

2025

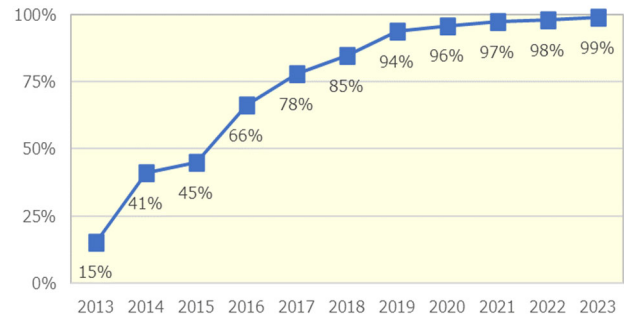
28th Presentation Session for Traffic Accident Investigations, Analysis, and Research

**Verification of Pedestrian AEBS Effectiveness**  
(From joint research with the Japan Automobile Manufacturers Association)

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## 1. Introduction

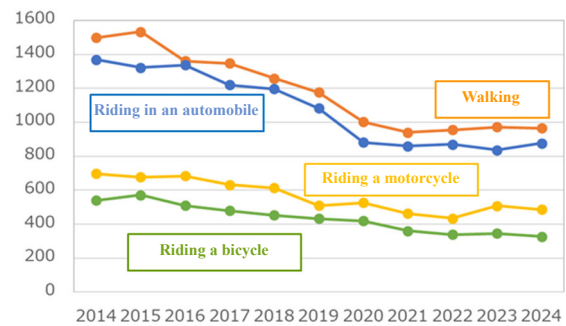
In recent years, Advanced Emergency Brake Systems (hereinafter “AEBS”) have become mandatory on new vehicle models, causing the proportion of vehicles produced that are equipped with AEBS to increase year by year (Figure 1). According to traffic accident statistics, although the number of casualty accidents attributable to four-wheeled vehicles has been declining year by year, pedestrians continue to account for the highest number of fatalities by circumstance (Figure 2). For pedestrian-related accidents, evaluation conditions in JNCAP vehicle assessments were expanded in 2024 by adding an intersection-crossing scenario during right and left turns, in addition to conventional day- and night-time crossing scenarios. In this paper, integrated traffic accident data (macro data) was used to demonstrate the effectiveness of pedestrian AEBS by reporting the results of comparative analysis that classified and compared accident counts for AEBS-equipped vehicles with and without pedestrian-detection capabilities under various environmental and traffic conditions.



**Figure 1. Trends in the proportion of vehicles equipped with AEBS**

(Proportion of vehicles manufactured in Japan equipped with vehicle AEBS)

Created based on ‘The Motor Industry of Japan 2024’ published by the Japan Automobile Manufacturers Association (JAMA)

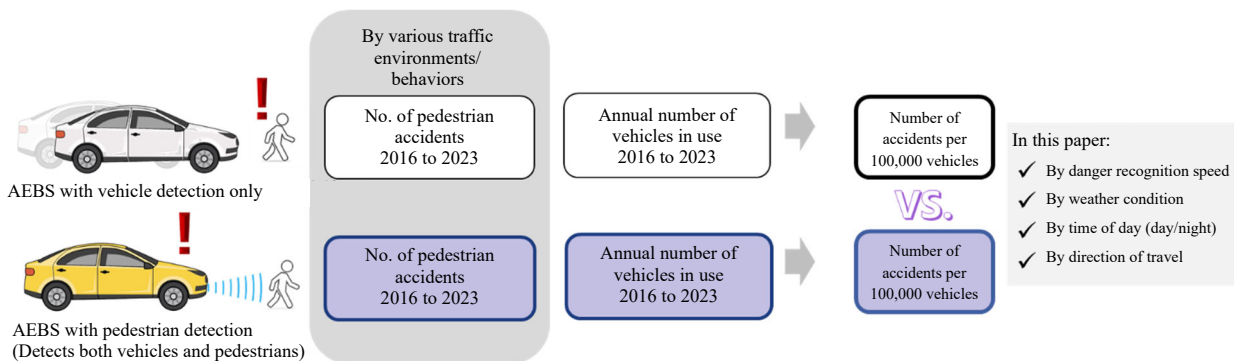


**Figure 2. Trends in fatalities by circumstance**

Created based on data from the National Police Agency’s Traffic Bureau

## 2. Analysis Method

Using macro data, we conducted comparative analysis by aggregating numbers of accidents and numbers of registered vehicles for each AEBS specification and calculating the number of accidents per 100,000 vehicles. For vehicles equipped with vehicle AEBS, which detects only vehicles, and vehicles equipped with pedestrian AEBS, which also detects pedestrians, we calculated the number of pedestrian accidents per 100,000 vehicles based on the annual number of pedestrian accidents and the number of vehicles in use, and conducted comparative analysis by classifying the data into various traffic environments (Figure 3).



