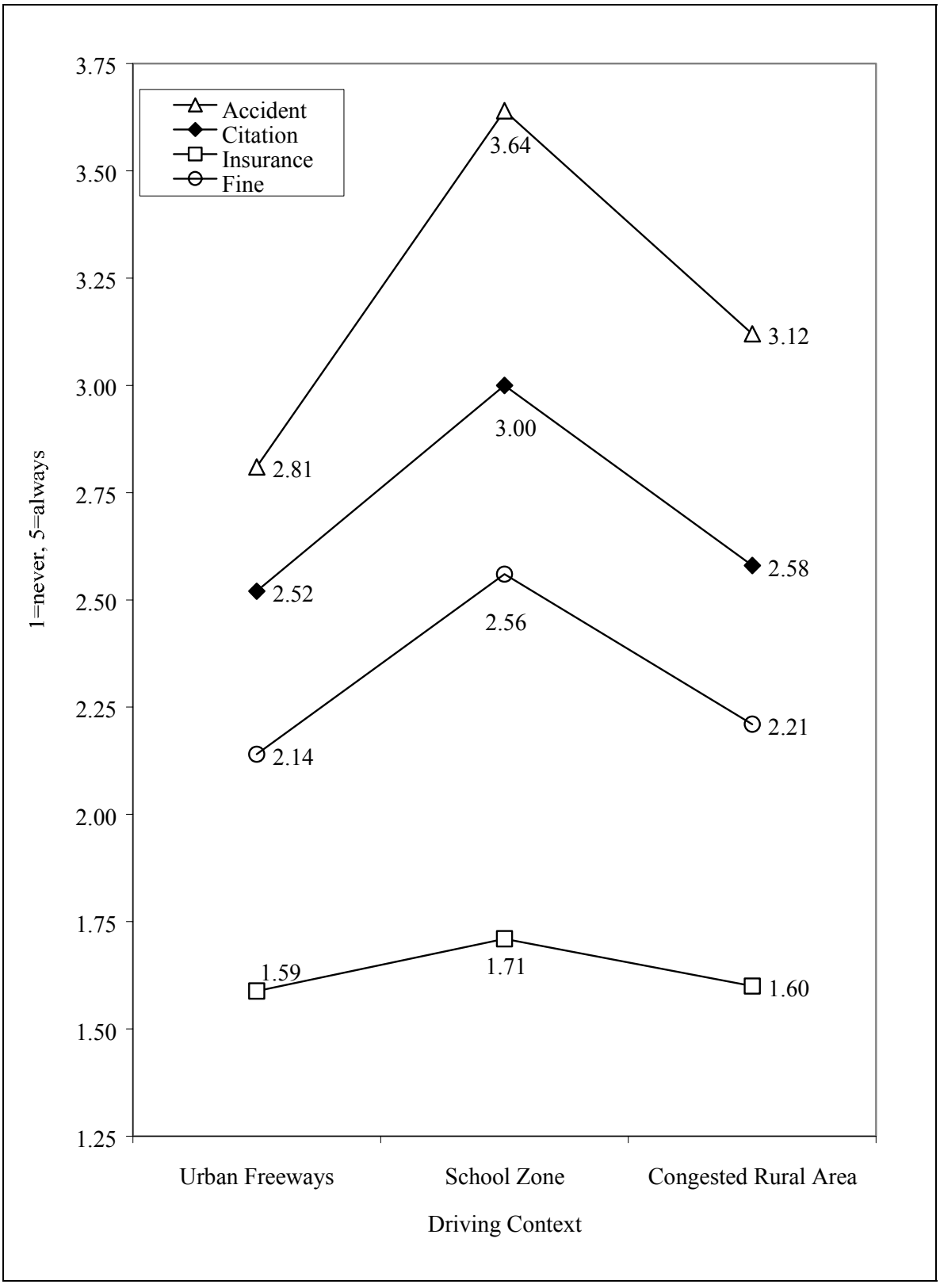

Figure 4.8: Average subjective weight of risk, by type of risk, comparing speed reductions in ***school zones*** to speed reductions on urban freeways, and in congested rural areas

4.4.5 Safety Corridors versus Baseline

Figure 4.9 presents means for responses to four questions about consideration of risk factors in safety corridors, again comparing those responses to the baseline contexts. The overall profile associated with risk in safety corridors is very different from that found for school zones and work zones. The consideration, or weight given to accident risk is higher than that for urban freeways but less than that reported for congested rural highways. The weight given to the risk of being stopped and cited by the police is somewhat higher than that given to either baseline context, although lower than in either school or work zones. The weight given to the risk of higher insurance rates is essentially the same for all three contexts.

The weight given to the risk of a traffic fine is also higher in safety corridors than in the baseline contexts, although, once again, not as high as in work or school zones. In addition, although the difference is very small, there is an interaction, to the extent that the difference in weight given to traffic fines is somewhat greater than the difference in weight given to citations. In relation to congested rural highways, the interaction is statistically significant. Relative to rural congested highways, the interaction is just below the threshold of statistical significance ($\alpha = .059$, see Table B.4).

4.5 AWARENESS OF DOUBLE FINES AND PERCEPTION OF RISK

If double fine laws work, then people who are not aware of double fine laws should perceive lower speeding risks in locations where double fines apply. This can be tested by looking for changes in the perception of speeding risk in a given driving context, depending on awareness of the applicability of double fines in that same driving context. This section, along with Tables 4.7 - 4.10 explore that hypothesis. It is important to note that these were telephone interviews, and that respondents were asked to assess risk before the issue of double fines was ever mentioned. Because of the ordering, learning effects associated with questions dealing with double fines, did not influence respondents' risk assessments.

