

1 **Pedestrian Safety Practitioners' Perspectives of Driver Yielding**
2 **Behavior across North America**

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1 ABSTRACT

2 This study presents results from a recent internet survey of practitioners in the pedestrian safety
3 field about their perceptions of driver yielding behavior in cities throughout North America. As
4 one of the first studies to attempt to understand driver and pedestrian interactions from a macro
5 perspective, this research combined perceptions of local driver yielding rates in three different
6 crosswalk scenarios with open-ended comments to understand factors that may influence driver
7 yielding behavior. Responses from 387 practitioners in 171 cities suggest that rates of driver
8 yielding to pedestrians in marked crosswalks are related to characteristics such as social norms,
9 roadway design, law enforcement, and pedestrian volumes. Respondents generally indicated that
10 drivers are more likely to yield to pedestrians on roadways with fewer lanes and slower travel
11 speeds. However, the results also suggest notable geographic differences in yielding culture.
12 Practitioners also indicated that crosswalk laws were rarely enforced in most communities. The
13 paper concludes with a theoretical framework for future empirical research on driver yielding as
14 it relates to driving and walking culture, roadway design, crosswalk laws, and enforcement.
15

1 INTRODUCTION

2 After a steady decline during the previous decade, the number of pedestrians killed in United
3 States traffic crashes increased each year between 2009 and 2012. The 4,743 pedestrian fatalities
4 in 2012 represented 14.1% of people killed in traffic crashes in the United States (up from 10.9%
5 in 2004) (1). Canada also experienced a 10-year decline, but pedestrian fatalities have remained
6 relatively steady since 2008. The 315 pedestrians killed in 2011 represented 15.7% of all traffic
7 fatalities (up from 11.8% in 2005) (2,3,4).

8 In all states and provinces, the law requires drivers to yield the right-of-way to
9 pedestrians crossing within a marked crosswalk (unless a signal prohibits the pedestrian from
10 crossing or the pedestrian enters the crosswalk when a vehicle is too close to yield). While this
11 law varies with respect to location of the pedestrian relative to the curb, lane-positioning of
12 approaching vehicles, presence of crosswalk markings, and whether the driver must stop or yield,
13 the core message at marked crosswalk locations is consistent: approaching drivers who have
14 enough time to see a pedestrian in the crosswalk must allow that person to cross the street.
15 However, this law is routinely violated throughout North America, resulting in pedestrian
16 crashes and injuries. The most common primary contributing factor in pedestrian crashes
17 reported in California between 2008 and 2012 was violating “pedestrian right-of-way” (37%)
18 (5). During the same five-year period, the most common contributing circumstance in
19 Wisconsin pedestrian crashes was driver “failure to yield” (28%) (6). Therefore, improving
20 driver yielding behavior has the potential to reduce pedestrian injuries and fatalities.

21 Purpose

22 This study is intended to improve understanding of driver yielding behavior by drawing on the
23 collective knowledge of pedestrian safety practitioners across North America. A secondary
24 purpose is to identify differences in the social norms governing driver yielding behavior (i.e.,
25 driver yielding culture) between communities. If there are differences in driver yielding
26 behavior between communities, this information can be used to improve research designs and
27 provide insights into strategies that have been effective at increasing driver yielding in particular
28 jurisdictions.

29 An online survey was used to achieve these purposes, since this method can gather
30 information from a large number of practitioners and different geographic regions. This study is
31 not intended to precisely measure driver yielding behavior, which requires observing pedestrians
32 and vehicles at field study sites. Collecting field data is important for future research but was not
33 practical or necessary for the purpose of this exploratory study.

34 LITERATURE REVIEW

35 Previous studies have examined the relationship between driver yielding behavior and signage
36 and marking, signalization, and roadway design treatments. Driver yielding has been shown to
37 increase after implementing in-street pedestrian crossing signs (7), high-visibility crosswalks
38 with overhead warning signs (8), advance yield signs and markings (9,10), leading pedestrian
39 intervals (11), and rectangular rapid flashing beacons (12,13,14). In addition, drivers tend to
40 yield to pedestrians more frequently when approaching at lower speeds (15,16) and on roadways
41 with fewer lanes (15).

42 Other studies have documented increases in driver yielding after targeted police
43 enforcement at crosswalks. Police enforcement campaigns in three small Canadian cities (17);
44 Miami Beach, FL (18); and Gainesville, FL (19); all led to increased rates of drivers yielding to

1 pedestrians at targeted crosswalks. Driver yielding improvements in Miami Beach were
2 sustained for one year after the targeted enforcement program was completed. Both Florida
3 studies showed that driver yielding rates also increased at “control” crosswalks where no
4 warnings or tickets were issued.

5 Several researchers have examined public understanding of crosswalk laws. Many
6 drivers and pedestrians in the San Francisco Bay Area did not understand how they were
7 supposed to interact at crosswalks, particularly crosswalks that were not marked with painted
8 lines (20). In addition, pedestrians in marked crosswalks were more likely to be involved in
9 potential multiple-threat situations (e.g., driver in one lane stops but driver approaching in the
10 adjacent lane does not see and stop for the pedestrian) (21). These studies suggested that
11 crosswalk laws may be confusing, counterintuitive, or possibly inappropriate for the local driving
12 culture. The authors emphasized the need for education and enforcement strategies to
13 supplement engineering treatments, particularly at uncontrolled crosswalks.

14 Studies have also explored differences in driver yielding rates based on pedestrian and
15 driver characteristics. These suggest that drivers may be more likely to yield to pedestrians
16 holding a cane (16,22), wearing brighter clothing (23), entering the crosswalk more assertively
17 (23), and classified as “White” ethnicity (within a majority-“White” community) (24). Drivers
18 of more expensive cars may be less likely than other drivers to yield to pedestrians (25).

19 Few studies have been conducted in multiple cities, and even fewer have attempted to
20 identify differences in driver yielding between communities. A study of three crosswalk sites
21 each in Buffalo, NY, and Sacramento, CA, found no significant increase in driver yielding rates
22 in either city after crosswalks were marked (26), but studies in the San Francisco Bay Area, CA,
23 and Washington, DC, found that drivers were more likely to yield to pedestrians in marked
24 crosswalks than unmarked crosswalks along the same roadway corridor (21,27). Additionally,
25 Huang, Zegeer, and Nassi (7) found that a significantly higher percentage of drivers yielded to
26 pedestrians after in-street pedestrian crossing signs were installed in four of six upstate New
27 York cities, but no significant difference after this treatment was installed at one site in Portland,
28 OR. A recent study of two-lane roundabouts found differences in driver yielding rates among
29 sites in six communities. For example, drivers in Annapolis, MD, and Towson, MD, were more
30 likely than drivers in Raleigh, NC, and Winston-Salem, NC, to yield to pedestrians at two-lane
31 roundabouts (16). These results support the possibility of geographic differences in driver
32 yielding behavior.

