ISA in the USA? The likelihood of U.S. drivers accepting and using intelligent speed assistance

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Abstract

Introduction: Speeding has contributed to thousands of fatalities in the Unites States annually for decades, despite long-standing awareness of its risks. Intelligence speed assistance (ISA) is a technology designed for speed limit compliance that has been shown to reduce speeding, and European law has mandated ISA for all new vehicles sold from July 2024. The United States lags in ISA deployment, with research specific to the U.S. driving population lacking in spite of lives lost. We studied attitudes toward ISA to understand how the intervention options specified for European vehicles are associated with ISA acceptability among U.S. drivers.

Method: U.S. adult drivers (N = 1,802) completed a survey that measured their agreement with statements about ISA and their driving-related attitudes and behaviors. Between-subjects assignment tied respondents to one intervention group (advisory warning, supportive accelerator pedal, or intelligent speed limiter) prior to rating ISA acceptability. Analyses estimated the likelihood of agreement that ISA would be acceptable and would be kept turned on, and agreement of the acceptability of interventions that would occur at 1–2 mph, 5 mph, or 10 mph over the speed limit.

Results: About three fourths of respondents agreed ISA would reduce speeding-related crashes. Over 60% agreed that ISA with an advisory warning would be acceptable or kept turned on, whereas agreement hovered around 50% for ISA with a supportive accelerator pedal or an intelligent speed limiter. Adjusting for multiple covariates minimized the preference for advisory warnings and found a significantly higher likelihood (21% higher) that a supportive accelerator pedal would be kept turned on relative to an intelligent speed limiter. A quarter to a third of each intervention group agreed that ISA interventions at 1–2 mph over the limit would be acceptable, whereas majorities agreed ISA interventions at 10 mph would be acceptable.

Conclusion: This study highlights opportunities to improve upon a modest level of agreement that ISA would be acceptable to U.S. drivers. A strong relationship between high intervention thresholds and acceptance implies there may be an ideal balance between effectiveness and acceptance. Deploying

ISA in environments with vulnerable road users also has promise, given ISA's potential to reduce injury crashes and the high acceptance for its use in school zones and among urban residents. The relationship between increased fleet penetration and increased ISA acceptability suggests that U.S. driver attitudes toward the technology may adapt positively with time.

Keywords: intelligent speed assistance, speeding behavior, vehicle technology acceptance

1. Introduction

Speeding increases crash risk by reducing a driver's margin for error. Reaction time must be sharper and more precise when an avoidance maneuver is required, as stopping distances are longer and the loss of steering control more likely. It also intensifies crash severity. Small increases in impact speed lead to exponential increases in forces transferred after the collision (Elvik et al., 2019), and studies have repeatedly found that actions that lead to changes in vehicle speed, such as lowering or raising speed limits and deploying or removing speed safety cameras, are associated with parallel drops or spikes in injury or fatal crashes (Farmer, 2019; Hu & Cicchino, 2024; Hu & McCartt, 2016).

Richter et al. (2005) suggested that the failure to address speeding in the United States accounted for the wide disparity in the United Kingdom's 30% reduction in the fatality rate during the 1990s relative to the modest 7% decrease observed in the United States. More recent data indicate that speeding remains a significant issue in the United States. In 2021, the most recent year reported, 12,330 (29%) of the deaths on U.S. roads involved speeding (National Center for Statistics and Analysis [NCSA], 2023a). Nationally representative self-report data from U.S. drivers and field surveys of vehicle speeds on U.S. roads indicate that excessive speeding is prevalent. About half of drivers admitted to speeding by 15 mph or more when driving on freeways in a 2022 survey, and about 70% of drivers on freeways were traveling at speeds over the posted limit when measured in 2015 (AAA Foundation for Traffic Safety, 2023; De Leonardis et al, 2018). The picture becomes even bleaker when considering that the United States experienced a record low of 32,744 deaths in traffic crashes in 2014, but fatalities have trended upward since. The lives lost in the United States in 2021 (42,939) represent a 31% increase over 2014 (NCSA, 2023b), and throughout this period, speeding was a factor in 26% to 29% of all traffic fatalities each year. In sum, speeding has been and remains a problem for U.S. transportation safety and merits more attention than it presently receives.

The current paper describes a survey about the acceptability of and intention to use intelligent speed assistance (ISA) among a representative sample of adult drivers residing in the United States. ISA

describes an in-vehicle technology designed to help drivers maintain vehicle speeds that comply with legal limits. An ISA system requires an accurate determination of speed limits in real time, an in-vehicle display of the current speed limit and a timely notification when the limit changes, and a method to intervene if the vehicle speed exceeds the limit. A body of research amassed over the past quarter century indicates that driving with ISA is associated with reductions in speeding and, if widely deployed, would lead to significant reductions in crashes, injuries, and fatalities (e.g., Biding & Lind, 2002; Lai et al., 2012; and for an extensive review, see Ryan, 2018).

The European Union (EU) issued a mandate requiring ISA for new vehicle types from July 2022 and requiring all new vehicles sold from July 2024 to be equipped with ISA (European Commission, 2022). Under this mandate, automakers must deploy an ISA system meeting certain requirements with some optional functions. Primary examples include speed limit determination, information, warning, and control functions. Determining the speed limit is feasible with an outfacing camera, GPS-linked speed limit data, or both. Automakers can use visual displays combined with auditory or tactile displays to meet information and warning requirements, and speed limit control can be accomplished by (a) an intelligent speed limiter that reduces power to the engine or (b) a supportive accelerator pedal that uses a counterforce that pushes against the accelerator pedal to reduce speed. Systems that include speed limit control are associated with improved speed compliance and greater crash reductions but are less acceptable than systems that include a warning (Biding & Lind, 2002). The minimum intervention required for an ISA by the EU mandate is a speed limit warning.

Despite the United States's high frequency of deaths due to speeding and work showing that the wide adoption of ISA could cut crashes by an estimated 30% (Lai et al., 2012), nearly all effort to study and encourage the deployment of ISA have occurred outside the United States. To date, published data on ISA acceptance at a national level show it is low in the United States relative to other countries (E-Survey of Road Users' Attitudes [ESRA], 2022). But this information is based on a single question, so it offers no insight about, for example, how ISA features influence acceptance. Similarly, a survey of U.S. drivers

found their acceptance of speed warnings to be higher than a speed interlock, but the focus of the effort was to establish how impairment prevention technologies ranked in acceptance among six hypothetical systems rather than a comprehensive study of ISA (Eshani et al., 2023). Thus, a detailed study of U.S. drivers' attitudes toward ISA can yield useful insight about a vehicle safety technology required in Europe but largely overlooked in the United States despite the role speeding plays in traffic crashes, injuries, and fatalities and ISA's potential as a countermeasure.

