

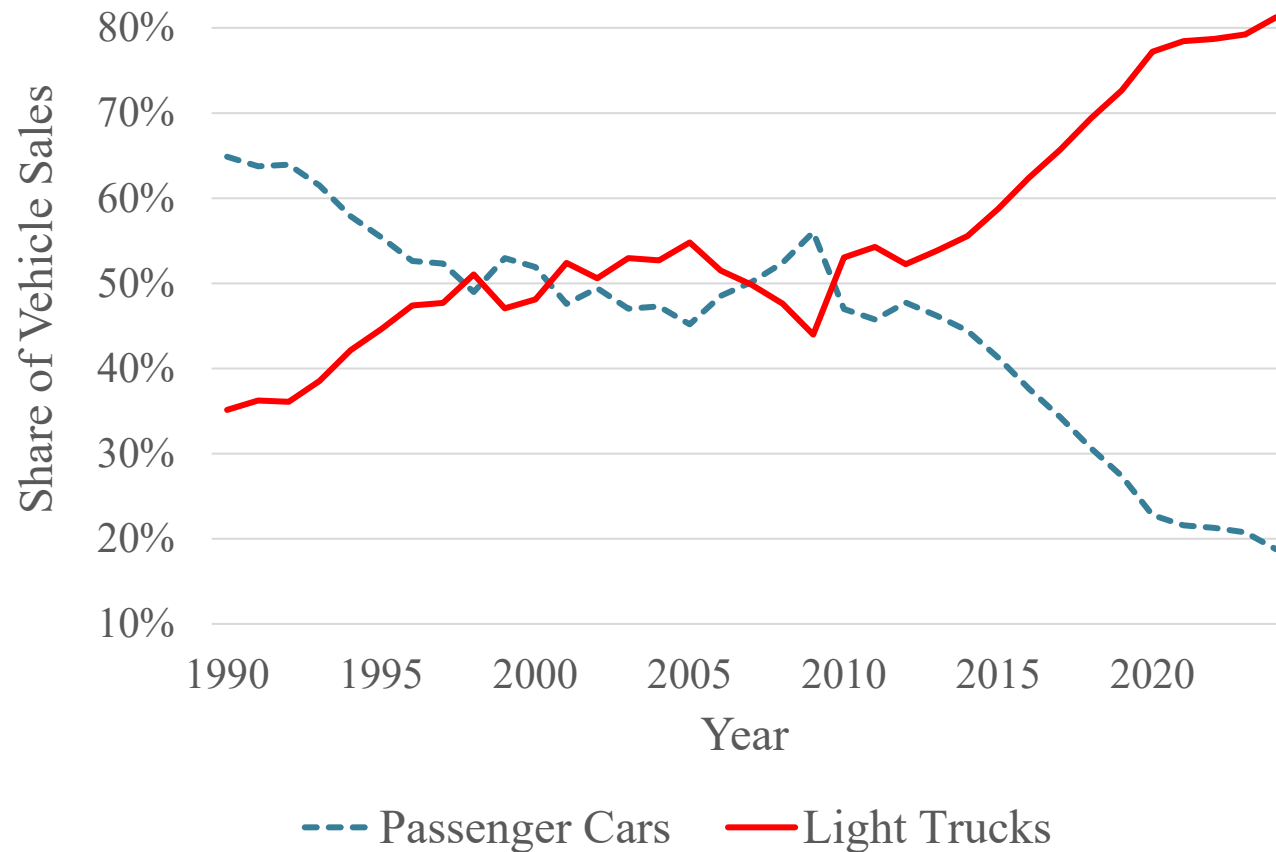
Visual Consequences of Greater Hood Heights in Larger Passenger Vehicles



Agenda

- 1** Background
- 2** Literature Review
- 3** Study Objectives
- 4** Field Study Methods
- 5** Results & Conclusions
- 6** Questions?