**Figure 3. Overview of Analysis Method**

In this study, vehicles equipped with pedestrian AEBS are those for which the AEBS installed on the vehicle is described online or in similar sources as being capable of detecting pedestrians. Other specific functional details (e.g., whether detection is possible in daytime, nighttime, or at intersections) were not further categorized.

Investigation details were as follows:

- Target models: Top vehicle models in use in 2023 (200,000 units or more)
- Investigation method: AEBS type and installation status were identified and aggregated based on the common name, model year, and initial registration month/year of each target model.
- Accident types investigated: Accident type: Pedestrian–vehicle; Primary party: Target models shown above; Secondary party: Pedestrian (general pedestrians)
- Years of aggregated accidents and number of vehicles in use: 2016 to 2023

### 3. Analysis Results

#### 3-1. Overview

Figure 4 shows the number of pedestrian accidents per 100,000 vehicles, classified by AEBS specification. ‘[Vehicle] detection’ refers to vehicles equipped with AEBS that detects only vehicles, while ‘[Vehicle+Pedestrian] detection’ refers to vehicles equipped with AEBS that detects both vehicles and pedestrians. In addition, ‘\*\*’ in the figure indicates that a test of the difference in proportions between the two groups showed a statistically significant difference in the number of accidents at the 1% significance level. Whether differences in AEBS specifications are associated with a reduction in the number of accidents is considered significant here, but this does not guarantee the absolute values of the accident counts themselves.

Figure 4 shows that the number of accidents for [Vehicle+Pedestrian] detection is significantly lower than for [Vehicle] detection. Furthermore, Figure 5 shows the number of pedestrian fatalities per 1,000,000 vehicles. Here too, [Vehicle+Pedestrian] detection shows a significantly lower number of fatalities.

The next section shows analysis results classifying pedestrian accident counts under various conditions.

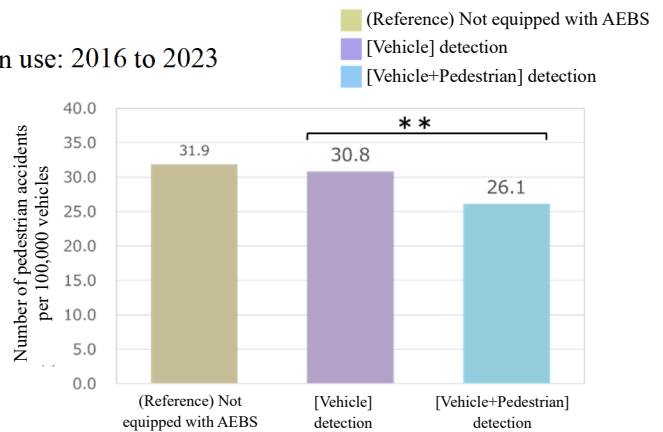


Figure 4. Comparison of numbers of pedestrian accidents per 100,000 vehicles

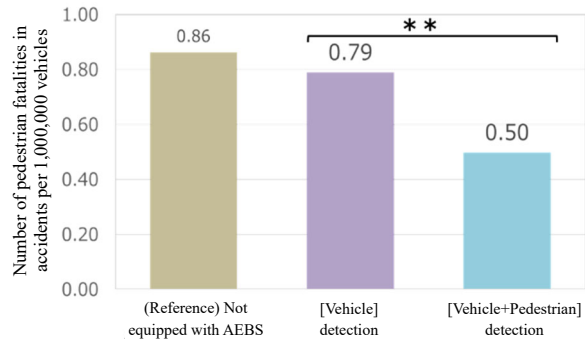


Figure 5. Comparison of pedestrian fatalities in accidents per 1,000,000 vehicles