To meet our objectives, we measured the acceptability of ISA by asking respondents to consider system features specified by EU law, so that respondents were rating systems implemented or permissible in the European market. In developing our survey, we were influenced by Vlassenroot et al. (2011), who evaluated the acceptability of ISA among samples from Belgium and the Netherlands while accounting for many factors associated with speeding and technology acceptance. A departure from Vlassenroot et al. and primary focus of the current study was our effort to measure how acceptance changes as a function of the type of ISA intervention (i.e., warning, supportive accelerator pedal, intelligent speed limiter). We also examined the role of potential tolerance margins between posted limits and when speeding interventions initiate.

2. Method

2.1 Sample characteristics

Advarra, an independent Institutional Review Board, determined the research to be exempt. Opinion America Group (OAG), a survey research company, began data collection in mid-March and finished in mid-June 2023. The sample was drawn from the population of U.S. drivers who met the age of consent in their state of residence, which was 18 years old except in Alabama and Nebraska (age of consent was 19) and Mississippi (age of consent was 21) and reported driving at least once a week in a typical month.

Surveys were completed via telephone (n = 359) and online (n = 1,443). OAG contacted a total of 5,447 individuals and collected 1,802 completed surveys. Among the 3,645 contacts who did not complete the survey, 2,532 refused to participate, 725 did not meet screening requirements (drove less than once a week, n =296; declined to provide informed consent, n = 228; refused to provide monthly driving frequency, n = 133; refused to provide age, n = 67; was younger than the age of consent, n = 1), 362 online surveys were flagged for quality control issues (e.g., completing answers too quickly) and then excluded from analysis, 16 began but did not finish, and 10 could not participate due to language barriers.

2.2 Survey instrument

The survey began with collecting state of residence, age, and informed consent, and then measured driving exposure, respondent speed typology, likelihood of conditional speeding, agreement that speeding is unsafe, and agreement that non-ISA vehicle technologies are effective. The survey then progressed to measuring attitudes toward ISA. Ratings of agreement were measured on an interval scale (e.g., 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree), with the response options presented in ascending or descending order and counterbalanced across participants. Several constructs were measured by multiple survey items, as detailed below, and individual survey items measuring one construct were rotated to control order effects.

Respondents estimated the number of minutes they drive on a typical weekday and during a weekend and the frequency of daily driving (e.g., once a day, 3–4 times a day) in a typical week. Respondents categorized their residential areas as urban, suburban, or rural. The survey then progressed to five survey items (Table 1) to classify respondents into speed typologies of rare, sometimes, or frequent speeders using a cluster analysis, following the methodology developed by Schroeder et al. (2013). Respondents self-reported whether they received a speeding ticket in the previous year for validation of the speed typologies.

Table 1

Five survey items used for the speed typology cluster analysis

Survey item	Response options
Which best describes your driving?	I tend to pass cars more often than they pass me. Other cars pass me more often than I pass them. Both about equally. Don't know.
When driving do you tend to …	Stay with slower traffic? Keep up with faster traffic? Do both about equally?
How often would you say you drive … 15 mph over the limit on divided multilane highways? 15 mph over the limit on undivided two-lane highways? 10 mph over the limit on neighborhood/residential streets?	Often Sometimes Rarely Never Don't know

The perception that speeding is unsafe was measured by agreement with statements that it (1) increases risk of crash and injury and (2) is a serious concern for traffic safety. Perceived effectiveness of non-ISA vehicle systems was measured by ratings of agreement with four statements that first described the design intent of a feature (automatic emergency braking or "autobrake," lane departure warning and prevention [LDWP], adaptive cruise control [ACC], and enhanced seat belt reminders) and then asserted it would be effective at achieving its intended purpose. Likelihood of conditional speeding was measured by agreement with definitive statements that respondents would drive slower or faster when they are in a hurry, familiar with the road, or alone on the road.

The section on ISA began by asking respondents to indicate their agreement that they would want a display of the current speed limit in their vehicle and to be notified with an unobtrusive tone when the limit changes. Stratified random assignment was then used to assign respondents to one intervention type to achieve roughly equal distributions of each intervention across gender, age group, and region of the country. Verbatim descriptions of the interventions are provided in Table 2. ISA intervention was treated as a between-subjects variable, so that respondents' attitudes about ISA acceptability and their intention to use ISA were linked to their assigned intervention type.

Tabel 2

Descriptions of ISA interventions: advisory warning, supportive accelerator pedal, and intelligent speed limiter

ISA intervention	Description provided to respondent
Advisory warning	If the vehicle is going too fast for more than a few seconds, the system alerts the driver. If the vehicle continues to be over the limit, the system will warn the driver a second or third time, but the alerts will stop after 30 seconds even if the vehicle is still going too fast.
	Drivers can choose whether the speed alert should activate when the speedometer matches the speed limit or at some higher threshold, ranging from 1 mph over the limit up to 10 mph over.
	The alert lasts no more than 3 to 5 seconds and consists of a visual speed warning combined with either a noticeable but unobtrusive audible warning, such as a bell tone, or vibration of the gas pedal against the driver's foot in a way that is noticeable but doesn't affect the vehicle's handling.
	The driver can turn the system off on any given trip, but the system will reset to "on" the next time car is started.
	The system does not record any information about the driver.
Supportive accelerator pedal	If the vehicle is going too fast for more than a few seconds, the system triggers the accelerator pedal to gently push up against the driver's foot, slowing the vehicle down toward the speed limit. Drivers can easily override the system, for example, to pass a slow-moving vehicle, by pressing an "override" button or pressing harder on the accelerator. When the vehicle slows to a stable speed below the speed limit threshold or enters a slower speed limit zone, the system will be ready to intervene again.
	Drivers select when the accelerator pedal feedback occurs, ranging from when the speedometer matches the speed limit up to when the speedometer is 10 mph over the speed limit.
	Drivers can turn the system off on any given trip, but the system will reset to "on" the next time the vehicle is started.
Intelligent speed limiter	If the vehicle is going too fast for more than a few seconds, the system will keep the vehicle from accelerating further. Drivers can easily override the system, for example, to pass a slow-moving vehicle, by pressing an "override" button or pressing harder on the accelerator. When the vehicle slows to a stable speed below the speed limit threshold or enters a slower speed limit zone, the system will be ready to intervene again.
	Drivers select when the system becomes active, ranging from when the speedometer matches the speed limit up to when the speedometer is 10 mph over the speed limit.
	Drivers can turn the system off on any given trip, but the system will reset to "on" the next time car is started.