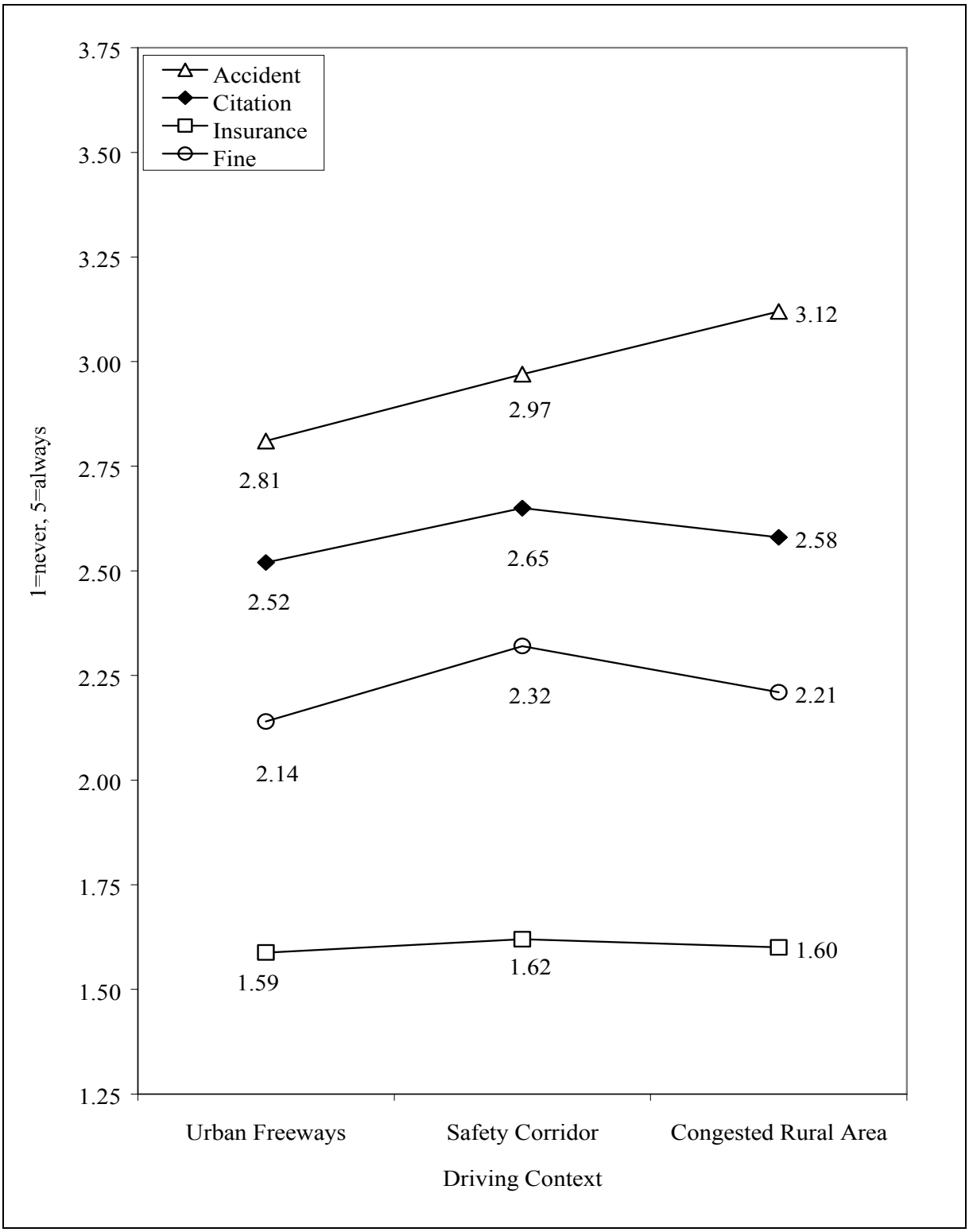

Figure 4.9: Average subjective weight of risk, by type of risk, comparing speed reductions in ***safety corridors*** to speed reductions on urban freeways, and in congested rural areas

4.5.1 Awareness of Double Fines and Accident Risk

Table 4.7 presents three cross-tabulations. The sub-sections of the table are formed by combining three parallel questions about awareness of double fines, with three parallel questions about risk of a traffic accident in different contexts. Consider the section labeled "School Zones;" in which *78*% of respondents who are aware that fines double in school zones are always influenced to obey speed limits, compared to 78% of people who are not aware that fines double. In other words, awareness of double fines has no effect on perceived accident risk. Note, based on the summary correlations across the bottom of the table, that none of the associations are statistically significant, indicating that there is no association between awareness of double fines and perceived accident risk. There is no reason to expect that there should be.

Table 4.7: Assessment of accident risk, by context and by awareness of the applicable double fine law

When driving in a **school zone/work zone/safety corridor** how often does the risk of an **Accident** influence you to obey posted speeds?	**Know fines double in:**					
	School Zones		**Work Zones**		**Safety Corridors**	
	YES	NO	YES	NO	YES	NO
ALWAYS	78%	78%	61%	63%	41%	34%
MOST OF THE TIME	13%	16%	27%	24%	33%	36%
SOMETIMES	5%	3%	8%	7%	16%	19%
HARDLY EVER	2%	3%	3%	2%	5%	7%
NEVER	2%	1%	1%	2%	4%	3%
Total	485	152	601	41	329	297
Kendall's Tau B		0.007		0.009		-0.064
Significance		0.859		0.813		0.082

4.5.2 Awareness of Double Fines and Traffic Citation and Traffic Fine Risk

Table 4.8 presents the same information for perceived risk of a traffic citation.. Kendall's Tau and its associated p value suggest that the difference for school zones is statistically significant. There is a similar, statistically significant association in the case of work zones. In the case of safety corridors, the correlation has the right sign, but is not statistically significant.

Table 4.9 presents the same information for perceived traffic fine risk. In this case all the correlations are in the right direction, but only the one for school zones is statistically significant.

One consideration regarding work zones in all four tables 4.7 through 4.10, is that regardless of the risk type, the awareness of double fines in work zones is very high. Note that in table 4.8, only 38 respondents did not know that traffic fines double in work zones. This seriously limits our ability to effectively measure differences.

Table 4.8: Assessment of citation risk, by context and by awareness of the applicable double fine law

When driving in a **school zone/work zone/safety corridor,** how often does the risk of a **traffic citation** influence you to obey posted speeds?	Know fines double in:					
	School Zones		**Work Zones**		**Safety Corridors**	
	YES	NO	YES	NO	YES	NO
ALWAYS	55%	43%	43%	29%	33%	27%
MOST OF THE TIME	21%	15%	25%	24%	28%	28%
SOMETIMES	9%	20%	17%	21%	24%	27%
HARDLY EVER	8%	10%	9%	13%	8%	12%
NEVER	7%	11%	7%	13%	7%	6%
Total	472	143	580	38	321	289
Kendall's Tau B		-0.117		-0.078		-0.059
Significance		0.002		0.034		0.112

Table 4.9: Assessment of traffic fine risk, by context and by awareness of the applicable double fine law

When driving in a **school zone/work zone/ safety corridor,** how often does the risk of **a traffic fine** influence you to obey posted speeds?	Know traffic fines double in:					
	School Zones		**Work Zones**		**Safety Corridors**	
	YES	NO	YES	NO	YES	NO
ALWAYS	27%	17%	37%	28%	30%	23%
MOST OF THE TIME	10%	8%	19%	15%	21%	24%
SOMETIMES	10%	6%	16%	18%	18%	24%
HARDLY EVER	25%	26%	14%	15%	16%	17%
NEVER	29%	43%	13%	23%	15%	13%
Total	459	140	561	39	309	286
Kendall's Tau B		-0.094		-0.064		-0.035
Significance		0.012		0.085		0.339

4.5.3 Awareness of Double Fines and Risk of Higher Auto Liability Insurance Rates

Table 4.10 presents the same information for perceived risk associated with higher auto liability insurance rates. This time correlations for school zones and safety corridors are significant and in the right direction. The correlation for work zones is small, non-significant, and in the wrong direction.