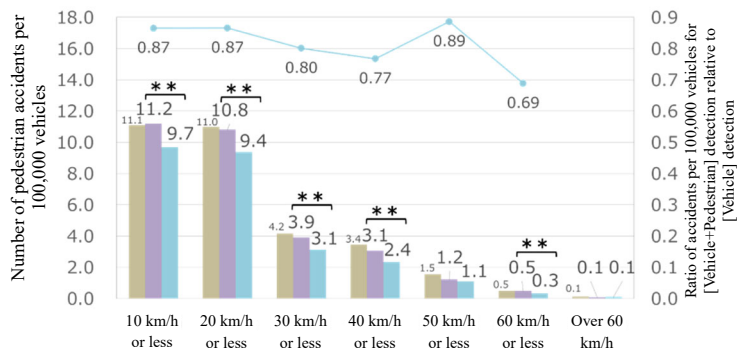


Figure 6. Numbers of accidents per 100,000 vehicles classified by danger recognition speed

### 3-2. Classification by danger recognition speed

Figure 6 shows numbers of accidents per 100,000 vehicles by AEBS specification and danger recognition speed. The bars in the graph represent the number of pedestrian accidents per 100,000 vehicles, while the line indicates the ratio of the number of pedestrian-detection accidents to those of [Vehicle] detection, using the latter as the denominator. The number of accidents for [Vehicle+Pedestrian] detection was significantly lower at speeds of 40 km/h or below, and except for at 50 km/h, the ratio of accidents relative to [Vehicle] detection tended to decrease as speeds increased.

### 3-3. Classification by weather condition

Figure 7 shows numbers of accidents per 100,000 vehicles by AEBS specification and weather condition. With the exception of snow, where accident counts are low, [Vehicle+Pedestrian] detection resulted in significantly fewer accidents than [Vehicle] detection. Furthermore, by calculating the ratio of accidents for [Vehicle+Pedestrian] detection relative to those for [Vehicle] detection by weather conditions showing significant differences in numbers of accidents revealed that the ratios for ‘Cloudy (0.77)’ and ‘Rain (0.77)’ were lower than for ‘Sunny (0.89)’.

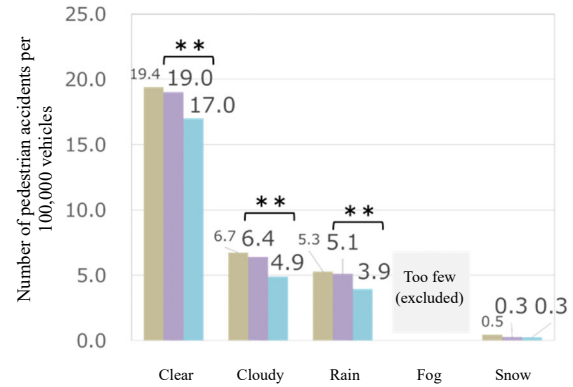


Figure 7. Numbers of accidents per 100,000 vehicles classified by weather condition

### 3-4. Classification by time of day (day/night)

Figure 8 shows numbers of accidents per 100,000 vehicles by AEBS specification and time of day (day/night). For both day and night, vehicles with [Vehicle+Pedestrian] detection experienced significantly fewer accidents than those with [Vehicle] detection. In addition, the ratio of accidents relative to [Vehicle] detection was slightly smaller at night (Day: 0.86, Night: 0.83).

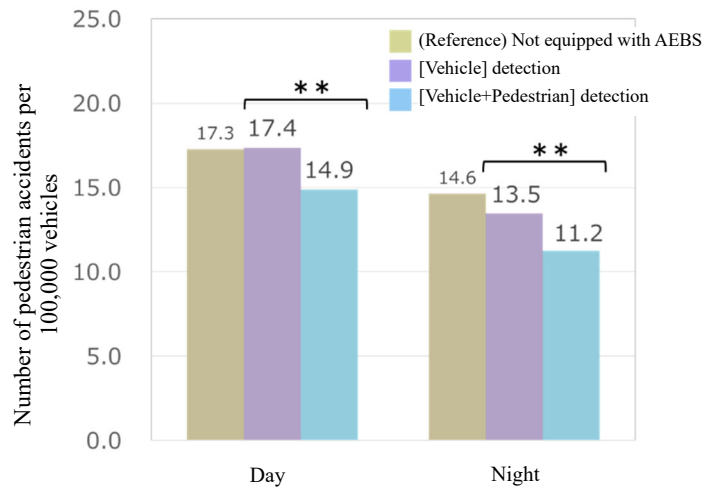


Figure 8. Numbers of accidents per 100,000 vehicles classified by time of day (day/night)

### 3-5. Classification by direction of vehicle travel

Directions of vehicle travel and pedestrian travel were subdivided as shown in Figure 9, and the numbers of accidents for [Vehicle+Pedestrian] detection and [Vehicle] detection were compared for each combination.