US New Vehicles Sales



Source: Bureau of Transportation Statistics

Reasons (anecdotal):

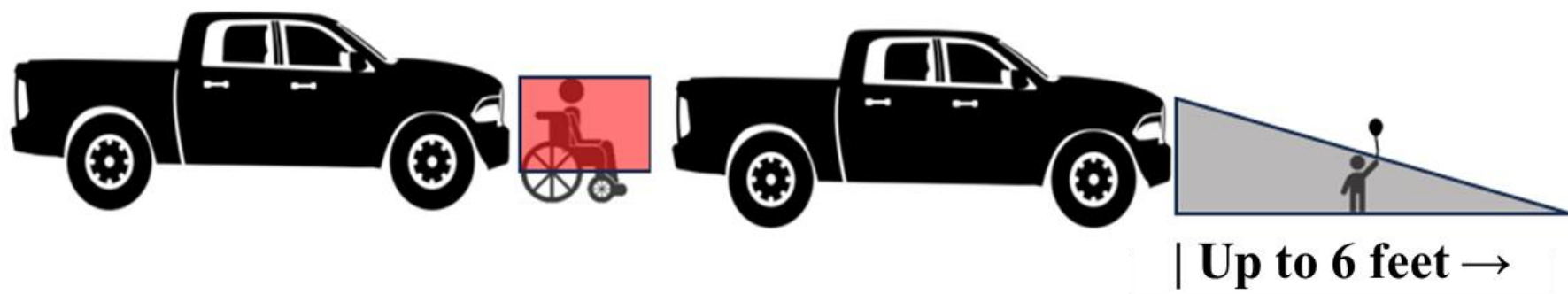
- Perceived sense of safety
- Lifestyle
- Wanting to look cool

Measured Vehicle Heights vs Human Heights

Vehicle (Pickup Trucks)	Center hood height (in)
GMC 2024 Sierra 2500 Crew Cab AT4X	<u>59</u>
Chrysler 2024 RAM 2500 Power Wagon Crew Cab	<u>58</u>
Chevrolet 2024 Silverado 3500 SWR Crew LTZ	<u>56</u>

Measured by Randy McCourt on February 4,
2024 at various dealerships in Beaverton, OR

- Average male height - 5' 9" (69 inches)
- Average female height - 5' 4" (64 inches)
- Average wheelchair height - 48 – 51 inches
(depending on person and wheelchair)



Pedestrian impact area for tall pickup



Pedestrian impact area for average sedan



Blind spot for tall pickup

Reminder



Research & MUTCD



Little research on hood height vs pedestrian visibility

Most research - hood height vs pedestrian injury severity



MUTCD - 4-foot advance stop line is guidance
(recommended practice in typical situations)

Study Objectives

Quantify the pedestrian visibility impacts at intersections of:



Driver height



Pedestrian type and position at intersection



Stopped position of vehicle at intersection



Higher hood height pickups and SUVs

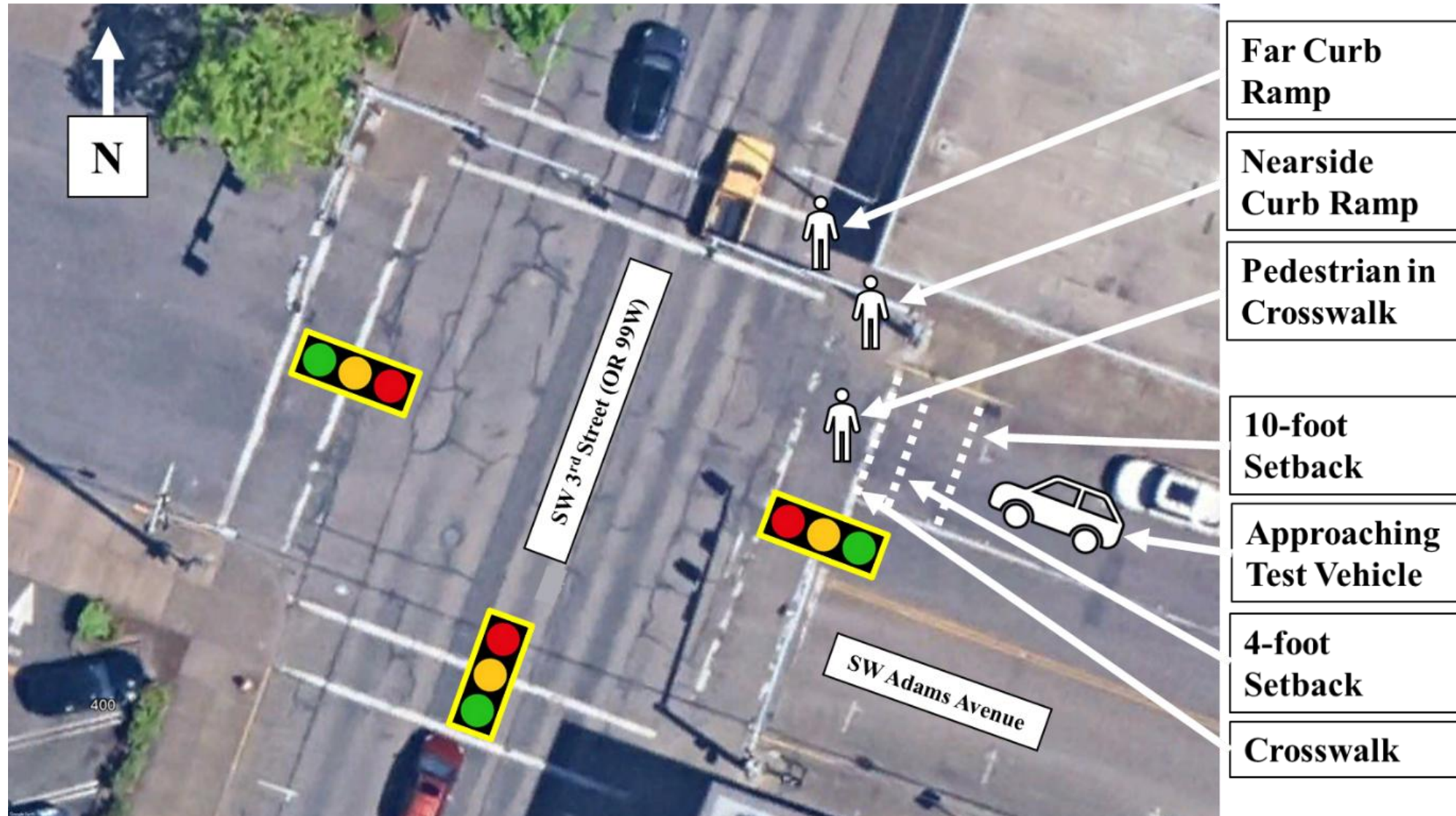
Variables for Testing

Vehicle / Hood Height	Driver Height (in)	Pedestrian Positions	Vehicle Positions	Pedestrian Type
2018 Honda CRV / 38 inches	Shorter (60)	Crosswalk	Zero Setback	Walking
2022 Ford Maverick pickup / 41 inches	Average (70)	Nearside Curb Ramp	Crosswalk	Wheelchair
2018 Ford F250 pickup / 52 inches	Taller (75)	Far Curb Ramp	4-foot Setback	
			10-foot Setback	



$3 \times 3 \times 3 \times 4 \times 2 = 216$ unique scenarios

Test Site - Signalized int. of SW 3rd St and SW Adams Ave in Corvallis, OR



Note

- 0 foot setback - manually placed at crosswalk line
- Other 3 positions – natural stop (about 2-5 ft behind the line)



Driver stopped at crosswalk position
(note 2-5 ft back)

Example Photo Matrix



Phone held up to eye of driver

**Honda
CRV -
Crosswalk**



**Ford
Maverick –
0 ft Setback**



**Ford F250
– 10 ft
Setback**



**Shorter Driver
(5')**

**Average Driver
(5' 10")**

**Taller Driver
(6' 3")**

Example Scenario



Short driver (60 in)



Vehicle positioned at Zero Setback



Pedestrians in all 3 positions,
wheelchair in crosswalk



F250 vehicle (52 in hood height)



Pedestrian Visibility Categories



216 scenarios
2 researchers



195 (90%) agreement

Discrepancies - joint review
and agree on a final rating

Description	Walking	Wheelchair	Rating
Full walking pedestrian/wheelchair			7
Obscured from legs down		N/A	6
Obscured from the waist/mid-chest area down			5
Obscured from the shoulders down			3
Partial head viewable			1
Fully Obscured			-2