Table 4.10: Assessment of the risk of higher auto liability insurance rates, by context and by awareness of the applicable double fine law

When driving in a **school zone/work zone/ safety corridor**, how often does the **cost of auto insurance** influence you to obey posted speeds?	**Know fines double in:**					
	School Zones		**Work Zones**		**Safety Corridors**	
	YES	NO	YES	NO	YES	NO
ALWAYS	47%	36%	21%	28%	22%	12%
MOST OF THE TIME	15%	11%	11%	18%	14%	14%
SOMETIMES	11%	17%	11%	8%	13%	14%
HARDLY EVER	13%	18%	25%	23%	25%	26%
NEVER	15%	19%	32%	25%	26%	35%
Total	454	139	560	40	307	285
Kendall's Tau B		-0.131		0.050		-0.116
Significance		0.000		0.176		0.002

5.0 DISCUSSION

5.1 SUMMARY

5.1.1 Demographics

Based on comparisons with 2000 US Census data, the sample appears to be reasonably representative. The geographic distribution of the sample by region is proportional to the population. The sample is somewhat more male, more middle-aged and more likely to have children present in the household, but these differences may reflect screening criteria that weed out low-mileage drivers. The sample is also better educated than the population.

5.1.2 Speeding Behavior

Most respondents readily admit to speeding, at least occasionally. Almost everyone (90%) admits to speeding within the past three years, and a clear majority (71%) report having been stopped by the police for speeding at least once during their driving career. Reasons given for speeding include "to match the flow of traffic" (91%), "to pass another vehicle" (92%), "because the speed limit is set too low" (45%) and "because everyone else speeds" (49%). The public also believes speed enforcement in Oregon is lenient. More than 82 percent of respondents think they can drive *at least* 5 mph (8 km/h) over the limit and not be cited, and almost 34 percent believe they can drive *more than* 5 mph (8 km/h) without being cited.

5.1.3 Awareness of Double Fines

Almost all respondents (93 percent) reported knowing about double fine laws in work zones, and 90 percent reported having noticed double fine signs in work zones. There was less awareness of double fines in school zones, with 85 percent reported knowing that fines can double in school zones, and not quite 48 percent reported having actually noticed double fine signs in school zones. About half (52 percent) reported being aware that fines double in safety corridors, and 41 percent reported having noticed double fine signs in safety corridors. Most respondents who were aware that fines double, said that the signs influenced how fast they drive. Of those who said they had noticed double fine signs in work zones, 79 percent reported being influenced "a lot" or "some." Respondents who reported having noticed signs in school zones and safety corridors, reported similar influence on their speed, but because fewer noticed the signs, the net influence was proportionately less.

5.1.4 Speeding by Context

Questions about speeding behavior indicate that people regard school and work zones as special; 81.6 percent claim they *always* obeying speed signs in school zones, and 64.5 percent *always*

obey speed signs in work zones. By comparison, on urban freeways 32.4 percent *always* obey speed signs, on congested rural highways, 42.7 percent, and in safety corridors, 37.6 percent.

Respondents were also asked about the speed compliance of others. Respondents generally perceive others to be more inclined (than themselves) to speed, but beyond that, the pattern is parallel, to the extent that respondents also see the compliance of others to be higher in school zones and work zones.

Based on 20 questions that tap four risk concerns and five driving contexts, survey results allowed us to develop a profile, or "mental map" of peoples' assessment of the risks associated with speeding, across different driving contexts. In doing so, it was possible to show that their risk assessments differ from one driving context to another. Assuming that these mental maps are shaped by experience and knowledge, it should be possible to evaluate anti-speeding measures by looking for changes in the mental map.

Regardless of the driving context, the risk of causing an accident consistently received the most consideration or weight from respondents, followed by the risk of being stopped and cited by the police, and the risk of a traffic fine. The risk associated with the cost of auto insurance received the lowest weight in all driving contexts. Also, unlike other risk types, risk associated with the cost of auto insurance was not sensitive to driving context.

5.1.5 School and Work Zones

Looking at differences between driving contexts, work zones and school zones have very similar risk profiles, with high consideration given to the risk of causing an accident, and also more weight given to risks associated with traffic citations and fines. Both these contexts involve unprotected road users, and this may account for the relatively high weight given in both cases to the risk of causing an accident. In addition, in both school and work zones, the characteristic mental map seems to reflect the effects of well established and effective speed countermeasures, in terms of relative weight given to both traffic citations and traffic fines. However, there is no specific evidence of an effect due to double fines. This is not surprising, to the extent that in fact multiple speed management strategies have been applied on a fairly long term basis in both contexts.

In school zones, speed control measures include conventional school zone signing, crossing guards, dedicated traffic control devices, traffic calming devices, relatively frequent traffic patrols, and well publicized use of photo radar. In Oregon work zones there is, in addition to double fine signing, a high level of coordinated public information (*Give 'em a Brake*), radar reader boards and a fairly high level of targeted enforcement.

5.1.6 Safety Corridors

Public perceptions of the risks associated with speeding in safety corridors provide an interesting contrast to other contexts. Overall, speeding in safety corridors is not considered to be more risky than speeding through congested areas along rural highways, and not much riskier than speeding on urban freeways. This is interesting in part because many safety corridors in Oregon are in fact segments of rural highway that include one or more specific congested areas.

However, when we look at risk type, it becomes clear that the public does differentiate safety corridors from congested rural highways. In the case of safety corridors they give relatively less weight to the risk of causing a traffic accident and relatively more weight to the risk of traffic citations and fines.

In addition, and perhaps most important, there are weak interaction effects which suggest that when safety corridors are compared to either baseline condition, the relative weight given to the risk of a traffic fine rises faster than the relative weight given to the risk of being cited. Given that being stopped and cited nearly always entails being fined, the interaction suggests that the public is cognizant of a difference in the *severity* of fines in safety corridors. This, more than anything else, suggests that double fines are having at least a modest effect on public perceptions of risk.

5.1.7 Risk Perception and Awareness of Double Fines

Awareness of double fines does not appear to alter perception of *accident* risk. However, awareness of applicability of double fines it does seem to alter perception of risk associated with *traffic citations*, *traffic fines* and the *cost of liability insurance*, at least to some extent. Associations are weak and not all associations are statistically significant. In the case of school zones, people who are aware of double fines are significantly more cognizant of risks associated with all three.

In the case of work zones, people who are aware of double fines are significantly more cognizant of just citation risk. However, as already noted, given the small number of respondents who are not aware of double fines in work zones, this may not provide a very powerful test.

In the case of safety corridors, people are significantly more cognizant of the risks of higher insurance rates. Other correlations are in the right direction but not statistically significant.

5.2 CONCLUSIONS

While is it difficult to translate these survey results to actual driving behavior, a number of potentially useful conclusions are possible.