After hearing the description, respondents rated agreement with statements that it would be acceptable for the intervention to occur when their vehicle exceeds the limit by 1–2 mph, 5 mph, or 10 mph over the speed limit. ISA effectiveness was then measured by ratings of agreement with statements that the ISA intervention would keep them from violating speed limits on five road types (residential streets, roads near retail centers, undivided two-lane highways, divided multilane 55-mph highways, divided multilane 70-mph highways), near schools, and in construction zones, and that the intervention would be effective for reducing tickets, speeding-related crashes, or injuries to vulnerable road users. ISA acceptability and usefulness were measured by agreement with five statements that the ISA system described to them would be acceptable or useful on different roads. The same five road types included in the section on ISA effectiveness were used for the acceptability and usefulness sections (i.e., residential streets, roads near retail centers, undivided two-lane highways, divided multilane 55-mph highways, divided multilane 70-mph highways).

The survey then measured respondent perception that ISA would benefit different vehicle users including younger drivers, older drivers, large truck drivers, delivery van drivers, taxi or rideshare drivers, bus drivers, motorcyclists, and reckless drivers. The influence of wide-scale ISA deployment in the vehicle fleet on the respondents' intention to buy an ISA-equipped vehicle was measured by agreement with the statement that they would want to buy a car with the system if 60%–80% of other drivers on the road had it.

The remaining items measured attitudes about various ISA options or features as specified by EU law, with some items common to the three interventions or specific to one or two of them. Respondents assigned to the warning intervention rated their acceptability of receiving a second warning after about 10 seconds if they did not slow down after the first warning, and this group also indicated their preference to be warned by vibrating the accelerator pedal against the foot rather than the auditory warning initially described. Respondents assigned to the supportive accelerator pedal and intelligent speed limiter interventions indicated how frequently they would override the intervention. All respondents rated the

acceptability of an ISA system that turns on at the start of every trip and whether they would keep the system turned on. Participants indicated their agreement that it would be a good idea for the system to be on all new cars and their agreement that they would want ISA on their next car if it could lower their insurance costs by showing they drive the speed limit.

2.3 Analysis plan

We used five binary logistic-regression models to estimate whether the ISA interventions were associated with differences in acceptability or in the intention to use the system and whether acceptability among the interventions differed assuming they initiated at 1–2 mph, 5 mph, or 10 mph over the speed limit. Each logistic regression estimated the difference associated with the ISA interventions after controlling for multiple covariates.

Ratings of agreement that respondents made on a 5-point scale were dichotomized prior to analysis for outcome measures. Values of 4 or higher were converted to "1" and indicate agreement or strong agreement. Given that the acceptability of ISA was measured by agreement with five statements that ISA would be acceptable on five different road types, we used a composite score based on mean agreement with the statements, with a mean equal to or greater than 4 indicating agreement or strong agreement that ISA would be acceptable. The dependent measure that assessed the intention to use ISA was based on agreement with the statement "I would keep this system turned on." The final three dependent measures were based on agreement with statements that ISA would be acceptable if it intervened when the vehicle was 1–2 mph, 5 mph, or 10 mph over the speed limit. Each logistic regression estimated the odds of agreeing or strongly agreeing that ISA would be acceptable or would be kept on.

Four covariates included in the main analysis were based on a single survey item (age, gender, type of residential area, and influence of wide-scale ISA deployment on the intention to buy a car with ISA). In addition to the measure of acceptability, eight covariates were composite values based on responses to multiple survey items. Table 3 provides details regarding these nine composite variables. For

those that used mean or standard deviation values, Cronbach's alpha indicated the items comprising each construct had acceptable to excellent internal consistency.

Table 3

Details about variables based on composites of individual survey items

Variables based on composites	Method of creating composite score	Cronbach's alpha
Driving exposure	([Minutes per typical weekday + minutes per typical weekend]) × frequency of days driven per week)/60	N/A
Speed typology	Cluster analysis to classify respondent as a rare, sometimes, or frequent speeder based on survey items listed in Table 1.	N/A
Perceived effectiveness of vehicle technologies	Mean of four ratings of agreement that autobrake, ACC, LDWP, and enhanced seat belt reminders are effective.	0.73
Likelihood of conditional speeding	Mean of three ratings of certainty that respondent would drive faster or slower when in a hurry, familiar with the road, or alone on the road.	0.80
Perceived danger of speeding	Mean of two ratings of agreement.	0.81
Perception that ISA will similarly benefit many driver types	Standard deviation among eight ratings of agreement that ISA would be beneficial for eight driver types.	0.92
Perceived usefulness of ISA	Mean of five ratings of agreement that ISA would be useful on five different road types.	0.93
Perceived effectiveness of ISA	Mean of eight ratings of agreement that ISA would be effective on five different road types and in reducing tickets, speeding-related crashes, and injuries to vulnerable road users.	0.95
Perceived acceptability of ISA	Mean of five ratings of agreement that ISA would be effective on five different road types.	0.93

Note. N/A = not applicable. ACC = adaptive cruise control. LDWP = lane departure warning and prevention. ISA = intelligent speed assistance.

Covariates were selected based on prior research. Driving exposure (Gabany et al., 1997), speed typology (Schroeder et al., 2013), and the likelihood of conditional speeding (Vlassenroot et al., 2011) were expected to have inverse relationships with ISA acceptability such that higher amounts of exposure or speeding would be linked to lower acceptability. Historically, females speed less than males and, therefore, were expected to agree that ISA would be more acceptable than males. Lai and Carsten (2012) indicate that ISA was associated with the largest speeding reductions on urban, lower speed roads, so we expected that respondents who reside in self-described urban areas would have higher agreement that ISA is acceptable than suburban and rural respondents. The remaining covariates were based on Vlassenroot et al. (2011) and were expected to have a positive relationship with acceptability such that increased agreement that vehicle technologies are effective, speeding is dangerous, ISA is useful, ISA is effective,

ISA will benefit many driver types, or respondents would want ISA on their next car if it was widely deployed on other vehicles would be associated with increased agreement that ISA would be acceptable or remain turned on.