Obstructions



Rearview mirror
Sensor assembly
Other pedestrians on the corner



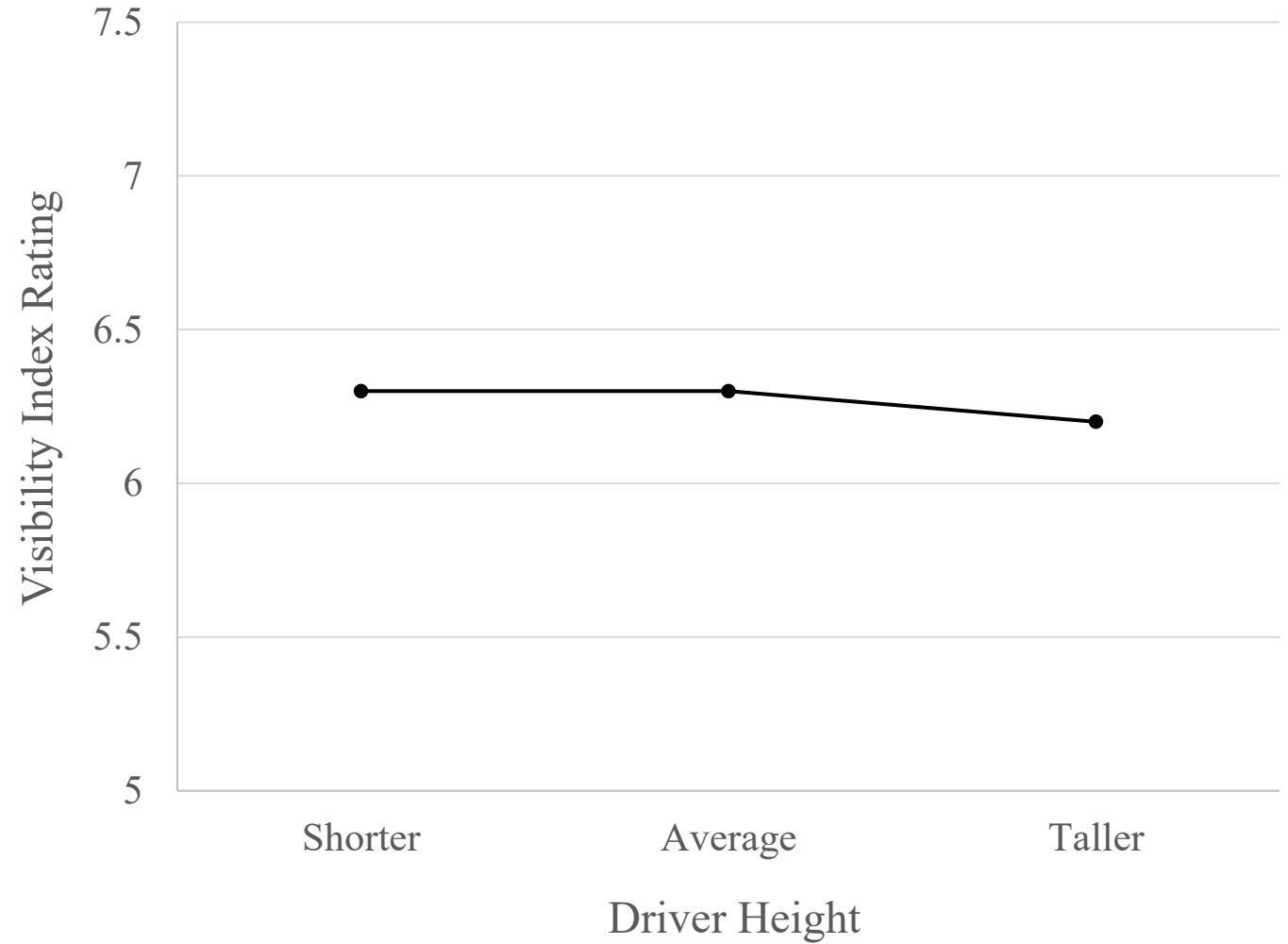
Obstruction-less data presented
to solely analyze variables of interest