1) Most people will admit to speeding, at least occasionally.
2) Most people think there is some ‘flexibility” in posted speeds, and that they can exceed the posted speed by up to 5 mph (8 km/h) without being cited. More than a third believe they can exceed the posted speed by more than 5 mph (8 km/h) and not be cited.
3) Most people are aware that double fines apply to work zones. There is less awareness of double fines in school zones and safety corridors.
4) When considering safety corridors, people do not report the same elevated perception of crash risk that they report for work zones and school zones. They also do not have the same elevated perception of citation or fine risk.
5) People give less consideration to crash risk in safety corridors than on “a rural highway approaching a congested area.”

6) Results that speak directly to the effectiveness of double fine signing are weak, inconsistent and generally not very conclusive. however there are subtle indications that double fine signing may be having a beneficial effect

   a) People make qualitative distinctions about the risks entailed in speeding, from one driving context to another, and they perceive greater risks, in work zones and school zones, than in the other speeding contexts we examined. Double fine signing is applicable to both work zones and school zones, and may account for at least some of the difference. However, it is also clear that there are a number of other differences, including other countermeasures that could account for this elevated perception of risk.

   b) Awareness of the applicability of double fines in school zones elevates the perception of the risk of traffic fines, traffic citations and higher insurance rates. Similar but less consistent results were found in the case of work zones and safety corridors.

   c) In safety corridors, respondents give relatively greater weight to the risk of a traffic fine, compared to a traffic citation. This finding would be more convincing if we had been able to show comparable relative differences in work zones and school zones.

5.3 RECOMMENDATIONS

Perhaps the most important finding contained in this report is that the driving public holds an elevated perception of not just accident risk, but also of risks of traffic citations and fines, in work zones and school zones, but not in safety corridors. This, it seems, is a more fundamental and important conclusion than any conclusions it may be possible to draw about the effectiveness of double fine signing. Double fines are just one component of a comprehensive countermeasure strategy.

Information and education are important to counteract the belief that safety corridors present less crash risk than other rural highways. Higher levels of enforcement are needed to amplify the weak but measurable increase in perception of risk associated with fines in safety corridors. Going back to the earlier discussion of deterrence theory, increases in *severity* of sanctions are more likely to be effective if they are accompanied by increases in the *certainty* of sanctions. No level of fine is going to deter a driver who does not expect to be cited.

This report provides some limited evidence that the threat of double fines elevate people's assessment of risk in several different driving contexts. However, double fines alone are not a sufficient countermeasure to effectively manage speed in safety corridors. Conversely, while there remains room for doubt about the effectiveness of double fine signing in safety corridors, the economic and social cost of leaving double fine laws in place, is negligible. Consequently, it is recommended that double fine signing be retained, and that other countermeasure enhancements be considered to achieve more effective speed control in safety corridors.

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APPENDICES

APPENDIX A - SURVEY QUESTIONNAIRE

Oregon Department of Transportation, Double Fine Survey Instrument

The following is the literal text from the Computer Assisted Telephone Interview (CATI) system used to conduct these interviews, complete with various prompts, probes and interviewer instructions. No hard copy questionnaire exists. Upper case signifies question labels and interviewer instructions. Lower case is to be read by the interviewer, either as a question or as a probe. Note that some sets of questions were randomized by the CATI system, and these sections may be particularly difficult to read and interpret in the hard copy version.

HELLO Hello. The Oregon Department of Transportation has asked us to conduct a 10-minute survey about people who drive faster than the speed limit [particularly in highway work zones and school zones]. My name is ____, calling from the University of Oregon Survey Research Laboratory. I want to assure you that I am not selling a thing, and that this survey is completely anonymous and voluntary. [Please do not even tell me your name]. PRESS 1

HELLO1 I need to speak with an adult licensed driver [age 18 and older] who drives 75 miles or more per week [on average]. Does that include you? PROBE: Are you an adult licensed driver [age 18 and older] who drives 75 miles or more per week [on average]? PROBE: Please include weekend trips as well as commuting to work or school [when thinking about 75 miles or more per week]. PROBE: The survey questions ask about your experiences with *other* people driving too fast, as well as your own driving decisions.
1 YES --> SKIPTO HELLO3
2 NO

HELLO2 Are there any other adult licensed drivers in your household [age 18 and older], who drive 75 miles or more per week [on average]? PROBE: Please include weekend trips as well as commuting to work or school [when thinking about 75 miles or more per week]. NOTE:IF OTHER DRIVER NOT AVAILABLE, SCHEDULE CALL BACK
1 YES
2 NO --> SKIPTO NOQAL
7 REFUSED
8 DON'T KNOW
9 NO ANSWER

HELLO3 Do you have any questions about the survey before we begin? YES --> REFER TO ANSWERS TO COMMON QUESTIONS
1 NO, CONTINUE

COOPERAT We appreciate your cooperation. [I'd like to begin the survey now.]
1 OK

WITHIN1 To begin, I am going to ask you a few questions about why some drivers obey speed signs on the road. For each one, please tell me if it is one of the reasons you consider when deciding to drive within the posted speed. The first one is the risk of causing an accident. PROBE: Do you obey speed signs because of the risk of causing an accident?
1 YES

2 NO
7 REFUSED
8 DON'T KNOW
9 NO ANSWER

WITHIN2 (What about / Do you obey speed signs because of) the risk of receiving a traffic citation from the police? PROBE: Is this one of the reasons you drive within the posted speed?
1 YES
2 NO
7 REFUSED
8 DON'T KNOW
9 NO ANSWER

WITHIN3 (What about / Do you obey speed signs because of) the cost of a traffic fine? PROBE FOR 'YOU JUST ASKED THAT': This question is about the cost of a speeding ticket. [The previous question was about the risk of getting a ticket, without regard to cost.] PROBE: Is this one of the reasons you drive within the posted speed?
1 YES
2 NO
7 REFUSED
8 DON'T KNOW
9 NO ANSWER

WITHIN4 (What about / Do you obey speed signs) to get better gas mileage? PROBE: Is this one of the reasons you drive within the posted speed?
1 YES
2 NO
7 REFUSED
8 DON'T KNOW
9 NO ANSWER

SPEEDER In the past three years, have you ever driven faster than the posted speed in Oregon [for any reason]? PROBE: I mean the posted speed [not the basic speed law]. NOTE: A FEW R'S WILL KNOW THAT THERE IS NO SPEED LIMIT IN MOST OF OREGON AND WILL WANT TO MAKE AN ISSUE OF IT.
1 YES
2 NO --> SKIPTO OTHER
7 REFUSED
8 DON'T KNOW
9 NO ANSWER

SPEED1 I need to ask you a few questions about the reasons you have driven faster than the speed limit. Have you ever driven faster [than the speed limit] because the flow of traffic was going faster [than the posted speed]?
1 YES
2 NO