SAS 9.4 was used for all analyses. Odds ratios and associated 95% confidence intervals produced from logistic regression were converted to relative likelihoods following the procedure outlined in Zhang and Yu (1998). Thus, for example, when modeling the likelihood that respondents assigned to the advisory warning versus intelligent speed limiter interventions would keep the system turned on, a relative likelihood of 1.35 would indicate that respondents assigned to the advisory warning intervention had a 35% higher likelihood of agreeing they would keep the system turned on compared with those assigned to the intelligent speed limiter intervention. Covariates measured on 5-point Likert scales were not dichotomized in the manner of the outcome variables, and therefore relative likelihood for them represent the percentage change associated with a 1-point increase in the scale. Age was a continuous variable, with the age parameter scaled so that the effect represents a 10-year increase in age. As the covariate to control for the perception that ISA will similarly benefit different driver types was the standard deviation of ratings provided for eight driver types, associated parameter effects represent the change in a dependent measure associated with a 1-unit change in standard deviation. Small values of standard deviation indicate that a respondent had levels of agreement that indicated each driver type would benefit from ISA similarly. Criterion for statistical significance was set at $p < 0.05$; confidence intervals in which the lower and upper bounds are both above 1.0 or below 1.0 indicate statistical significance.

3. Results

Table 4 shows that stratified random assignment of respondents resulted with even distributions of males and females; younger, middle-aged, and older drivers; and residents dwelling in the East, Midwest, South, and West to the three ISA intervention groups. About one half of respondents in each group described their residential area as suburban, and about a quarter of each ISA group indicated they resided in a rural area or in an urban area. About three quarters of respondents assigned to each ISA intervention indicated they drove daily or almost daily. Comparison of the current sample's distribution across gender, age group, and region of the country approximated the U.S. Census Bureau's, so the unweighted sample was used for all analyses.

Table 4

Sample characteristics assigned to each ISA intervention group (percent)

Characteristic	Advisory warning (n = 600)	Supportive accelerator pedal (n = 601)	Intelligent speed limiter (n = 601)
Gender			
Female	49.2	49.1	49.1
Male	50.8	50.9	50.9
Age group			
Ages 18 to 44	44.7	45.8	46.6
Ages 45 to 64	34.3	33.3	32.5
Age 65 and older	21.0	21.0	21.0
Region of the U.S.			
East	17.2	17.3	17.8
Midwest	21.0	21.3	21.1
South	38.5	38.1	37.1
West	23.3	24.0	24.0
Description of area where respondent lives			
Rural	27.2	26.3	23.8
Suburban	49.5	50.1	53.1
Urban	23.3	23.6	23.1
Drive every day or almost every day of the week	75.0	74.9	74.0

Note. ISA = intelligent speed assistance.

The cluster analysis that classified respondents as drivers who rarely, sometimes, or frequently speed excluded those who did not know the answer to the items used in the cluster analysis (Table 1); this reduced the sample included in the cluster analysis and the sample used for subsequent analyses to 1,782

respondents. As indicated in Table 5, there were fewer frequent speeders (n = 406) than sometimes (n = 757) or rare speeders (n = 619), but 32%–35% of each speeder type was represented in each ISA group. Over a quarter of respondents classified as frequent speeders reported receiving at least one ticket in the year before the survey, which was 4 times and 6 times higher than respondents classified as sometimes and rare speeders, respectively. The frequent speeder group was skewed toward greater male representation, whereas females and males were more evenly distributed among sometimes and rare speeders. Although there are more drivers aged 18–44 classified as frequent speeders compared with the two older age groups, respondents in the 45–64 and 65 and older age groups had meaningful representation in the frequent speeder group.

Table 5

Speeding behaviors, ISA group, and age group by speed typology (percent)

Characteristic	Frequently speed (n = 406)	Sometimes speed (n = 757)	Rarely speed (n = 619)
ISA group			
Advisory warning	33.5	33.2	34.7
Supportive accelerator pedal	32.3	35.0	32.3
Intelligent speed limiter	34.2	31.8	33.0
What best describes your driving?			
I tend to pass other cars more than they pass me.	64.0	14.5	13.1
Other cars pass me more often than I pass them.	11.8	25.0	49.3
Both about equally.	24.1	60.5	37.6
When driving, do you tend to …			
Stay with slower moving traffic?	7.6	1.6	54.9
Keep up with the faster moving traffic?	77.8	27.7	38.5
Do both about equally?	14.5	70.7	6.6
Reported sometimes or often driving			
15 mph over the limit on divided multilane highways.	85.9	25.0	1.6
15 mph over the limit on undivided two-lane highways.	72.6	6.1	2.9
10 mph over the limit on residential streets.	60.8	4.6	8.9
Reported receiving a speeding ticket in past year.	26.4	6.1	4.4
Gender			
Female	42.9	52.7	46.2
Male	57.1	47.3	53.8
Age group			
Ages 18 to 44	66.0	45.8	30.8
Ages 45 to 64	26.6	33.6	38.3
Age 65 and older	7.4	20.6	30.8

Note. ISA = intelligent speed assistance.

Table 6a provides mean agreement on several composite variables and the individual items comprising them across ISA intervention group. Near uniform levels of mean agreement are evident across the three interventions for items related to perceived effectiveness of vehicle safety technologies, likelihood of conditional speeding, and perceptions that speeding is unsafe. In contrast, there was a consistent ranked order in mean agreement that ISA would be effective, useful, or would benefit the different driver types across the three ISA interventions. Ratings were highest for those assigned to the advisory warning intervention, followed by the intelligent speed limiter group. Ratings were lowest for the supportive accelerator pedal group. Mean agreement that ISA would be effective or useful ranged from values of 3.5 to 3.9 across the intervention groups and the two composite scores, where values of 3 and 4 are anchored to "neutral" and "agree."

Across intervention groups, respondents had the highest mean agreement that ISA would be effective in school zones compared with other road environments. Respondents also tended to have higher mean agreement that ISA interventions would be effective in terms of reducing speeding tickets, speeding-related crashes, and injuries to vulnerable road users than being effective on certain types of roads. In terms of frequencies, about two thirds of respondents agreed an ISA intervention would reduce injuries to vulnerable road users, and nearly three fourths concurred that the interventions would reduce speeding tickets and speeding-related crashes.