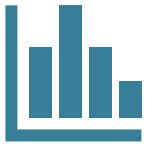
Driver Height



No real difference or
takeaways



Pedestrian Position



Pedestrians in crosswalk are least visible



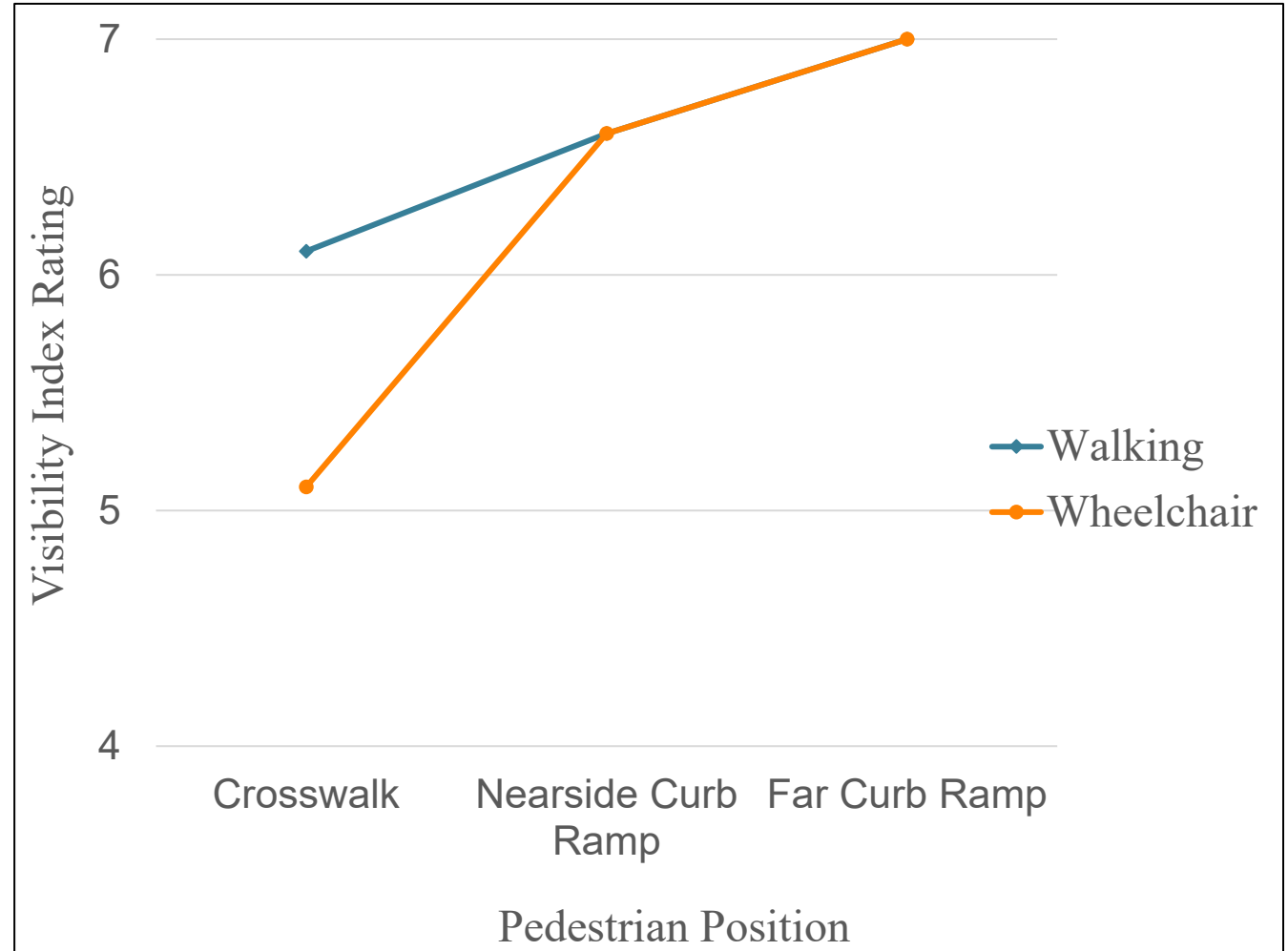
Practical Takeaway

Front facing sensors are increasingly important

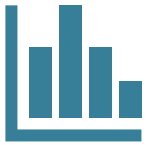


Future Research

Front facing sensors & differing curb radii



Hood Height



Increased hood height =
decreased visibility



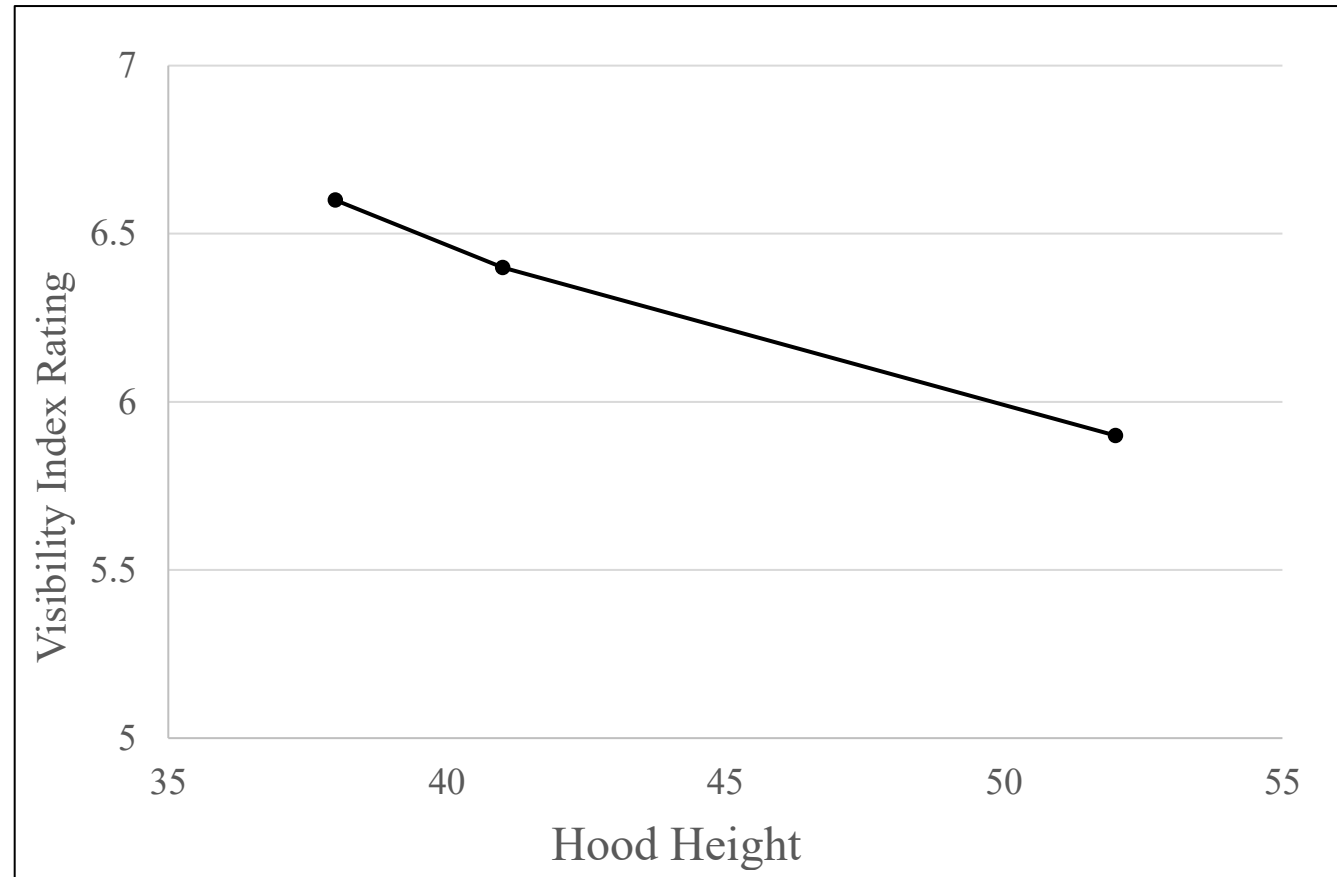