33 While these studies have contributed to a greater understanding of driver yielding
34 behavior in specific circumstances, no study has attempted to draw all of the factors together into
35 a larger, holistic framework for understanding driver yielding to pedestrians. This paper
36 attempts to help fill this gap in the literature.

37 38 **SURVEY DESIGN AND DISTRIBUTION**

39 An online survey was used to investigate pedestrian safety practitioners’ perceptions of driver
40 yielding behavior. The 18 survey questions gathered demographic information as well as
41 perceptions of driver and pedestrian behavior in the area (e.g., city, town, etc.) where
42 respondents worked, including:

- 43 • Driver yielding rates along various roadway facilities.
- 44 • Rates of enforcement for driver yielding laws.
- 45 • Pedestrian crossing behaviors.

46

1 Questions asking specifically about yielding rates used the following scale:

- 2 • Almost Always (More than 85%).
- 3 • Often (60% to 85%).
- 4 • About half the time (40% to 59%).
- 5 • Occasionally (15% to 39%).
- 6 • Almost Never (Less than 15%).

7

8 An “I don’t know” option was also included to discourage guessing. Additionally, comment
9 boxes followed each question to allow respondents to elaborate on their responses. The survey
10 was developed based on a need for greater understanding of the subject given the current
11 literature and was modified after pre-testing by six experts in the pedestrian safety field.

12 Participation in the online survey was solicited via e-mail in Fall 2013. The e-mail was
13 distributed initially to a list of pedestrian and bicycle professionals in North America, and
14 forwarded in “snowball” fashion to other practitioners. No material incentives were offered for
15 participation. A total of 419 people completed the survey. Participants who indicated that they
16 had no experience in the field of pedestrian safety (defined as “working on pedestrian
17 transportation, driver behavior, and/or safety issues”) or worked outside of North America were
18 dropped from consideration in order to ensure a minimum level of validity in the analysis
19 process. After data cleaning, there were 387 valid, completed surveys.

20 Table 1 shows the survey participant characteristics. Approximately 43% of respondents
21 reported working in areas with a metro population of at least one million people, although some
22 worked in small jurisdictions within that area (e.g., Albany, CA, within the San Francisco Bay
23 Area). A majority of respondents had at least six years of experience in the pedestrian safety
24 field. Since most respondents had multiple years of experience, they were assumed to have a
25 reasonable understanding of yielding behavior in the communities where they worked. Planners,
26 engineers, researchers, and advocates were particularly well-represented among the respondents.

27

1 **TABLE 1 Survey Population Characteristics (N=387)**

	Metropolitan Region Population						Total (N=387) %
	Less than 100K (n=50) %	100K – 499K (n=106) %	500K – 999K (n=58) %	1M – 2.9M (n=79) %	More than 3M (n=86) %	Not in Metro Region or No Data (n=8) %	
Work City Character							
Urban	50	68	83	85	83	50	74
Suburban	10	22	16	14	16	13	16
Exurban	0	3	0	0	1	0	1
Small town	38	7	0	1	0	38	8
Rural	2	1	0	0	0	0	1
Not given	0	0	2	0	0	0	0
Years of Experience							
Less than 1	4	1	2	3	2	0	2
1 to 2	18	14	12	10	12	13	13
3 to 5	10	13	29	30	27	13	22
6 to 10	26	26	26	25	22	25	25
11 to 20	22	24	19	23	17	38	21
More than 20	20	22	12	9	20	13	17
Profession							
Planning	46	58	36	52	67	25	53
Engineering	26	30	36	25	24	50	29
Urban Design	6	13	7	18	15	25	13
Public Health	6	5	10	6	2	13	6
Law Enforcement	4	2	0	1	0	0	1
Education	30	16	16	18	16	13	18
Research	14	22	19	24	22	25	21
Advocacy	28	17	19	20	15	25	19
Other	10	18	21	16	19	13	17
<i>Note: Multiple choices permitted, resulting in column totals exceeding 100%</i>							
Age							
20-29	2	7	17	15	26	13	14
30-39	20	20	26	38	22	38	25
40-49	32	27	24	22	24	25	26
50-59	20	24	16	20	17	0	19
60-69	18	18	12	0	6	13	11
70+	0	1	2	3	5	13	2
Not given	8	4	3	3	0	0	3
Sex							
Female	28	31	47	39	43	50	38
Male	64	64	50	57	57	50	59
Not given	8	5	3	4	0	0	4

1 Survey respondents worked in 171 North American cities. Madison, WI, had the most
2 respondents (16), followed by Portland, OR (14), and Seattle, WA (14). Nineteen cities had five
3 or more respondents; 104 cities had a single respondent.
4

5 **ANALYSIS**

6 The primary analysis focused on the following open-ended question: “Why do you think that
7 drivers in your community exhibit this yielding behavior? Do you think any local, state, or
8 federal policies have influenced yielding behavior, either directly or indirectly?” Both authors
9 reviewed all responses to this question and developed lists of common factors independently.

10 After comparing lists and discussing small differences, a list of 15 factors was finalized:

11 education about the law, enforcement of the law, urban design and roadway design, vehicle
12 speed, vehicle volume, driver alertness, driver behavioral norms, driver socio-demographic
13 characteristics, land use and pedestrian volume, pedestrian assertiveness, pedestrian
14 predictability, pedestrian visibility, pedestrian behavioral norms, pedestrian socio-demographic
15 characteristics, and social fabric. The original database was re-coded according to the final
16 factor list.