Table 6b indicates that large majorities of respondents agree that an in-vehicle display of the current speed limit and an unobtrusive tone to notify of speed limit changes would be acceptable. Nearly 7 out of every 10 respondents assigned to the advisory warning intervention indicated it would be acceptable for warnings to recur after 10 seconds if they had not slowed the vehicle, whereas about a quarter of would prefer the advisory warning be provided by vibrating the accelerator pedal against the driver's foot. About half of respondents assigned to the supportive accelerator and intelligent speed limiter interventions indicated they would frequently override the intervention, and similar proportions indicated it would be acceptable for the system to turn on at the start of every trip but 59.4% of

respondents in the advisory warning group agreed it would be acceptable for the ISA system to turn on at the start of each trip. Majorities of respondents in each group also agreed that they would want ISA on their next vehicle if 60%–80% of cars had it and that it would be a good idea for each intervention to be installed on all new cars. About 70% of respondents agreed that they would want ISA in their next car if it led to lower insurance costs.

Table 6a

Mean (SD) agreement on statements related to speeding behavior and vehicle technologies and associated mean composite scores

Composite variable and associated survey items	Advisory warning (n = 594)	Supportive accelerator pedal (n = 596)	Intelligent speed limiter (n = 592)
Vehicle safety technologies are effective [a]	**4.1 (0.6)**	**4.1 (0.6)**	**4.0 (0.6)**
Autobrake systems are likely effective at reducing frontal crashes.	4.1 (0.8)	4.0 (0.8)	4.0 (0.8)
LDWP are likely effective at reducing lane drift crashes.	4.1 (0.8)	4.1 (0.7)	4.1 (0.7)
ACC is likely effective at keeping a steady speed and safe distance.	3.9 (0.8)	3.9 (0.9)	3.9 (0.8)
Enhanced seat belt reminders are likely effective at increasing belt use.	4.2 (0.9)	4.2 (0.9)	4.2 (0.9)
I drive faster when in a hurry, familiar with the road, or alone on the road.	**3.7 (0.7)**	**3.7 (0.7)**	**3.7 (0.6)**
Speeding is unsafe.	**4.4 (0.7)**	**4.4 (0.8)**	**4.3 (0.7)**
ISA will be effective for ...	**3.9 (0.9)**	**3.6 (0.9)**	**3.7 (0.8)**
Residential or neighborhood roads, speed limits of 20–30 mph.	3.8 (1.0)	3.5 (1.1)	3.7 (1.0)
Roads with commercial activity, speed limits of 35–45 mph.	3.8 (1.0)	3.5 (1.1)	3.7 (1.0)
Highways with one lane in each direction, speed limits of 55 mph.	3.8 (1.0)	3.5 (1.1)	3.6 (1.1)
Divided multilane highways such as interstates, 55-mph speed limit.	3.8 (1.1)	3.5 (1.1)	3.6 (1.1)
Divided multilane highways such as interstates, 70-mph speed limit.	3.8 (1.1)	3.5 (1.2)	3.6 (1.1)
School zones.	3.9 (1.0)	3.7 (1.1)	3.8 (1.0)
Construction zones.	3.9 (1.0)	3.6 (1.1)	3.8 (1.0)
Reducing injuries to pedestrians and cyclists.	3.9 (1.0)	3.6 (1.1)	3.7 (1.0)
Helping me avoid speeding tickets.	4.0 (1.0)	3.8 (1.0)	3.9 (1.0)
Helping reduce crashes caused by speeding.	4.0 (1.0)	3.8 (1.0)	3.9 (1.0)
I would find ISA to be useful when driving on …	**3.8 (0.9)**	**3.5 (1.1)**	**3.6 (1.0)**
Residential or neighborhood roads, speed limits of 20–30 mph.	3.7 (1.1)	3.4 (1.2)	3.5 (1.1)
Roads with commercial activity, speed limits of 35–45 mph.	3.7 (1.0)	3.4 (1.2)	3.5 (1.1)
Highways with one lane in each direction, speed limits of 55 mph.	3.8 (1.0)	3.5 (1.2)	3.6 (1.1)
Divided multilane highways such as interstates, 55-mph speed limit.	3.9 (1.1)	3.5 (1.2)	3.6 (1.2)
Divided multilane highways such as interstates, 70-mph speed limit.	3.9 (1.1)	3.5 (1.2)	3.6 (1.2)
ISA would be beneficial for different driver types.	**4.1 (0.8)**	**3.8 (0.9)**	**3.9 (0.8)**
Young drivers	4.4 (0.8)	4.0 (1.0)	4.3 (0.9)
Older drivers	4.2 (0.9)	3.8 (1.1)	4.0 (1.0)
Large truck drivers	4.1 (1.0)	3.8 (1.1)	3.9 (1.1)
Delivery van drivers	4.0 (1.0)	3.8 (1.1)	3.8 (1.0)
Taxi or rideshare drivers	3.9 (1.0)	3.7 (1.1)	3.8 (1.1)
Bus drivers	4.0 (1.0)	3.7 (1.1)	3.8 (1.1)
Motorcyclists	3.8 (1.2)	3.5 (1.2)	3.7 (1.2)
Reckless drivers	4.4 (1.0)	4.2 (1.1)	4.3 (1.1)

Note. Agreement on statements were measured on the following scale: 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly agree.

LDWP = lane departure warning and prevention. ACC = adaptive cruise control. ISA = intelligent speed assistance.

[a] Composites variables and values are bolded.

Table 6b

Percentage of respondents who agreed or strongly agreed with statements about ISA

Survey statement	Advisory warning (n = 594)	Supportive accelerator pedal (n = 596)	Intelligent speed limiter (n = 592)
Would want current speed limit displayed in my vehicle.	80.3	82.2	80.2
Would want an unobtrusive tone to sound when speed limit changes.	72.2	74.5	75.7
Acceptable for advisory warning to repeat after 10 seconds if I did not slow down.	69.0	—	—
Would prefer accelerator pedal vibration against my foot as the warning.	25.6	—	—
Would frequently override the speed intervention.	—	46.0	48.6
Would find it acceptable if ISA was turned on at start of every trip.	59.4	50.7	48.3
Would want ISA on next car if 60%–80% of other cars have it.	64.5	51.2	51.7
It would be a good idea for ISA to be required in all new cars.	65.7	52.2	58.8
If ISA lowered insurance costs by showing I do not speed, then I would want it in my next car.	72.4	69.1	68.1

Note. A dash (—) indicates that the subsample did not respond to the survey statement.