Practical Takeaway

Trend not going away,
need to design accordingly



Future Research

Increased hood heights &
finding critical hood height



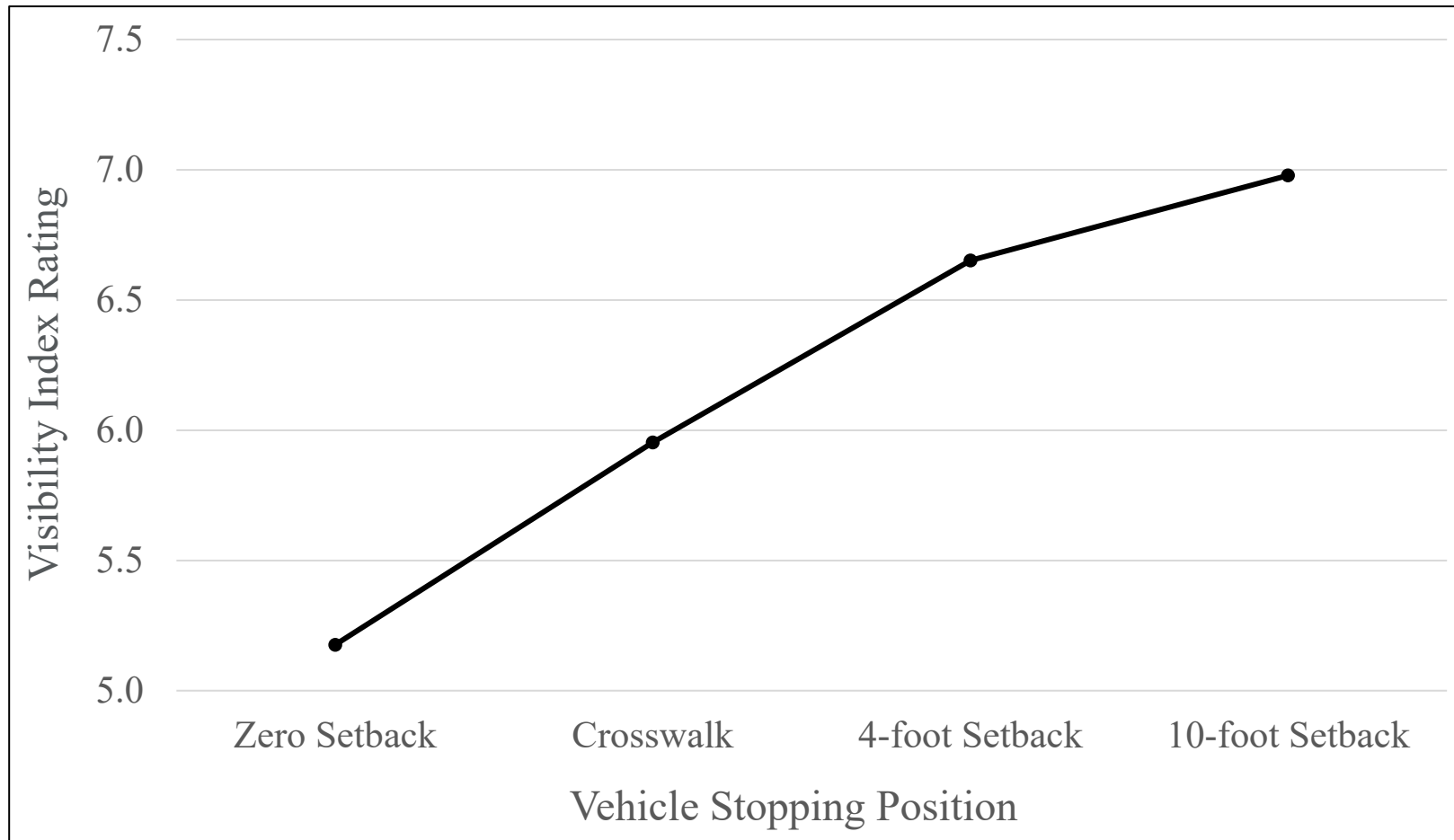
Reminder



Pedestrian (esp. wheelchair/child) + Crosswalk + High Hood = Very Low/No Visibility



Vehicle Stopping Position



Further from crosswalk = higher visibility

Diminishing improvements between 4 ft and 10 ft setback

Practical Takeaway



4 ft advance stop line



practical for achieving meaningful visibility gains
MUTCD - required in urban/pedestrian environments



Future Research

Vehicle adherence at
different setback distances



Study Team

- Wyatt Brown, MSCE – HDR (formerly Oregon State University)
- Hisham Jashami, Ph.D., RSP1 – Oregon State University
- Ransford McCourt, P.E., PTOE – Retired, DKS Past President
- Matt Duncan, P.E., PTOE – City of Lakewood, CO
- David Hurwitz, Ph.D. – Oregon State University