Figure 10 shows the results of classification by direction of vehicle travel. Relative to vehicles with only [Vehicle] detection, vehicles with [Vehicle+Pedestrian] detection experienced significantly fewer accidents when driving straight or turning right, and although the number of accidents was also lower when turning left, the difference was not statistically significant. Furthermore, the ratio of accidents for [Vehicle+Pedestrian] detection relative to [Vehicle] detection was smallest when driving straight, followed by when turning right (Straight: 0.81, Right turn: 0.91).

Next, the vehicle travel classifications ‘Straight’, ‘Right turn’, and ‘Left turn’ were further subdivided by ‘Direction of pedestrian travel’. Figure 11 shows the results of classifying straight-driving accidents by direction of pedestrian travel. In all cases, there were significantly fewer accidents when pedestrians approached parallel to the vehicle or from the right or left.

Similarly, Figure 12 shows results for right turns and Figure 13 for left turns. Although accidents were significantly fewer when pedestrians approached from the left during right turns, there was no significant difference when they approached from the right. Furthermore, when turning left, there was no significant difference in the number of accidents regardless of whether pedestrians approached from the left or right.

There are two possible reasons for this result. One is that few models of the vehicles in this study were capable of detecting pedestrians when turning right or left at intersections. The other is the positional relationship between pedestrians and the vehicle camera field of view. Although numbers of accidents are lower when pedestrians approach the vehicle from the left when turning right, in this case the pedestrian enters the camera field of view earlier than in other scenarios, enabling detection to start earlier and possibly preventing the accident (the pedestrian enters the field of view earlier from the side of oncoming traffic; Figure 14).

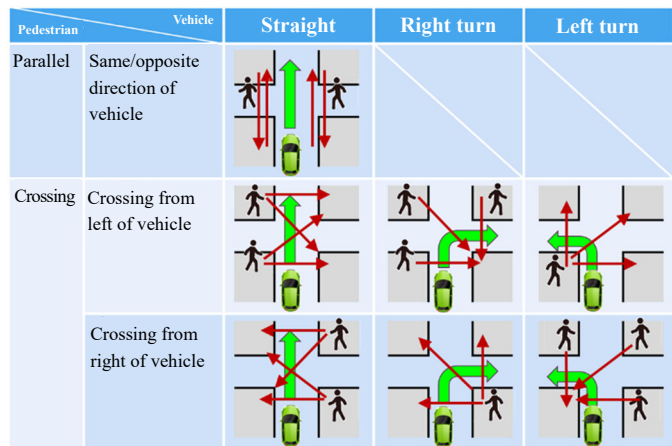


Figure 9. Classification of directions of vehicle and pedestrian travel used in this study

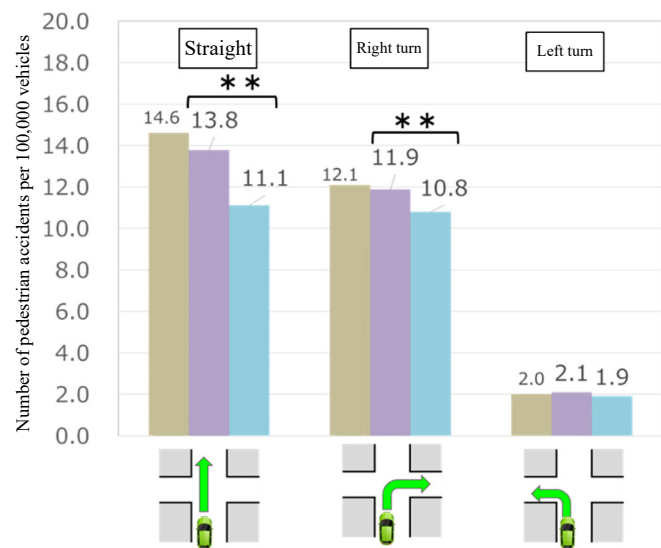


Figure 10. Numbers of accidents per 100,000 vehicles classified by direction of vehicle travel