17 A second analysis summarized a set of questions that asked participants to estimate driver
18 yielding rates under three scenarios in the community where they worked. Introductory text
19 explained that each scenario applied to uncontrolled, marked crosswalks (i.e., locations where
20 there is no traffic control that requires drivers on the main roadway to stop) and stated, “For
21 these questions, consider ‘drivers yielding’ to a pedestrian to be defined as a driver in the right
22 lane stopping or slowing for a single, adult pedestrian who either just started to enter a marked
23 crosswalk or clearly appears ready to enter a marked crosswalk from the right side of the street.
24 Only consider drivers who, given the posted speed limit, would have sufficient distance to see
25 the pedestrian in order to stop in advance of the crosswalk. Assume that the marked crosswalk
26 has no additional pedestrian crosswalk enhancements other than a painted crosswalk and
27 crosswalk warning sign (i.e., no flashing beacons, median islands, yield-to-pedestrian bollards,
28 etc.)” Given these specific conditions, the three questions asked practitioners to estimate driver
29 yielding rates on the following roadways:

- 30 • Two lanes (one in each direction) and actual traffic speed of 25 to 30 mph (40 to 48
31 kmh).
- 32 • Two lanes and actual traffic speed of 35 to 40 mph (56 to 64 kmh).
- 33 • Four lanes and actual traffic speed of 35 to 40 mph (56 to 64 kmh).

34
35 Since the response options were given in ordered categories, the data were summarized
36 by showing the percentage of responses in each category and identifying the median response
37 category.
38

1 RESULTS

2 The North American practitioners provided many insights about driver yielding behavior.
3 Impressively, 342 (88%) of the 387 participants provided a substantive response to the open-
4 ended question about why drivers exhibit certain yielding behaviors in their community. Most
5 respondents mentioned multiple reasons, which were grouped into the list of 15 factors. The
6 most commonly-cited factors are listed below. These factors are further combined in the
7 following sections to help frame the presentation of results.

- 8 • Driver behavioral norms (cited by 142 respondents).
- 9 • Urban design and roadway design (123).
- 10 • Enforcement of laws (105).
- 11 • Education about laws (101).
- 12 • Land use and pedestrian volume (55).
- 13 • Vehicle speed (42).
- 14 • Pedestrian behavioral norms (27).
- 15 • Social fabric and socio-demographic characteristics (21).

16
17 Although the remaining factors (e.g., vehicle volume, driver alertness/distraction,
18 pedestrian visibility) may still impact driver yielding behavior, they are not discussed in detail
19 because they were each mentioned by fewer than 20 respondents.

21 Driver and Pedestrian Behavioral Norms

22 Behavioral norms are the typical behaviors exhibited by drivers and pedestrians throughout a
23 community. Many professionals believe that these norms influence how individual drivers and
24 pedestrians behave at specific crosswalk locations, independent of other factors.

- 25 • “I think [drivers] follow the behavior of other drivers.” (*FL, 20+ years experience*)
- 26 • “No one else yields...it frankly feels unsafe as a motorist to stop...due to the risk of
27 being rear ended.” (*MO, 11-20 years experience*)
- 28 • “Local culture is for vehicles to have priority even if that is different from policy.” (*AL,*
29 *11-20 years experience*)
- 30 • “I think that local custom and a generally laid back atmosphere in this community leads
31 to drivers yielding to pedestrians most of the time, except on certain 4 lane roads.” (*NS,*
32 *6-10 years experience*)
- 33 • Drivers often yield because of the “large military population that is used to always
34 yielding to pedestrians on base.” (*NC, 11-20 years experience*)
- 35 • “Operating a motor vehicle is a right not to be interfered with by other users of the road.
36 While perhaps not formal policies, the actions of road agencies (local and state) over the
37 years tend to reinforce such an attitude.” (*WV, 20+ years experience*)

38
39 Many respondents emphasized that pedestrians also contribute to the social norms
40 governing interactions at crosswalks. For example, pedestrians who enter the crosswalk in front
41 of approaching vehicles so that drivers need to slow or stop indicate that the social norm is for
42 drivers to yield. Pedestrians exhibiting this behavioral norm were often referred to as
43 “assertive.”

- 44 • “There is a general understanding that invincible university students will walk into the
45 street, so drivers tend to be on high alert...This behavior spreads elsewhere in town.”
46 (*VA, 6-10 years experience*)

- 1 • “In Boston, pedestrians have always crossed at will and drivers, while irritated maybe,
2 give them space.” (*MA, 20+ years experience*)
- 3 • “Naturally, it depends on how forcefully the pedestrian asserts his/her right of way.” (*OR,*
4 *6-10 years experience*)

5
6 In contrast, respondents suggested that pedestrians who wave vehicles past or wait for a
7 sufficient gap in traffic to enter the crosswalk, even when they have a legal right to cross,
8 indicate that the social norm is for drivers not to yield. Pedestrians exhibiting this behavioral
9 norm were sometimes referred to as “passive.”

- 10 • “People in Minnesota tend to not want to inconvenience others too much, so they wait
11 patiently for a gap. And if a car does stop and wave them across, they tend to [walk
12 quickly or run across]; I've never seen that in a place like Berkeley.” (*MN, 6-10 years*
13 *experience*)
- 14 • “[The] culture in Wisconsin [is] that pedestrians should wait for a gap in cars.” (*WI, 6-10*
15 *years experience*)
- 16 • “Pedestrians do not ‘claim the crosswalk,’ and many drivers react negatively if they do.”
17 (*NC, 11-20 years experience*)

18
19 Several respondents connected driver and pedestrian behavioral norms (e.g., assertive
20 pedestrian behavior was associated with drivers yielding, while passive pedestrian behavior was
21 associated with drivers not yielding).

- 22 • “In ‘pedestrian friendly’ locations, motorists seem to yield to pedestrians pretty well—
23 and in those locations pedestrians seem more assertive when crossing. On busier, car-
24 oriented streets, pedestrians seem less assertive and motorists tend to keep going unless
25 stopped by a sign or signal,” (*NY, 6-10 years experience*)
- 26 • “It is engrained in the culture on the road: drivers don’t yield where they should;
27 pedestrians yield where they don’t have to. There's like some sort of respect for a
28 hierarchy on the road (with automobilists on top).” (*QC, 3-5 years experience*)

29
30 In addition to being an important factor contributing to driver yielding behavior, several
31 participants noted that behavioral norms for drivers and pedestrians differed by community:

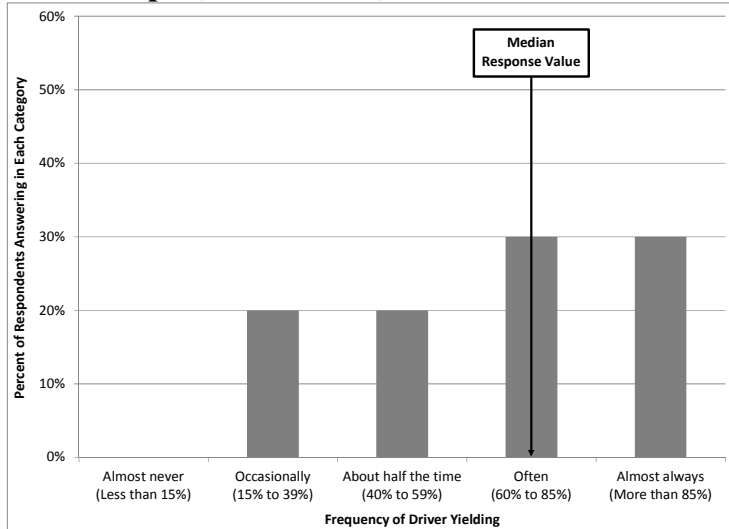
- 32 • “It may be cultural. Yielding to pedestrians is far more common throughout northern
33 California than on the East Coast where I previously worked.” (*CA, 3-5 years experience*)
- 34 • “Minnesota ‘nice’ has something to do with it, I believe. I have worked and lived in
35 Boston and New York and the rate of stopping for pedestrians seems much higher in
36 Minnesota.” (*MN, 3-5 years experience*)

37
38 Data from the three driver yielding scenario questions corroborate the idea that driver
39 yielding culture differs across North American communities. Figure 1 shows the distribution of
40 responses for how often drivers yield when approaching uncontrolled, marked crosswalks on
41 two-lane arterial or collector roadways with actual traffic speeds of 25 to 30 mph (40 to 48 kmh)
42 in three cities. Even with the relatively small number of responses in each city, these results hint
43 that there may be differences in driver yielding behavior between cities. The median response
44 value in San Francisco was “often” (60% to 85% of the time), while the median response in
45 Washington, DC was “occasionally” (15% to 39% of the time). The same median response
46 analysis was applied to all 33 communities that had at least two respondents and were the central

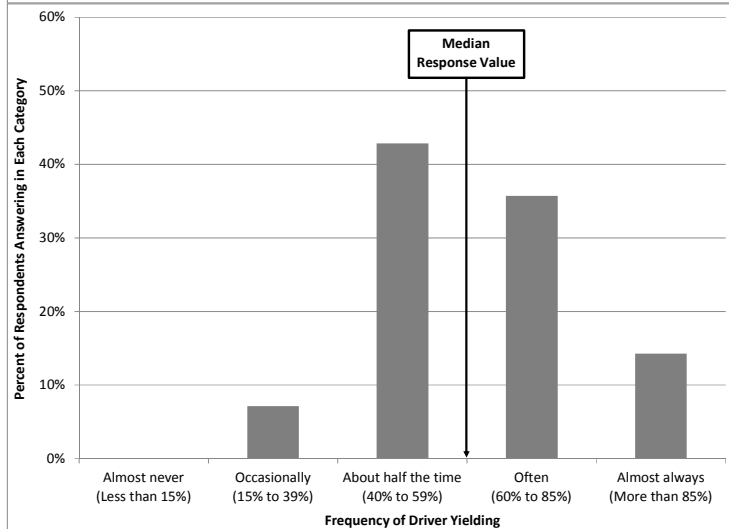
1 city of a metropolitan region with more than 500,000 people (Figure 2). Note that “almost
2 never” and “occasionally” were grouped and “often” and “almost always” were grouped to
3 simplify Figure 2.

4 Under this two-lane, 25 to 30 mph (40 to 48 kmh) scenario, professionals in the
5 northwestern United States and southwestern Canada perceived higher rates of driver yielding
6 than professionals in other parts of North America. Similar geographic differences in yielding
7 rates were revealed for the other two scenarios (though the rates of yielding in most cities were
8 perceived to be lower on roads with more lanes and higher traffic speeds). There was no
9 noticeable difference between rates of yielding depending on the language of the state law (i.e.,
10 whether the law required drivers to “stop” or “yield”).
11

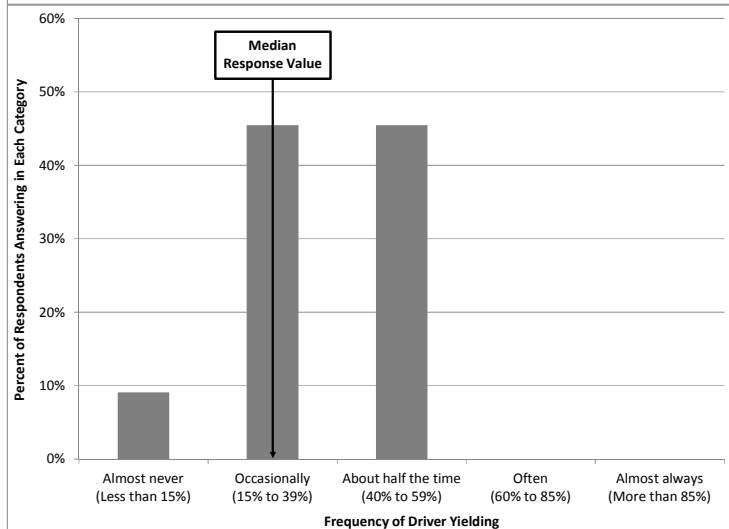
1 **FIGURE 1 Distribution of perceived driver yielding rates in three cities: two-lane roads,**
 2 **25 to 30 mph (40 to 48 kmh)**



San Francisco, CA
(10 responses)



Seattle, WA
(14 responses)