Table 7 shows that over 60% of respondents in the advisory warning group agreed, on average, that ISA would be acceptable (63.8%), whereas agreement hovered around 50% for ISA with a supportive accelerator pedal or an intelligent speed limiter (50.0% and 51.5%, respectively).

We observed similar differences among the ISA intervention groups in the percentages who agreed they would leave the ISA system turned on, with 60.6% of respondents in the advisory warning group agreeing or strongly agreeing that they would leave the ISA system turned on compared with 47.9% in the supportive accelerator pedal group and 44.8% in the intelligent speed limiter group. The table also indicates that a higher proportion of respondents within each group agreed that it would be acceptable for an ISA system to intervene at 10 mph over the speed limit compared with 1–2 mph or 5 mph over the limit, but the increase in the percentage of respondent agreement was greatest for those assigned to the advisory warning group.

Table 7

Percentage of respondents agreeing or strongly agreeing that ISA would be acceptable or kept turned on, by ISA group and categorical covariates

Outcome measure and covariates	Advisory warning (n = 594)	Supportive accelerator pedal (n = 596)	Intelligent speed limiter (n = 592)
ISA would be acceptable.	63.8	50.0	51.5
ISA would remain on.	60.6	47.9	44.8
ISA would be acceptable if the intervention occurs at			
1–2 mph over the limit.	33.2	30.2	24.8
5 mph over the limit.	52.4	39.1	33.5
10 mph over the limit.	79.2	57.7	54.4

Table 8 shows that after controlling for covariates, respondents in the advisory warning group had a higher relative likelihood of agreeing, on average, that ISA would be acceptable compared with respondents in the supportive accelerator pedal (11% higher) and intelligent speed limiter groups (15% higher), but the differences were not significant. Similarly, respondents in the supportive accelerator pedal group had a 4% higher relative likelihood of agreeing, on average, that ISA would be acceptable, but this difference was not statistically significant. Respondents assigned to the advisory warning and accelerator pedal groups had a 28% and a 21% higher relative likelihood, respectively, of agreeing that ISA would remain turned on compared with those in the intelligent speed limiter group, with both differences statistically significant. Respondents assigned to the advisory warning intervention had a 7% higher relative likelihood of agreeing they would leave ISA on compared with those assigned to the supportive accelerator pedal intervention, but the difference was not statistically significant.

Regarding notable covariates, increasing ISA penetration to 60%–80% of the vehicle fleet was associated with a significantly higher relative likelihood of agreeing ISA would be acceptable (13% higher) or remain turned on (38% higher). Frequent speeders had a statistically significant lower likelihood (21% lower) of agreeing that ISA would be acceptable compared with rare speeders, although the two groups had a similar likelihood of agreeing they would keep ISA turned on. In contrast, sometimes speeders had a statistically significantly 18% lower likelihood of agreeing they would keep ISA turned on relative to rare speeders. Respondents who described living in urban residences had a

statistically significant 23% higher likelihood of agreeing they would keep ISA turned on relative to respondents who reported living in rural homes. Relative to rural respondents, those who reported living in suburban homes had a 4% lower likelihood of agreeing that ISA would stay on and a 7% higher likelihood of agreeing that ISA would be acceptable, but neither difference was significant.

Table 8

Relative likelihood (95% confidence intervals) of agreeing that ISA would remain turned on or that ISA would be acceptable

Predictors	Agreement that ISA would remain turned on	Agreement that ISA would be acceptable
Advisory warning vs. supportive accelerator pedal	1.07 (0.91, 1.25)	1.11 (0.94, 1.27)
Advisory warning vs. intelligent speed limiter	**1.28 (1.12, 1.44)**	1.15 (0.99, 1.29)
Supportive accelerator pedal vs. intelligent speed limiter	**1.21 (1.04, 1.38)**	1.04 (0.88, 1.20)
Agreement that:		
ISA is effective.	**1.24 (1.09, 1.43)**	**1.24 (1.11, 1.36)**
ISA is useful.	**1.35 (1.24, 1.54)**	**1.59 (1.52, 1.64)**
I want ISA in my next car if 60%–80% of other cars have it.	**1.38 (1.31, 1.53)**	**1.13 (1.06, 1.20)**
ISA would be beneficial for different driver types.	0.92 (0.78, 1.07)	1.00 (0.85, 1.14)
Safety technologies are effective.	**1.18 (1.06, 1.35)**	**1.35 (1.24, 1.44)**
I drive faster when in a hurry, familiar with the road, or alone on the road.	0.94 (0.83, 1.05)	0.99 (0.88, 1.09)
Speeding is unsafe.	1.03 (0.93, 1.15)	1.06 (0.97, 1.16)
Speed typology		
Frequent speeders vs. rare speeders	1.00 (0.84, 1.21)	**0.79 (0.63, 0.95)**
Sometimes speeders vs. rare speeders	**0.82 (0.70, 0.92)**	0.95 (0.83, 1.06)
Urbanicity of where respondent lives		
Urban vs. rural	**1.23 (1.04, 1.44)**	1.06 (0.87, 1.24)
Suburban vs. rural	0.96 (0.81, 1.13)	1.07 (0.91, 1.22)
Driving exposure	1.00 (0.99, 1.00)	1.00 (1.00, 1.01)
Males vs. females	0.90 (0.78, 1.02)	0.95 (0.82, 1.07)
Respondent age (10 years)	1.02 (0.98, 1.07)	**1.05 (1.01, 1.09)**

Note. Statistically significant values are bolded.

After adjusting for the covariates listed in Table 9, the estimated relative likelihood of agreeing that ISA would be acceptable was higher for those assigned to the advisory warning group compared with those assigned to the intelligent speed limiter group for interventions at 1–2 mph (12% higher), 5 mph (50% higher), and 10 mph (52% higher) over the limit, but only the 50% and 52% estimates were significant. Respondents had a 17% lower relative likelihood of agreeing that an advisory warning ISA would be more acceptable than a supportive accelerator pedal for interventions at 1–2 mph, but this was not statistically significant. Respondents had a 12% and a 36% higher relative likelihood of agreeing that

an advisory warning ISA would be more acceptable than a supportive accelerator pedal ISA with interventions occurring at 5 mph and 10 mph over the limit, respectively, but only the 36% increase was significant. Respondents had a significantly higher relative likelihood of agreeing the supportive accelerator pedal would be more acceptable than the intelligent speed limiter at 1–2 mph (35% higher), 5 mph (36% higher), and 10 mph (18% higher) over the speed limit.