7 REFUSED
8 DON'T KNOW
9 NO ANSWER

SPEED2 (What about speeding up / Do you ever speed up) for a short time to pass another vehicle?
1 YES
2 NO
7 REFUSED
8 DON'T KNOW
9 NO ANSWER

SPEED3 (What about driving / Do you ever drive) faster than the posted speed, because it is set too low?
1 YES
2 NO
7 REFUSED
8 DON'T KNOW
9 NO ANSWER

SPEED4 (Have you ever driven / Do you ever drive) faster than the posted speed, because everyone else does?
1 YES
2 NO
7 REFUSED
8 DON'T KNOW
9 NO ANSWER

QOTHER Now please take a moment to think about other drivers on the road, and how often they obey signs and rules. For each question that I ask, please use these answer categories: always, most of the time, sometimes, or hardly ever. PRESS 1 RANDOMIZE ORDER OF OTHER1 - OTHER5

OTHER1 [What about / How often do other drivers obey signs to reduce speed] when they PROBE: ... always, most of the time, sometimes, or hardly ever? PROBE: A safety corridor is a section of highway that ODOT has designated for special signing, more law enforcement, and other special treatments [like daytime use of headlights], because of a history of safety problems.
1 ALWAYS
2 MOST OF THE TIME
3 SOMETIMES
4 HARDLY EVER
7 REFUSED
8 DON'T KNOW
9 NO ANSWER

SELF Now please take a moment to think about your driving habits, and how often you obey certain signs and rules. [Please use the same answer categories as before: always, most of the time, sometimes, or hardly ever.] PRESS 1

SELF1 (What about / How often do you completely obey signs that tell you to reduce your speed) when you PROBE: ... always, most of the time, sometimes, or hardly ever?
1 ALWAYS
2 MOST OF THE TIME
3 SOMETIMES
4 HARDLY EVER
7 REFUSED
8 DON'T KNOW
9 NO ANSWER

INTRO As you know, drivers sometimes decide to obey the speed limit depending on where they are driving. I need to ask you some questions about what you consider when you obey posted speeds. For each question, please tell me how often you consider it, using these answer categories: always, most of the time, sometimes, or hardly ever. PRESS 1 RANDOMIZE PLACEMENT OF FINE Qs- BEFORE ACCI SERIES, BEFORE CITE SERIES, BEFORE INSUR SERIES, OR AFTER INSUR SERIES

FINEA (One / Another) reason for obeying speed signs is the cost of a traffic fine. NOTE: IF R BALKS, HAVING SAID BEFORE THAT IT IS NOT A REASON S/HE OBEYS SPEED LIMITS, SAY 'THANK YOU' AND QUICKLY RECORD '9s' FOR THE QUESTIONS IN THIS COLOR. [First / Next / What about], when you drive [how often does the cost of a traffic fine influence you to obey speed signs]? PROBE: [Is that] always, most of the time, sometimes, or hardly ever? PROBE FOR 'DIDN'T YOU ASK ME THAT ALREADY?': Not exactly. The earlier question asked *if* you obey speed signs because of the cost of a traffic fine. These questions ask *how often* the cost of a traffic fine influences you [in different driving situations]. PROBE: A safety corridor is a section of highway that ODOT has designated for special signing, more law enforcement, and other special treatments [like daytime use of headlights], because of a history of safety problems.
1 ALWAYS
2 MOST OF THE TIME
3 SOMETIMES
4 HARDLY EVER
5 (IF VOLUNTEERED) NEVER
7 REFUSED
8 DON'T KNOW
9 NO ANSWER

ACCI (One / Another) reason for obeying speed signs is the risk of causing an accident. NOTE: IF R BALKS, HAVING SAID BEFORE THAT IT IS NOT A REASON S/HE OBEYS SPEED LIMITS, SAY 'THANK YOU' AND QUICKLY RECORD '9s' FOR THE QUESTIONS IN THIS COLOR. [First / Next / What about], when you drive [how often does the risk of causing an accident influence you to obey speed signs]? PROBE: [Is that] always, most of the time, sometimes, or hardly ever? PROBE: A safety corridor is a section of highway that ODOT has designated for special signing, more law enforcement, and other special treatments [like daytime use of headlights], because of a history of safety problems.

1 ALWAYS
2 MOST OF THE TIME
3 SOMETIMES
4 HARDLY EVER
5 (IF VOLUNTEERED) NEVER
7 REFUSED
8 DON'T KNOW
9 NO ANSWER

FINEB (One / Another) reason for obeying speed signs is the cost of a traffic fine. NOTE: IF R BALKS, HAVING SAID BEFORE THAT IT IS NOT A REASON S/HE OBEYS SPEED LIMITS, SAY 'THANK YOU' AND QUICKLY RECORD '9s' FOR THE QUESTIONS IN THIS COLOR. [First / Next / What about], when you drive [how often does the cost of a traffic fine influence you to obey speed signs]? PROBE: [Is that] always, most of the time, sometimes, or hardly ever? PROBE FOR 'DIDN'T YOU ASK ME THAT ALREADY?': Not exactly. The earlier question asked *if* you obey speed signs because of the cost of a traffic fine. These questions ask *how often* the cost of a traffic fine influences you [in different driving situations]. PROBE: A safety corridor is a section of highway that ODOT has designated for special signing, more law enforcement, and other special treatments [like daytime use of headlights], because of a history of safety problems.

1 ALWAYS
2 MOST OF THE TIME
3 SOMETIMES
4 HARDLY EVER
5 (IF VOLUNTEERED) NEVER
7 REFUSED
8 DON'T KNOW
9 NO ANSWER

CITE (One / Another) reason for obeying speed signs is the risk of being cited by the police. NOTE: IF R BALKS, HAVING SAID BEFORE THAT IT IS NOT A REASON S/HE OBEYS SPEED LIMITS, SAY 'THANK YOU' AND QUICKLY RECORD '9s' FOR THE QUESTIONS IN THIS COLOR. [First / Next / What about], when you drive [how often does the risk of receiving a traffic citation influence you to obey speed signs]? PROBE: [Is that] always, most of the time, sometimes, or hardly ever? PROBE: A safety corridor is a section of highway that ODOT has designated for special signing, more law enforcement, and other special treatments [like daytime use of headlights], because of a history of safety problems.

1 ALWAYS
2 MOST OF THE TIME
3 SOMETIMES
4 HARDLY EVER
5 (IF VOLUNTEERED) NEVER
7 REFUSED
8 DON'T KNOW
9 NO ANSWER

FINEC (One / Another) reason for obeying speed signs is the cost of a traffic fine. NOTE: IF R BALKS, HAVING SAID BEFORE THAT IT IS NOT A REASON S/HE OBEYS SPEED LIMITS, SAY 'THANK YOU' AND QUICKLY RECORD '9s' FOR THE QUESTIONS IN THIS COLOR. [First / Next / What about], when you drive [how often does the cost of a traffic fine influence you to obey speed signs]? PROBE: [Is that] always, most of the time, sometimes, or hardly ever? PROBE FOR 'DIDN'T YOU ASK ME THAT ALREADY?': Not exactly. The earlier question asked *if* you obey speed signs because of the cost of a traffic fine. These questions ask *how often* the cost of a traffic fine influences you [in different driving situations]. PROBE: A safety corridor is a section of highway that ODOT has designated for special signing, more law enforcement, and other special treatments [like daytime use of headlights], because of a history of safety problems.