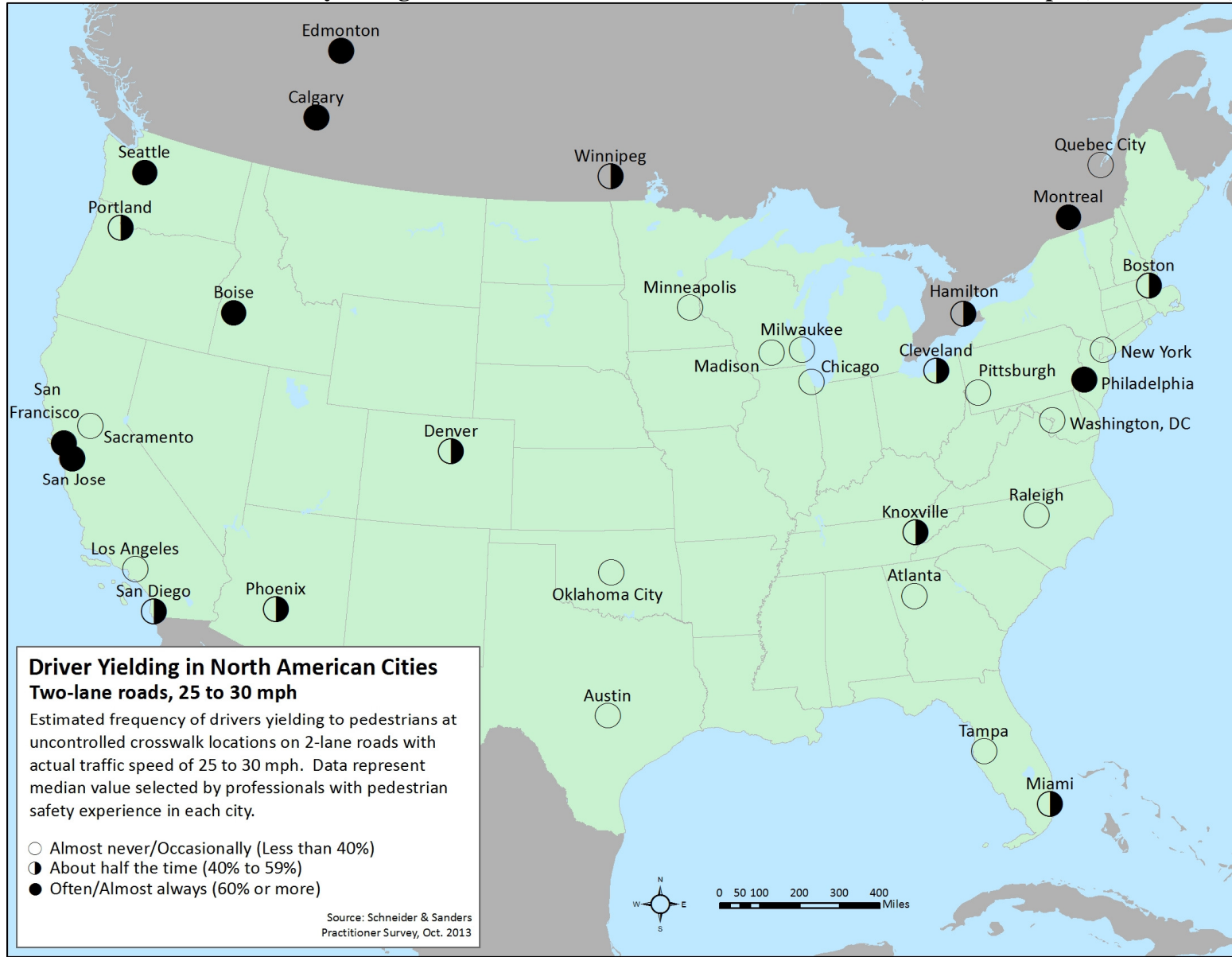
Washington, DC
(11 responses)

3

4

5

1 **FIGURE 2 Perceived driver yielding rates in North American cities: two-lane roads, 25 to 30 mph (40 to 48 kmh)**



1 **Urban Design and Roadway Design Characteristics, including Vehicle Speed**

2 Professionals also cited the importance of urban design attributes, such as building setbacks and
3 the presence and size of street trees, on driver yielding behavior. For example:

- 4 • “Combination of the design of the built environment (i.e., on-street parking, buildings
5 edging the roadway, wide sidewalks) all contribute to slower traffic. [Then the]
6 pedestrian expectation [is] that drivers will stop.” (OR, 6-10 years experience)
- 7 • “[Portland’s] short blocks, combined with the fact that commute distance/time is shorter
8 than the average...make people less stressed out and more aware of pedestrians when
9 driving.” (OR, 6-10 years experience)

10
11 Respondents echoed the findings of the literature review when discussing traffic control
12 devices and aspects of roadway design such as crosswalk markings, curb-to-curb width, number
13 of lanes, curb extensions, and other traffic calming features.

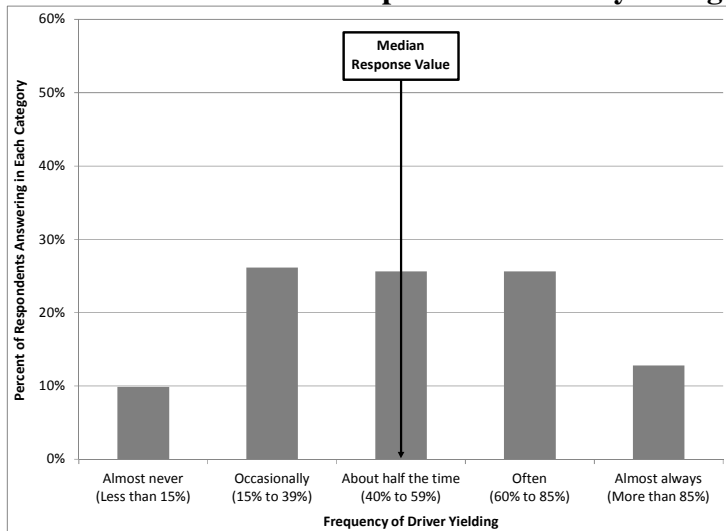
- 14 • “There is greater yielding if marked crosswalks, bulb-outs, and medians are present.”
15 (OR, 6-10 years experience)
- 16 • “The number of lanes seems to have a significant relationship to driver yielding,
17 especially for drivers traveling in the inside lanes where sight lines to pedestrians on the
18 curb side are poor.” (CA, 6-10 years experience)
- 19 • “In areas with slower speed limits the pedestrian yield signs posted in the road between
20 the two yellow lines really helps remind drivers to yield.” (VA, 6-10 years experience)
- 21 • “On streets where cars are supposed to actively share space with pedestrians (unmarked
22 but low speed streets), yielding is common. On streets where cars actions are more
23 controlled (high speed, signalized streets), yielding is highly uncommon.” (WA, 3-5 years
24 experience)

25
26 Related to roadway design, vehicle speed was also mentioned frequently by practitioners.
27 Many professionals pointed out that higher vehicle speeds mean that drivers must notice a
28 pedestrian in the crosswalk at a greater distance from the crosswalk in order to stop or yield.