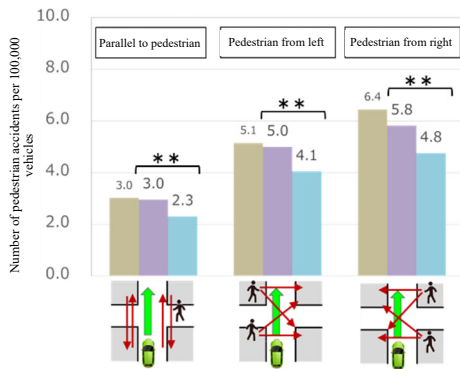


Figure 11. Numbers of accidents classified by direction of pedestrian travel when driving straight

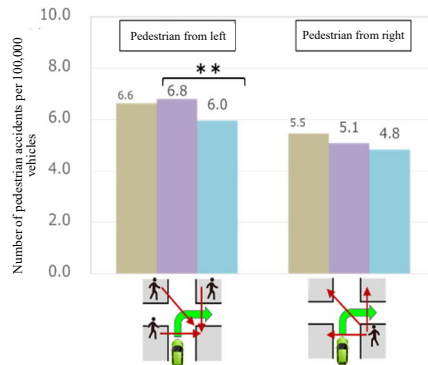


Figure 12. Numbers of accidents classified by direction of pedestrian travel when turning right

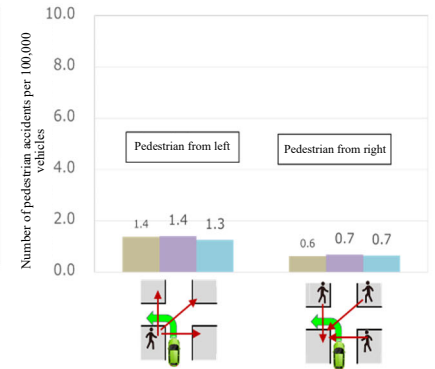


Figure 13. Numbers of accidents classified by direction of pedestrian travel when turning left

#### 4. Summary

Using macro data, we compared the number of pedestrian accidents per 100,000 vehicles between AEBS-equipped vehicles with pedestrian detection and those without.

Of the vehicles investigated:

- The number of pedestrian accidents per 100,000 vehicles was generally and significantly lower for vehicles equipped with pedestrian detection than for those without it.
- Although numbers of pedestrian accidents per 100,000 vehicles when making a right (partial) turn or left turn do not differ based on the presence of a pedestrian detection function, the following may influence results.

- Few AEBS-equipped vehicles are capable of handling right or left turns at intersections. Although factors can likely be identified by subdividing and analyzing AEBS functions, that remains a topic for future research.
- Camera field of view and pedestrian position  
The decrease in right-turn accidents is thought to be due to pedestrians entering the vehicle camera’s field of view earlier, enabling them to be detected more quickly.

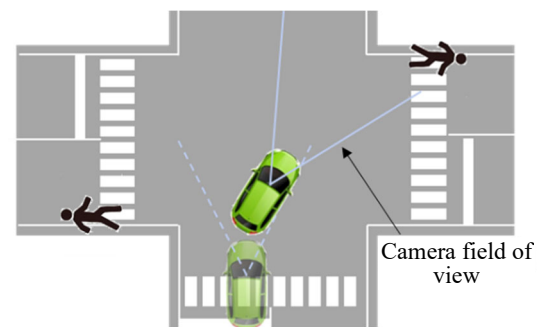


Figure 14. Positional relationship between pedestrians and the vehicle camera field of view when turning right and left (image)

The results of this study show that vehicles equipped with a pedestrian detection function were involved in fewer pedestrian accidents than those without it. Furthermore, as JNCAP began using intersection scenarios in 2024, increased numbers of vehicles capable of handling such scenarios will likely lead to continued reductions in right- and left-turn accidents in the future. However, pedestrians continue to account for the highest number of fatalities across all circumstances. Drivers should avoid overrelying on AEBS and instead endeavor to confirm safety on their own.

[References/Sources]

Japan Automobile Manufacturers Association / Institute for Traffic Accident Research and Data Analysis, 2024,  
“AEBS 市場効果検証並びに残存要因調査”