1 ALWAYS
2 MOST OF THE TIME
3 SOMETIMES
4 HARDLY EVER
5 (IF VOLUNTEERED) NEVER
7 REFUSED
8 DON'T KNOW
9 NO ANSWER

INSUR Another reason for obeying speed signs is the cost of auto insurance. [First / Next / What about], when you drive [how often does the cost of auto insurance influence you to obey speed signs]? PROBE: [Is that] always, most of the time, sometimes, or hardly ever? PROBE: A safety corridor is a section of highway that ODOT has designated for special signing, more law enforcement, and other special treatments [like daytime use of headlights], because of a history of safety problems. NOTE: IF R BALKS, HAVING SAID BEFORE THAT IT IS NOT A REASON S/HE OBEYS SPEED LIMITS, SAY 'THANK YOU' AND QUICKLY RECORD '9s' FOR THE QUESTIONS IN THIS COLOR.

1 ALWAYS
2 MOST OF THE TIME
3 SOMETIMES
4 HARDLY EVER
5 (IF VOLUNTEERED) NEVER
7 REFUSED
8 DON'T KNOW
9 NO ANSWER

FINED (One / Another) reason for obeying speed signs is the cost of a traffic fine. NOTE: IF R BALKS, HAVING SAID BEFORE THAT IT IS NOT A REASON S/HE OBEYS SPEED LIMITS, SAY 'THANK YOU' AND QUICKLY RECORD '9s' FOR THE QUESTIONS IN THIS COLOR. [First / Next / What about], when you drive [how often does the cost of a traffic fine influence you to obey speed signs]? PROBE: [Is that] always, most of the time, sometimes, or hardly ever? PROBE FOR 'DIDN'T YOU ASK ME THAT ALREADY?': Not exactly. The earlier question asked *if* you obey speed signs because of the cost of a traffic fine. These questions ask *how often* the cost of a traffic fine influences you [in different driving situations]. PROBE: A safety corridor is a section of highway that ODOT has designated for special signing, more law enforcement, and other special treatments [like daytime use of headlights], because of a history of safety problems.

1 ALWAYS
7 REFUSED

2 MOST OF THE TIME 8 DON'T KNOW
3 SOMETIMES 9 NO ANSWER
4 HARDLY EVER
5 (IF VOLUNTEERED) NEVER

SPEEDER2 Some people believe that police do not strictly enforce posted speeds. How many miles per hour do you think you can drive and not be cited, even if a police officer sees you speeding, where speed signs say 55 miles per hour? RECORD MILES PER HOUR ENTER EXACT NUMBER, 55-150
150 = 150 MILES PER HOUR OR MORE
996 = OTHER, IT DEPENDS, SPECIFY
997 REFUSED
998 DON'T KNOW
999 NO ANSWER

DBL1 [Next I need to ask you about fines.] Do you know that traffic fines double in highway work zones in Oregon? PROBE: Oregon has a law that says: If you receive a traffic ticket while driving through a part of the highway where construction or maintenance is taking place, the amount of money you have to pay is doubled [because you violated a law while in a work zone].
1 YES
2 NO
7 REFUSED
8 DON'T KNOW
9 NO ANSWER

DBL2 Have you ever noticed signs along the highway warning that traffic fines double in work zones?
1 YES
2 NO --> SKIPTO DBL4
7 REFUSED
8 DON'T KNOW
9 NO ANSWER

DBL3 How much do those signs influence how fast you decide to drive - a lot, some, a little, or not at all?
1 A LOT
2 SOME
3 A LITTLE
4 NOT AT ALL
7 REFUSED
8 DON'T KNOW
9 NO ANSWER

DBL4 Do you know that traffic fines double in school zones in Oregon? PROBE: Oregon has a law that says: If you receive a traffic ticket while driving through a school zone, the amount of money you have to pay is doubled [because you violated a law while in a school zone].

1 YES
2 NO
7 REFUSED
8 DON'T KNOW
9 NO ANSWER

DBL5 Have you ever noticed signs along the highway [warning that traffic fines double in school zones]?
1 YES
2 NO --> SKIPTO DBL7
7 REFUSED
8 DON'T KNOW
9 NO ANSWER

DBL6 How much do those signs influence how fast you decide to drive - [a lot, some, a little, or not at all]?
1 A LOT
2 SOME
3 A LITTLE
4 NOT AT ALL
7 REFUSED
8 DON'T KNOW
9 NO ANSWER

DBL7 Do you know that traffic fines double in some safety corridors in Oregon? PROBE: A safety corridor is a section of highway that ODOT has designated for special signing, more law enforcement, and other special treatments [like daytime use of headlights], because of a history of safety problems. PROBE: Oregon has a law that says: If you receive a traffic ticket while driving through a safety corridor, the amount of money you have to pay is doubled [because you violated a law while in a school zone].
1 YES
2 NO --> SKIP DBL10
7 REFUSED
8 DON'T KNOW
9 NO ANSWER

DBL8 Have you ever noticed signs along the highway [warning that traffic fines double in safety corridors]?
1 YES
2 NO --> SKIPTO DBL10
7 REFUSED
8 DON'T KNOW
9 NO ANSWER

DBL9 How much do those signs influence how fast you decide to drive - [a lot, some, a little, or not at all]?
1 A LOT
2 SOME
3 A LITTLE
4 NOT AT ALL
7 REFUSED
8 DON'T KNOW
9 NO ANSWER

DBL10 Have you ever received a double fine for speeding in a work zone, a school zone, or a safety corridor?
1 YES
2 NO
7 REFUSED
8 DON'T KNOW
9 NO ANSWER

DRIVE1 I need to end the survey by asking some questions about you. First, for how many years have you been a licensed driver? ENTER EXACT NUMBER OF YEARS, 0-80
0 = LESS THAN ONE YEAR
80 = 80 OR MORE
97 REFUSED
98 DON'T KNOW
99 NO ANSWER

MILES How many miles do you drive, on average, in a typical week? PROBE: ... including miles you drive on the job. NOTE:THIS SHOULD 75 MILES MINIMUM CODE ACTUAL MILES, 0-996, NO DECIMALS
996 = 996 MILES OR MORE
997 REFUSED
998 DON'T KNOW
999 NO ANSWER

DRIVE2 Do you regularly drive through any areas that are prone to vehicle accidents? PROBE: ... such as a safety corridor.
1 YES
2 NO
7 REFUSED
8 DON'T KNOW
9 NO ANSWER

STOP1 Have you ever been stopped for speeding by a police officer? PROBE: Do not include any times you were a passenger in a car that a police officer stopped for speeding.
1 YES
2 NO

7 REFUSED
8 DON'T KNOW
9 NO ANSWER

STOP2 Have you received a citation for speeding in the past three years in Oregon?
1 YES
2 NO
7 REFUSED
8 DON'T KNOW
9 NO ANSWER

COUNTY In what county [in Oregon] do you live?