- 29 • “I think drivers traveling at higher speeds often don’t see pedestrians in time to yield,
30 especially on roads with two lanes in each direction.” (MT, 6-10 years experience)
- 31 • “If [drivers] are going too fast they may be afraid if they stop they may be rear-ended.”
32 (PA, 20+ years experience)
- 33 • “As you bring the travel speeds down drivers are generally more willing to stop because
34 it is less of an inconvenience.” (CO, 6-10 years experience)
- 35 • “Design guidance to use the highest design speed feasible...leads to speed limits (and
36 actual speeds) so high that braking is usually a last resort for motorists...” (CA, 11-20
37 years experience)

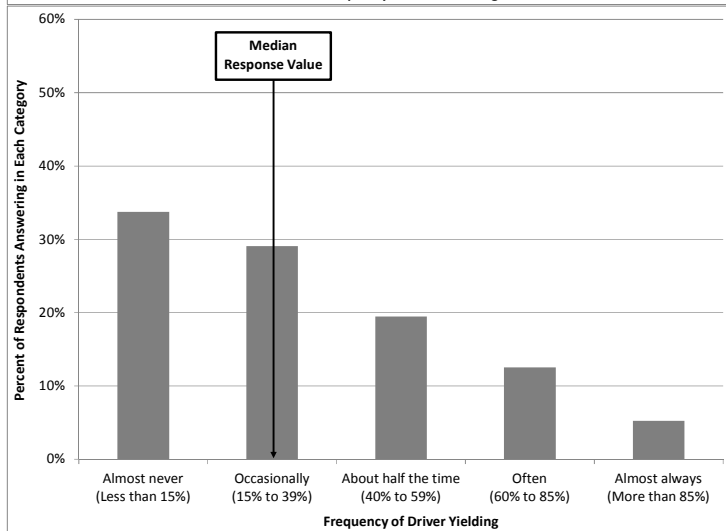
38
39 Results from the three crosswalk scenario questions give additional support to these
40 comments. Figure 3 shows that most respondents perceived local yielding rates to be higher on
41 narrower, slower-speed roadways.

1 **FIGURE 3 Distribution of perceived driver yielding rates on three types of roadways**



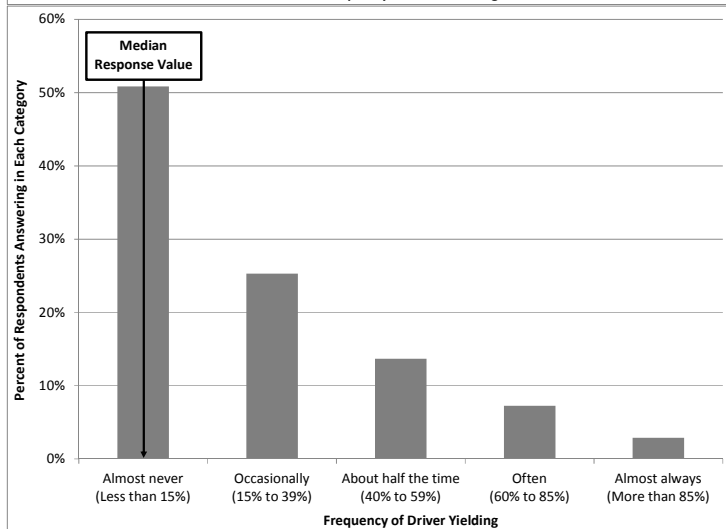
**2-Lane, 25-30 MPH
(375 responses)**

2



**2-Lane, 35-40 MPH
(344 responses)**

3



**4-Lane, 35-40 MPH
(344 responses)**

4

1 **Land Use and Pedestrian Volume**

2 Many professionals cited the importance of land use (e.g., proximity to downtown core,
3 commercial districts, university campuses, schools, etc.) on driving yielding behavior because of
4 its relationship with pedestrian volumes. Respondents suggested that areas with more
5 pedestrians condition drivers to be alert and ready to yield to pedestrians who enter a crosswalk.

- 6 • “Motorists yield more where...there are lots of pedestrians crossing...In dense business
7 districts, yielding is high.” (*MA, 20+ years experience*)
- 8 • “In locations where pedestrian crossings are frequent, most cars yield to peds at
9 crosswalks.” (*VA, 11-20 years experience*)
- 10 • “Autos are used to having the road to themselves. In areas where there is heavy
11 pedestrian traffic autos are far more likely to yield.” (*PA, 3-5 years experience*)
- 12 • “As the number of bikes and pedestrians has increased so has the yielding behavior.”
13 (*MT, 11-20 years experience*)

14 **Enforcement of Laws**

15 Enforcement introduces the threat of being ticketed or warned by police for not yielding to a
16 pedestrian in a crosswalk. Respondents suggested that a high level of enforcement, particularly
17 through targeted efforts like crosswalk stings, may increase the importance of yielding in drivers’
18 minds.
19

- 20 • “On...campus and in school zones, drivers are more likely to yield to pedestrians in
21 crosswalks, partly because speed is lower, partly because of higher risk of enforcement.”
22 (*IL, 3-5 years experience*)
- 23 • “Many drivers will not yield unless they feel they are being watched or can be tracked
24 (cameras or witnesses)...” (*CA, 11-20 years experience*)
- 25 • “Generally there are no consequences to not yielding. Enforcement is practically non-
26 existent.” (*CA, 11-20 years experience*)
- 27 • “Lack of sufficient police enforcement on drivers’ yielding to pedestrians...has a
28 negative influence in my area. I have also observed some police officers do not yield to
29 pedestrians!” (*NC, 3-5 years experience*)
- 30 • “The only things that seemed to affect yielding were the pedestrian sting programs.” (*DC*
31 *suburbs, 20+ years experience*)

32
33 Despite the emphasis given to enforcement in their responses, practitioners from most
34 parts of North America reported low rates of enforcement within their jurisdiction. Of 358
35 respondents, 77% indicated that the law was almost never enforced and 15% indicated that it was
36 only occasionally enforced.
37

38 **Education about Laws**

39 Education programs are designed to inform drivers of the yielding law and to help them
40 understand how to behave according to the law. The educational aspects of enforcement are also
41 included in this category.