Table 9

Relative likelihood (95% confidence intervals) of agreeing that ISA interventions at 1–2, 5, or 10 mph over the speed limit are acceptable

Predictors	Intervention at 1–2 mph over	Intervention at 5 mph over	Intervention at 10 mph over
Advisory warning vs. intelligent speed limiter	1.12 (0.90, 1.38)	**1.50 (1.29, 1.72)**	**1.52 (1.42, 1.60)**
Advisory warning vs. supportive accelerator pedal	0.83 (0.66, 1.02)	1.12 (0.94, 1.30)	**1.36 (1.25, 1.45)**
Supportive accelerator pedal vs. intelligent speed limiter	**1.35 (1.09, 1.64)**	**1.36 (1.14, 1.58)**	**1.18 (1.05, 1.30)**
Agreement that			
ISA is effective	1.15 (0.93, 1.41)	**1.24 (1.06, 1.42)**	**1.27 (1.18, 1.33)**
ISA is useful	**1.77 (1.53, 2.00)**	**1.61 (1.46, 1.74)**	**1.19 (1.12, 1.26)**
I want ISA in my next car if 60%–80% of other cars have it	**1.51 (1.36, 1.66)**	**1.36 (1.27, 1.46)**	**1.20 (1.16, 1.25)**
ISA would be beneficial for different driver types	0.99 (0.81, 1.19)	1.02 (0.86, 1.18)	**1.13 (1.02, 1.22)**
Safety technologies are effective	1.03 (0.86, 1.23)	0.99 (0.85, 1.14)	1.08 (0.99, 1.16)
I drive faster when in a hurry, familiar with the road, or alone on the road.	**0.68 (0.58, 0.80)**	0.89 (0.78, 1.01)	**1.09 (1.01, 1.16)**
Speeding is unsafe	1.04 (0.89, 1.20)	0.98 (0.86, 1.10)	1.01 (0.93, 1.08)
Speed typology			
Frequent speeders vs. rare speeders	**1.46 (1.18, 1.75)**	1.02 (0.84, 1.21)	0.95 (0.81, 1.07)
Sometimes speeders vs. rare speeders	0.99 (0.81, 1.19)	0.87 (0.74, 1.01)	0.99 (0.89, 1.08)
Urbanicity of where respondent lives			
Urban vs. rural	1.25 (0.98, 1.55)	**1.24 (1.02, 1.47)**	1.03 (0.89, 1.16)
Suburban vs. rural	0.86 (0.68, 1.08)	0.99 (0.84, 1.14)	0.94 (0.82, 1.06)
Driving exposure	1.00 (0.99, 1.01)	1.00 (0.99, 1.01)	1.00 (1.00, 1.01)
Males vs. females	0.99 (0.82, 1.17)	0.92 (0.79, 1.06)	**0.90 (0.81, 1.00)**
Respondent age (10 years)	0.99 (0.94, 1.05)	**1.04 (1.00, 1.09)**	**1.07 (1.04, 1.09)**

Note. Statistically significant values are bolded.

4. Discussion

The current survey of adult drivers residing in the United States found the acceptability of and willingness to use ISA was heavily influenced by the assigned intervention type, with respondents having a clear preference for an advisory warning compared with a supportive accelerator pedal or intelligent speed limiter. Three out of five respondents agreed, on average, that an advisory ISA would be acceptable and would be kept turned on, whereas about half had similar sentiments regarding the other two interventions. Logistic regression analyses that included covariates expected to covary with speeding

behavior weakened the preference for the advisory warning and suggested the supportive accelerator pedal ISA would be more likely to stay turned on than an intelligent speed limiter ISA. It should be noted, however, that among vehicles subject to EU requirements and tested in the European New Car Assessment Programme (Euro NCAP), no ISA system has included a supportive accelerator pedal (Thatcham Research, personal communication, January 2024).

Lai et al.'s (2012) work suggests that the implications for differences in ISA acceptability with respect to intervention type cannot be overstated. Based on changes in driver speeding behavior associated with ISA implementations evaluated in field operational tests, they estimated a small (3%) reduction in injury crashes assuming universal deployment of an advisory warning. But for ISA that directly slows the vehicle, they estimated reductions in injury-related crashes to be 4 times larger for overridable ISA and 9 times larger for non-overridable ISA. Thus, our results indicate that the system most likely to find acceptance and be used by U.S. drivers is the implementation expected to have the least effect.

The wide range of potential reductions to injury crashes estimated for ISA interventions that slow the vehicle reflect whether Lai et al. (2012) assumed that the systems permitted overriding ISA to drive faster or not, with 12% reductions estimated for ISA systems that did and 29% for those that did not. In the current study, the accelerator pedal and speed limiter interventions were presented as overridable. Slightly less than half of respondents indicated that they would frequently override a supportive accelerator pedal (46%) or intelligent speed limiter (49%), which aligns with Lai's estimation that an overridable ISA will have about half the injury crash reduction than ISA interventions that slow the vehicle but cannot be overridden. For the foreseeable future, ISA implementations for the U.S. driving population are likely to include driver override, so efforts to promote ISA acceptance could be valuable.

Our study highlights how the threshold for triggering the intervention would likely influence acceptance of ISA. EU requirements for interventions allow little tolerance relative to speed limits. Warnings must initiate when vehicle speed matches the speed limit for 6 seconds, with timing of warnings

required to decrease at a rate of 1 second per 10% increment over the limit. Tolerances for speed control functions are also narrow, with interventions required to start 1.5 seconds after the vehicle speed is over the limit (European Commission, 2022). In the global survey of roads users from 48 countries, the U.S, and Canada were in the top third in the prevalence of driving over the speed limit on motorways or freeways, and regionally, speeding on motorways is most prevalent in the western hemisphere followed in order by Europe, Africa, and Asia (ESRA, 2022). In our study, frequent speeders were less likely to accept any type of ISA compared with those who sometimes or rarely speed, which is consistent with prior work (e.g., Lai and Carsten, 2012). The relatively high prevalence of self-reported speeding in the U.S. and low likelihood of ISA acceptance among frequent speeders suggests that implementing ISA with the same tolerances specified by the EU will likely lead to disuse of the technology. Only a quarter to a third of our sample would accept any ISA intervention if it occurred at 1–2 mph over the limit, but majorities of respondents agreed or strongly agreed that interventions at 10 mph over the limit would be acceptable.