1 BAKER	13 HARNEY	25 MORROW
2 BENTON	14 HOOD RIVER	26 MULTNOMAH
3 CLACKAMAS	15 JACKSON	27 POLK
4 CLATSOP	16 JEFFERSON	28 SHERMAN
5 COLUMBIA	17 JOSEPHINE	29 TILLAMOOK
6 COOS	18 KLAMATH	30 UMATILLA
7 CROOK	19 LAKE	31 UNION
8 CURRY	20 LANE	32 WALLOWA
9 DESCHUTES	21 LINCOLN	33 WASCO
10 DOUGLAS	22 LINN	34 WASHINGTON
11 GILLIAM	23 MALHEUR	35 WHEELER
12 GRANT	24 MARION	36 YAMHILL
97 REFUSED	98 DON'T KNOW	99 NO ANSWER

URBRUR Do you live in an urban, suburban, or rural area?

1 URBAN
2 SUBURBAN
3 RURAL, RANCH, FARM
7 REFUSED
8 DON'T KNOW
9 NO ANSWER

HHKIDS Do any children under age 18 live in your home? PROBE: ... half time or more?

1 YES
2 NO
7 REFUSED
8 DON'T KNOW
9 NO ANSWER

AGE How old are you? OPEN-ENDED, ENTER EXACT AGE 18-96

96 96 OR MORE
97 REFUSED
98 DON'T KNOW
99 NO ANSWER

SEX [This may sound silly but] [I have to ask] are you male or female?

1 MALE
2 FEMALE
7 REFUSED
8 DON'T KNOW
9 NO ANSWER

EDUC What is the highest level of education you have completed? PROBE FROM LIST

1 0-8 YEARS, NO GED
2 8-12 YEARS, NO HIGH SCHOOL DIPLOMA OR GED

3 HIGH SCHOOL DIPLOMA OR GED
4 SOME COLLEGE, NO DEGREE
5 ASSOCIATE'S DEGREE (AA, AS)
6 BACHELORS DEGREE (BA, BS, AB)
7 MASTERS DEGREE (MA, MS, MBA)
8 DOCTORATE OR PROFESSIONAL DEGREE (PHD, JD, EDD, MD, DDS)
9 (IF VOLUNTEERED) OTHER
97 REFUSED
98 DON'T KNOW
99 NO ANSWER

EMPLOY Are you currently working for pay, either full time or part time? IF NO, PROBE: Are you retired, looking for work, keeping house, taking classes, disabled, or something else? PROBE FOR STUDENT WORKERS: Do you see yourself mainly as a student or as a worker?
1 EMPLOYED, OR SICK/ON VACATION FROM REGULAR JOB
2 RETIRED --> SKIPTO POVLEVEL
3 LOOKING FOR WORK / UNEMPLOYED --> SKIPTO POVLEVEL
4 KEEPING HOUSE --> SKIPTO POVLEVEL
5 STUDENT TAKING CLASSES, GOING TO SCHOOL, ON BREAK FROM SCHOOL
6 DISABLED /UNABLE TO WORK --> SKIPTO POVLEVEL
7 VOLUNTEER WORK ONLY --> SKIPTO POVLEVEL
8 OTHER, DOING NOTHING, HANGING OUT AND NOT LOOKING FOR WORK --> SKIPTO POVLEVEL
97 REFUSED
98 DON'T KNOW
99 NO ANSWER

DISTOWK How many miles is it one-way from your home to your (workplace / school)? PROBE: If you make no stops on the way, how many miles is it? NOTE: EXCLUDE MILES TO DROP OFF CHILDREN OR MAKE OTHER STOPS. CODE ACTUAL MILES, 0-995, NO DECIMALS
0 = WORKS AT HOME, WORKS OUT OF HOME
1 = 1 MILE OR LESS
995 = 995 MILES OR MORE
996 = WORKPLACE VARIES, NO FIXED WORKPLACE, ODD SITUATIONS - WORK IN ONE CITY AND LIVE IN ANOTHER, ALASKA FISHERMEN, TRAVELING EXECUTIVES
997 REFUSED
998 DON'T KNOW
999 NO ANSWER

INTID Thank you. That is the end of the survey. On behalf of the Oregon Department of Transportation, I would like to thank you for your time and attention to these questions. INTERVIEWER: TYPE YOUR INTERVIEWER ID NUMBER

INTOBS PLEASE RECORD ANY ADDITIONAL RESPONDENT COMMENTS OR ANY RELEVANT OBSERVATIONS IN THIS SPACE. NOTE: ANYTHING YOU WRITE HERE WILL BE READ AFTER THE STUDY IS LONNNGGGG OVER.

NOQAL I'm sorry to have bothered you. We can only interview people who drive 75 miles or more per week (on average). IF NO ADULT DRIVES 75+ MILES PER WEEK, PRESS 1 TO GO TO DISPOSITION SCREEN ENTER DISPOSITION: "(z) INELIGIBLE/DO NOT DRIVE ENOUGH"

APPENDIX B - DETAILED RESULTS FROM STATISTICAL ANALYSIS

Appendix B
Detailed Results from Statistical Analysis

Note that these analyses apply analysis of variance to dependent variables that are based on ordinal scales. Ordinarily analysis of variance requires at least an interval scale in the dependent variable, but we're not aware of a distribution-free method parallel to repeated-measures analysis of variance. Also, there is ample justification in the literature to relax this assumption in most cases. According to Labovitz (1970: 515)

> *"(a)lthough some small error may accompany the treatment of ordinal variables as interval, this is offset by the use of more powerful, more sensitive, better developed, and more clearly interpretable statistics with known sampling error."*

In general, violating the measurement assumption can be viewed as a special case of measurement error, and the threat posed by measurement error is an issue of degree. Few data collection efforts are error free, so the question is always, how much error can be tolerated? In this case it is arguable that the threat to validity due to measurement error is small.

First, it is arguable that this particular ordinal scale approximates a higher level of measurement in some important respects. The five point scale involves the labels, *always*, *most of the time*, *sometimes*, *hardly ever* and *never*. It has meaningful end points, i.e., "*always*" and "*never*," and it is arguable that "*sometimes*" is a reasonable approximation of an interval-level midpoint. In this regard it appears to meet Labovitz's (1970: 523) criteria of being "nearly" interval. Second, most of our inferences in this analysis are based on comparative results, and all the measures involved in the analysis are based on the same scale, so that absolute distortions may be less important in a relative sense.