- 42 • “Ad campaigns to yield to pedestrians have been running in my community which helps
43 create awareness.” (*VA, 6-10 years experience*)
- 44 • “I think a lot of drivers are not aware of the laws.” (*WI, 20+ years experience*)

- 1 • “I...believe that getting a license is so easy—no training and the testing is a joke—that
2 people simply don’t know much beyond the very obvious rules of the road.” (CA, 11-20
3 years experience)
- 4 • “Active public education efforts about pedestrian and bicycle safety have contributed [to
5 driver yielding]....” (WA, 20+ years experience)

7 **Social Fabric and Socio-demographic Characteristics**

8 Social fabric reflects the extent of each person’s connections with other members of the
9 community. Several professionals suggested that drivers may be more likely to yield when they
10 are more likely to know (or relate to) people who are crossing the street.

- 11 • “I think drivers in Berkeley are generally conscientious of pedestrians given...many of
12 them probably walk at some frequency.” (CA, 1-2 years experience)
- 13 • “I think we have a pretty good percentage of people who walk or bike often and
14 understand that those users have ROW at most intersections/crosswalks.” (WA, 1-2 years
15 experience)
- 16 • “I feel like Oregonians, in general, have more respect for our fellow people. Pedestrians
17 are less likely to jaywalk. Drivers are more likely to be courteous...mutual respect leads
18 to improved transportation behavior in general.” (OR, 3-5 years experience)
- 19 • “There seems to be a cultural ethic here of thinking broadly about the community as a
20 whole, which includes looking out for pedestrians.” (WA, 1-2 years experience)

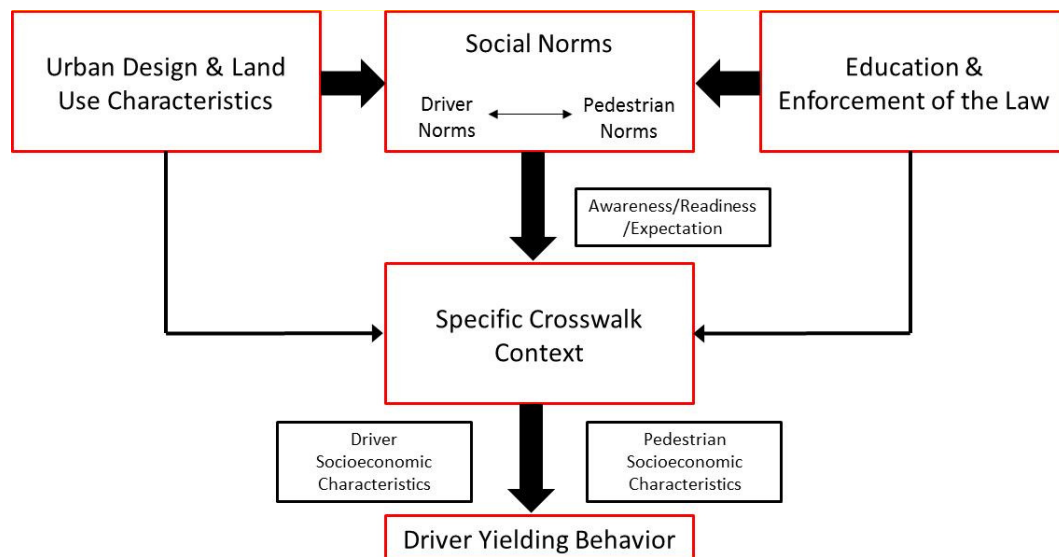
22 **Tying It All Together**

23 Many respondents emphasized that certain characteristics influencing driver yielding behavior
24 were related.

- 25 • “I think yielding is more common...on a 2-lane street because pedestrians are more likely
26 to be more assertive on narrower streets. I think enforcement COULD influence driver
27 behavior if it were frequent, consistent and publicized widely...” (DC, 1-2 years
28 experience)
- 29 • “1) Partly, it's about traffic engineering. Our roadways have been designed for many
30 decades to minimize stopping for drivers...This builds an expectation for drivers to not
31 need to stop unless absolutely necessary. 2) Mostly, I think it's about culture and
32 emulating your peers and following the status quo. Drivers see other drivers fail to yield
33 to pedestrians, so in turn they also do not yield to pedestrians. Even pedestrians do not
34 expect drivers to yield to them. 3) In addition to ‘traditional’ traffic engineering, police
35 enforcement (lack thereof) also reinforces this culture norm. Drivers who do not yield to
36 pedestrians face no legal repercussions.” (CA, 3-5 years experience)
- 37 • “I think most drivers are unaware of the law about yielding to pedestrians in crosswalks.
38 The design of our streets reinforces this notion.” (NC, 11-20 years experience)

39
40 These comments suggest that relationships between different factors may ultimately
41 determine whether or not drivers yield to pedestrians. Figure 4 presents a conceptual framework
42 suggesting how community and site factors may relate to driver yielding behavior at a specific
43 location. The top row summarizes the main community-level factors that contribute to driver
44 and pedestrian behavioral norms; the middle-row represents the site-level factors that may
45 impact the probability of a driver yielding; and the bottom-row represents the driver’s behavior
46 (yield or not yield). The figure is described in the following paragraphs.

1
2 **FIGURE 4 Conceptual framework suggesting influences on driver yielding behavior**
3



4
5
6 *Urban Design & Land Use Characteristics (upper left box)*

7 Many professionals suggested that low-density suburban areas with low pedestrian volumes and
8 high-speed, multi-lane roadways contributed to a culture of drivers expecting to travel at high
9 speeds without stopping and passive pedestrian behavior. In contrast, mixed-use areas near the
10 urban core and college campuses with high pedestrian volumes and low-speed, narrow roadways
11 were believed to contribute to pedestrian assertiveness and driver caution.

12
13 *Education about and Enforcement of Driver Yielding Laws (upper right box)*

14 Independent of the built environment, education and enforcement can also contribute to norms
15 where drivers in a community know and follow the law.

16
17 *Social Norms (upper middle box)*

18 The social norms that develop at the community level may influence not only how aware drivers
19 are of their responsibility to yield, but also how willing and prepared they are to yield if a
20 pedestrian is present. Similarly, social norms can influence pedestrians' awareness of their rights
21 and their willingness to assert them.

22
23 *Specific Crosswalk Context (middle row box)*

24 The likelihood of yielding at a specific crosswalk may relate to the factors on the top row (social
25 norms, education and enforcement, and urban design/land use), and may be further influenced by
26 characteristics of the crosswalk site. These include nearby land use and urban design features
27 (e.g., pedestrian crossing volume, number of lanes, traffic calming treatments) and site-specific
28 education and enforcement (e.g., in-street pedestrian crosswalk signs, presence of a police officer
29 near the crossing).