It is unclear the extent to which implementing ISA that intervenes when a vehicle is traveling 10 mph over the limit will reduce crashes and injuries, although such reductions seem likely given the strong relationship between extreme speeds and the risk of severe or fatal injury. Regulators may balk at the strategy for its implicit approval to violate limits up to the tolerance range, but it aligns with margins used by jurisdictions in the United States that use speed safety cameras that have reduced speeds and serious injury risk (Hu & McCartt, 2016; Shin et al., 2009). Yet given differences in acceptability of the interventions we studied, adjusting operating rules as a function of ISA intervention type may garner higher acceptance than implementing the same rules across interventions. Advisory warnings had a higher likelihood of acceptability overall and a higher willingness to use ISA with this intervention type, and the rate of respondent agreement that advisory warnings at 5 mph over the limit would be acceptable approximated rates of agreement that the supportive accelerator pedal and intelligent speed limiter interventions were acceptable at 10 mph over. Consumers may accept warnings at a lower threshold than interventions that would directly reduce vehicle speed. The significantly higher likelihood of accepting an

ISA with a supportive accelerator pedal relative to an intelligent speed limiter regardless of the intervention threshold supports the European Commission's decision to allow automakers the option to implement ISA with a speed control function.

A separate strategy to build acceptance through ISA design could be to consider the road environment when setting any tolerance. Euro NCAP's (2022) 2023 test program allots additional points to ISA vehicles that slow the vehicle at curves or junctions or warn about local hazards (e.g., traffic jams, poor road conditions). Our results indicate that ratings of ISA effectiveness were highest for school zones within each intervention group. In summarizing their field operational test, Lai and Carsten (2012) indicated that when using overridable ISA, drivers classified as intentional speeders sped about twice as much as those classified as non-intentional speeders on 70-mph roads, but the groups mirrored each other with low levels of speeding and little overriding of ISA on 30-mph roads. Drivers may appreciate an ISA that intervenes at a lower threshold in areas with high concentrations of vulnerable road users such as school zones or city centers but provides a wider margin on high-speed, limited-access roads where traffic streams are separated and pedestrians and bicyclists are prohibited. Lai et al. (2012) estimates ISA would have the greatest injury crash reductions on low-speed urban roads primarily due to a potential decrease in injuries to vulnerable road users that would be more likely to be present, given the large increases in pedestrian fatality risk that are associated with small increases in impact speed (Tefft, 2013). The higher likelihood of urban residents in the current study agreeing they would keep ISA turned on suggests that ISA would be especially advantageous for areas with high pedestrian traffic.

A recurring theme in Ryan's (2018) review of decades of ISA research is the connection between drivers' decreased acceptance of ISA and strong perceptions that using the system impedes other drivers. The perception that drivers were "rolling speed bumps" was expressed as anxiety-producing alone but also increased concerns about experiencing aggressive behavior such as tailgating. At the same time, Ryan reviews several studies that found increases in positive ratings toward ISA (e.g., useful, acceptable, desire to keep the system) after drivers use the technology. Our study found strong relationships between

wanting ISA if 60%–80% of other cars had it and the likelihood of agreeing that ISA would be acceptable or be kept turned on, which may indicate how this drivers' concern about slowing others may dispel if most vehicles on the road are equipped. These findings provide additional support for implementing features associated with increased acceptability, particularly under the assumption that the decision to use and not override an ISA that directly lowers speed will solely be determined by the driver.

A different use case for ISA is the compulsory requirement for drivers habitually convicted of excessive speeding or reckless driving to install an aftermarket ISA system with a speed control function with little tolerance range or driver-override options (see van der Pas et al., 2014). This strategy to deploy ISA would be analogous to requiring alcohol ignition interlocks for those convicted of driving impaired by alcohol. Implementing ISA in governmental or commercial vehicles could introduce the system to the U.S. fleet on a greater scale than requiring it for individual habitual speeders, and fleet managers could compel drivers to use it. New York City indicates a positive experience with an ongoing pilot study of municipal vehicles equipped with ISA (New York City Government, 2023). Novice teen drivers are another candidate population that may benefit from a requirement to drive an ISA-equipped vehicle, given that teens account for the highest percentage of speeding drivers involved in fatal traffic crashes relative to all other age groups (NCSA, 2023a). Respondents in the current study indicated higher mean ratings of ISA effectiveness for reckless and novice teen drivers. Some state legislatures and the District of Columbia have proposed legislation that would require the countermeasure for drivers with multiple or extreme speeding offenses within each locality (Fan, 2023; Nguyen, 2024). However, requiring mandatory installation of a non-overridable ISA to enforce speed limit compliance among compulsive speeders runs counter to designing an ISA system to be acceptable and voluntarily used by the wider driver population, so messaging may be essential to limit driver confusion between the two use cases and limit the rejection of voluntary ISA.

4.1 Conclusion

In sum, the current study indicates some ambivalence about ISA. Adult drivers in the United States find certain ISA features required for new vehicles in Europe to be appealing, with nearly 75% agreeing that a non-annoying alert to indicate speed limit changes would be acceptable. Acceptability of the interventions designed to motivate drivers to slow down or that directly slow vehicles is more moderate, yet respondents had substantial agreement that ISA would reduce speeding-related crashes and injuries to pedestrians and bicyclists as well as helping drivers avoid tickets.

Thus, this work also underscores the value of adopting the holistic "Safe System" philosophy rather than focusing on any one countermeasure. The tenets are based on the premise that collisions are inevitable due to errors inherent in human behavior. Implementing redundant, proven safety countermeasures that target different elements of the transportation system (road users, vehicles, infrastructure) is essential to achieve maximum crash reductions, but the main goal is preventing serious injuries and fatalities. Safe speeds are a key element of a safe system because of the role speed plays in crash risk and survivability, particularly among vulnerable road users. Reducing and enforcing speed limits, expanding speed-safety-camera programs, and implementing road diets that remove the perceptual affordances to speed and other traffic-calming measures can promote lower speeds collectively while welcoming and promoting ISA adoption.

5. Acknowledgements

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