Given these considerations, and with due cautions, the use of analysis of variance in this case appears to be justifiable.

Table B.1: Contrasts for repeated measures analysis of variance: Baseline

Source	Risk	Context	Type III Sum of Squares	df	Mean Square	F	Sig.
Risk							
	Acc vs. Fine		337.04	1	337.038	188.280	.000
	Cite vs. Fine		79.84	1	79.838	76.867	.000
	Insur vs. Fine		177.65	1	177.650	83.664	.000
Error(Risk)							
	Acc vs. Fine		991.71	554	1.790		
	Cite vs. Fine		575.41	554	1.039		
	Insur vs. Fine		1176.35	554	2.123		
Context							
		Urban vs. Rural	6.27	1	6.272	35.601	.000
Error (Context)		Urban vs. Rural	97.60	554	.176		
Risk * Context							
	Acc vs. Fine	Urban vs. Rural	29.06	1	29.061	22.551	.000
	Cite vs. Fine	Urban vs. Rural	.0451	1	.04505	.059	.809
	Insur vs. Fine	Urban vs. Rural	1.62	1	1.622	2.127	.145
Error(Risk*Context)							
	Acc vs. Fine	Urban vs. Rural	713.94	554	1.289		
	Cite vs. Fine	Urban vs. Rural	424.96	554	.767		
	Insur vs. Fine	Urban vs. Rural	422.38	554	.762		

Table B.2: Contrasts for repeated measures analysis of variance: Baseline and Work Zone

Source	CONTEXT	RISK	Type III Sum of Squares	df	Mean Square	F	Sig.
CONTEXT							
	Urban vs. Work zone		63.459	1	63.459	177.311	.000
	Rural vs. Work zone		30.038	1	30.038	106.166	.000
Error(CONTEXT)							
	Urban vs. Work zone		197.916	553	.358		
	Rural vs. Work zone		156.462	553	.283		
RISK							
		Acc vs. Fine	375.336	1	375.336	217.976	.000
		Cite vs. Fine	75.365	1	75.365	82.028	.000
		Insur vs. Fine	235.671	1	235.671	112.383	.000
Error(RISK)							
		Acc vs. Fine	952.220	553	1.722		
		Cite vs. Fine	508.080	553	.919		
		Insur vs. Fine	1159.662	553	2.097		
CONTEXT * RISK							
	Urban vs. Work zone	Acc vs. Fine	30.977	1	30.977	20.738	.000
		Cite vs. Fine	.874	1	.874	.840	.360
		Insur vs. Fine	47.958	1	47.958	45.960	.000
	Rural vs. Work zone	Acc vs. Fine	.181	1	.181	.136	.712
		Cite vs. Fine	.260	1	.260	.256	.613
		Insur vs. Fine	30.505	1	30.505	34.463	.000
Error(CONTEXT*RISK)							
	Urban vs. Work zone	Acc vs. Fine	826.023	553	1.494		
		Cite vs. Fine	575.126	553	1.040		
		Insur vs. Fine	577.042	553	1.043		
	Rural vs. Work zone	Acc vs. Fine	731.819	553	1.323		
		Cite vs. Fine	561.740	553	1.016		
		Insur vs. Fine	489.495	553	.885		

Table B.3: Contrasts for repeated measures analysis of variance: Baseline and School Zone

Source	CONTEXT	RISK	Type III Sum of Squares	df	Mean Square	F	Sig.
CONTEXT							
	Urban vs. School zone		114.319	1	114.319	241.280	.000
	Rural vs. School zone		66.677	1	66.677	180.703	.000
Error(CONTEXT)							
	Urban vs. School zone		260.118	549	.474		
	Rural vs. School zone		202.573	549	.369		
RISK							
		Acc vs. Fine	432.398	1	432.398	252.616	.000
		Cite vs. Fine	88.802	1	88.802	91.797	.000
		Insur vs. Fine	238.701	1	238.701	113.050	.000
Error(RISK)							
		Acc vs. Fine	939.713	549	1.712		
		Cite vs. Fine	531.087	549	.967		
		Insur vs. Fine	1159.188	549	2.111		
CONTEXT * RISK							
	Urban vs. School zone	Acc vs. Fine	103.856	1	103.856	53.631	.000
		Cite vs. Fine	2.765	1	2.765	2.168	.141
		Insur vs. Fine	41.456	1	41.456	29.965	.000
	Rural vs. School zone	Acc vs. Fine	22.000	1	22.000	12.426	.000
		Cite vs. Fine	3.682	1	3.682	3.029	.082
		Insur vs. Fine	26.620	1	26.620	23.183	.000
Error(CONTEXT*RISK)							
	Urban vs. School zone	Acc vs. Fine	1063.144	549	1.937		
		Cite vs. Fine	700.235	549	1.275		
		Insur vs. Fine	759.544	549	1.384		
	Rural vs. School zone	Acc vs. Fine	972.000	549	1.770		
		Cite vs. Fine	667.318	549	1.216		
		Insur vs. Fine	630.380	549	1.148		

Table B.4: Contrasts for repeated measures analysis of variance: Baseline and Safety Corridor

Source	CONTEXT	RISK	Type III Sum of Squares	df	Mean Square	F	Sig.
CONTEXT							
	Urban vs. Safety Corridor		6.593	1	6.593	30.936	.000
	Rural vs. Safety Corridor		.001	1	.001	.005	.943
Error(CONTEXT)							
	Urban vs. Safety Corridor		116.157	545	.213		
	Rural vs. Safety Corridor		108.686	545	.199		
RISK							
		Acc vs. Fine	275.248	1	275.248	164.289	.000
		Cite vs. Fine	64.962	1	64.962	71.696	.000
		Insur vs. Fine	199.854	1	199.854	98.955	.000
Error(RISK)							
		Acc vs. Fine	913.085	545	1.675		
		Cite vs. Fine	493.815	545	.906		
		Insur vs. Fine	1100.702	545	2.020		
CONTEXT * RISK							
	Urban vs. Safety Corridor	Acc vs. Fine	2.507	1	2.507	2.140	.144
		Cite vs. Fine	3.546	1	3.546	4.005	.046
		Insur vs. Fine	16.529	1	16.529	17.787	.000
	Rural vs. Safety Corridor	Acc vs. Fine	43.436	1	43.436	32.671	.000
		Cite vs. Fine	3.079	1	3.079	3.586	.059
		Insur vs. Fine	6.593	1	6.593	8.407	.004
Error(CONTEXT*RISK)							
	Urban vs. Safety Corridor	Acc vs. Fine	638.493	545	1.172		
		Cite vs. Fine	482.454	545	.885		
		Insur vs. Fine	506.471	545	.929		
	Rural vs. Safety Corridor	Acc vs. Fine	724.564	545	1.329		
		Cite vs. Fine	467.921	545	.859		
		Insur vs. Fine	427.407	545	.784		