30
31
32

1 *Driver Yielding Behavior (bottom row box)*

2 Finally, the decision about whether or not to yield at the crosswalk site may be related to the
3 personal characteristics of the pedestrian and the driver, including unconscious and overt biases,
4 and how much experience the driver has as a pedestrian.

5
6 *Summary*

7 This framework focuses on the main factors discussed in the section above, so it does not include
8 possible feedback loops (e.g., changes that result in more drivers yielding at a particular
9 crosswalk may impact social norms throughout the community) and may not be the only way to
10 describe driver yielding behavior. However, the figure presents a way of conceptualizing the
11 pathways leading to driver yielding behavior, draws from the collective knowledge of a
12 professional community, and can help expand the conversation about driver yielding.
13 Ultimately, thinking broadly about the many possible influences on driver yielding behavior may
14 help practitioners identify more effective strategies to increase yielding and improve pedestrian
15 safety at uncontrolled crosswalks.

16
17 **DISCUSSION**

18 The findings presented in this paper provide insights into the dynamics of driver yielding
19 behavior at uncontrolled crosswalks. As Figure 4 summarizes, the results suggest that education
20 (e.g., public awareness programs), enforcement (e.g., crosswalk stings), and roadway design
21 (e.g., narrower roadways; traffic calming) strategies may help increase yielding. Practitioners
22 also suggest that land use leading to more pedestrian activity (e.g., higher-density, mixed-use
23 development) may improve driver behavior. Strategies targeted at increasing driver yielding at
24 specific locations may also have positive impacts on other locations in the same community due
25 to shifts in driver and pedestrian behavioral norms. However, the results should be interpreted
26 carefully, recognizing the need for more field research. There are several important areas for
27 future study.

28
29 **Considerations**

30 The study analyzes perceptions of driver yielding rates, which may be higher or lower than
31 yielding rates calculated from precise field measurements. For example, the high reported rates
32 of driver yielding in Philadelphia appear to be an anomaly on the East Coast of the United States.
33 These perceptions may have been inaccurate or based only on a limited set of streets, such as the
34 busy, constrained roadways of the Center City or University City District in Philadelphia (which
35 may have relatively higher yielding rates). These possibilities underscore the importance of
36 refining these results using field observations of driver yielding behavior. However, the strength
37 of this study is the collective knowledge from the pedestrian safety field. Even if some
38 individual perceptions are inaccurate, aggregating responses from practitioners throughout North
39 America provides useful information about patterns in driver yielding to investigate through
40 future research.

41 The survey was conducted in a snowball, rather than a systematic, fashion. As such,
42 some cities had greater representation than others. This may have been due to city size, local
43 attention to pedestrian safety, or other reasons, such as professionals in some communities not
44 having seen nor having had time to respond to the survey. These challenges were addressed in
45 part by removing respondents with no experience in the pedestrian safety field from the analysis
46 and by only mapping results from cities with two or more respondents.

1 Additionally, open-ended comments suggested that not everyone read the questions
2 carefully. For example, a few respondents thought incorrectly that the pedestrian crosswalk
3 scenarios applied to locations with traffic signals or stop signs. Incorrect interpretation of
4 questions is a common limitation of survey methods.

5 Despite these limitations, this paper contributes to the literature and thinking about
6 pedestrian safety because it presents patterns in data from a fairly large sample size to suggest a
7 framework for investigating driver yielding. In doing so, this paper serves as a springboard for
8 future research on the topic.

9 10 **Future Research**

11 The evidence of geographic differences in driver yielding culture provided by this study opens
12 new, important issues for pedestrian safety policy and research:

- 13 • National studies using driver yielding as a proxy measure for pedestrian safety should be
14 done in a variety of communities. Pedestrian safety treatments may not have the same
15 impact in every community.
- 16 • Guidelines for pedestrian safety treatments should recognize differences in driver
17 yielding behavior among communities. In addition, pedestrian crash modification factors
18 may not generalize to all communities with different yielding behaviors.

19
20 Additional research is also needed to understand how social norms related to driver
21 yielding develop in various communities. This information can help reveal specific strategies
22 that could be used in other communities to change driver yielding culture. Case studies of
23 communities that have strong yielding cultures, including interviews with local engineers,
24 planners, law enforcement officers, and residents, could be one approach to gather this
25 information. An exploration of the differences in behavior between the United States and
26 Canada could be particularly enlightening: the 36 Canadian respondents reported slightly higher
27 rates of driver yielding than United States respondents, but the Canadian sample size was too
28 small to emphasize this result.

29 While failure to yield is a common cause of pedestrian crashes, it is also important to
30 understand whether or not increased rates of driver yielding actually create a safer pedestrian
31 environment. Few studies have attempted to make this direct connection. One study found that
32 the number of pedestrian crashes went down in St. Johns, NL, and Fredericton, NB, after police
33 enforcement programs had increased driver yielding rates (17). In addition, a Florida DOT
34 campaign increased awareness of pedestrian laws, and the state pedestrian fatalities decreased by
35 more than six percent between 2011 and 2012 (28). However, the safety improvements are not
36 tied directly to increased driver yielding at specific crosswalks. More research is needed to
37 quantify the magnitude of potential pedestrian injury reduction and determine the extent to which
38 increasing driver yielding rates is a helpful safety policy.

39 Understanding driver yielding behavior is important for pedestrian safety. But it is also
40 important for creating livable communities—places where people of all ages and abilities feel
41 comfortable walking, playing, socializing, and doing business. Communities where drivers are
42 aware of their responsibility and allow pedestrians to cross the street at legal crossings may be
43 better places to live, work, and visit.

44
45
46

1 **CONCLUSION**

2 This paper contributes to the understudied field of factors affecting driver yielding behavior.

3 While much research has focused on the efficacy of specific treatments in particular field

4 locations, this study draws upon the collective knowledge of practitioners throughout North

5 America to inform a potential framework for future research on driver yielding behavior. In

6 particular, practitioners provided evidence of:

- 7 • Differences in driver yielding culture among communities.
8 • Higher rates of yielding on narrower, lower-speed roadways.
9 • Rare enforcement of crosswalk laws in most communities.

10

11 The insights gained from this paper can lead to more rigorous evaluation of driver yielding

12 behavior in the future, as well as innovations in treatments to reduce pedestrian injuries and

13 fatalities.

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