

Elderly Fatality in CIREN Cases: A Matched Case Review

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INTRODUCTION

- Elderly fatalities in automobile accidents persist as a critical public health concern requiring detailed investigation. [1][2]
- Detailed crash, vehicle, and occupant data from the CIREN database are utilized for in-depth case comparisons beyond what is available in large-scale systems like FARS.
- Matched-case analysis is employed to isolate age-related differences in injury tolerance and physiological response, accounting for variables where crash severity alone is insufficient.

OBJECTIVE
The goal of this study was to identify younger, non-fatal match cases within the CIREN database that correspond to elderly fatality cases to provide insight into factors contributing to fatal outcomes in elderly occupants.

METHODS

- Elderly fatality cases were extracted from the CIREN database and younger control subjects were selected via filter search tools, matching for key anthropometric variables including sex, height, and weight.

Pair Label	Fatality Case	Match (Survived) Case
Pair A	116	145
Pair B	157	11
Pair C	658	72
Pair D	1034	194

Table 1. Paired cases and corresponding labels

- Collision comparability was established by analyzing **Delta-V** and **Principal Direction of Force (PDOF)**.
- Paired t-tests** were conducted to confirm the statistical similarity between the fatality and match case pairs.
- Injury patterns and outcomes were evaluated across all identified cases to assess **age-related differences under comparable crash conditions**.

RESULTS

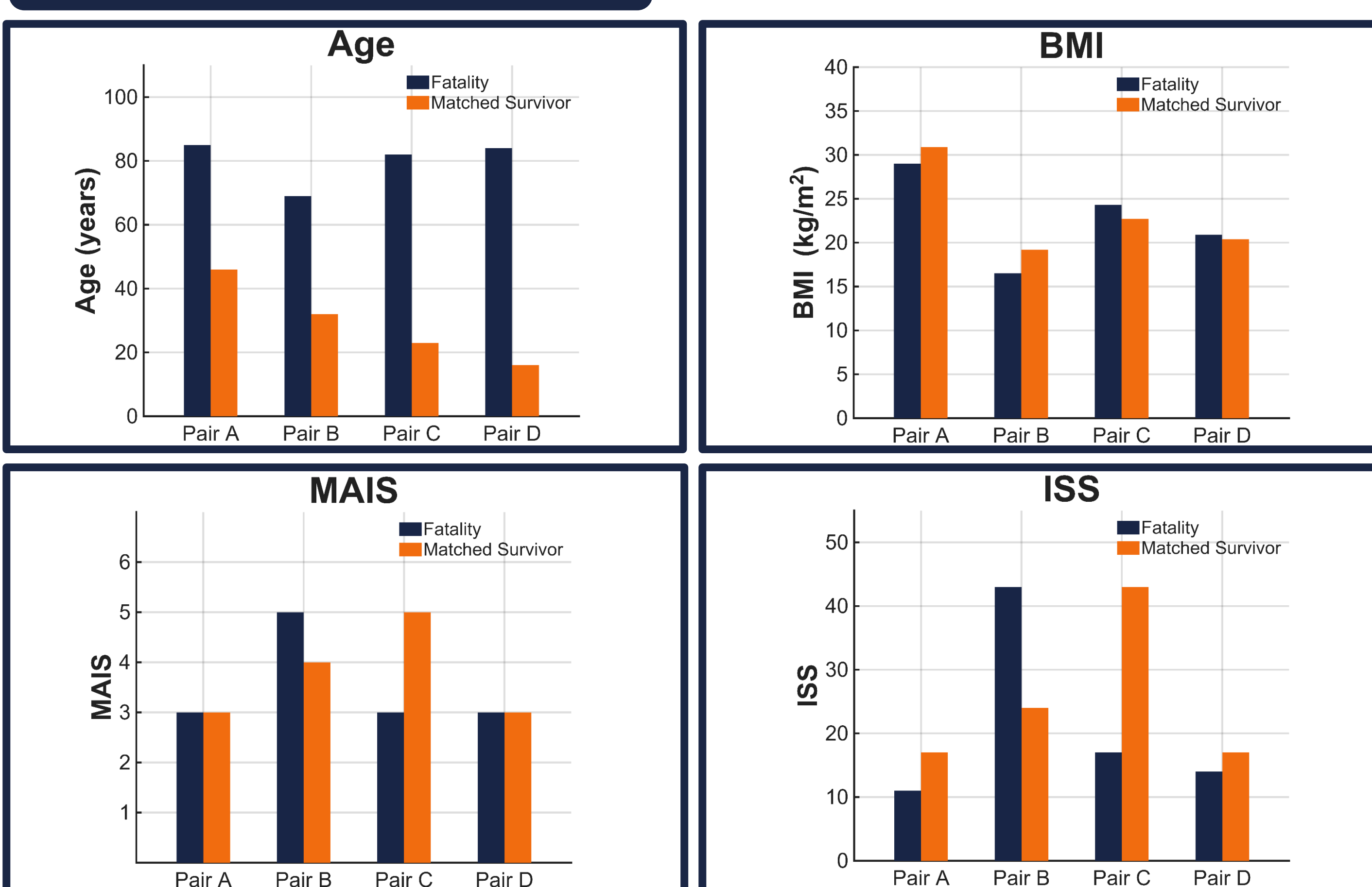


Figure 1. Bar graph indicating similarity between match and fatality case conditions

Variable	P-Value from Paired T Test
Age	<0.001*
MAIS	0.352
ISS	0.302
Delta-V (mph)	0.170
PDOF (°)	0.203
Height (in)	0.337
Weight (lb)	0.476

Table 2. Paired T tests results between matched case pairs of various crash variables, *significant

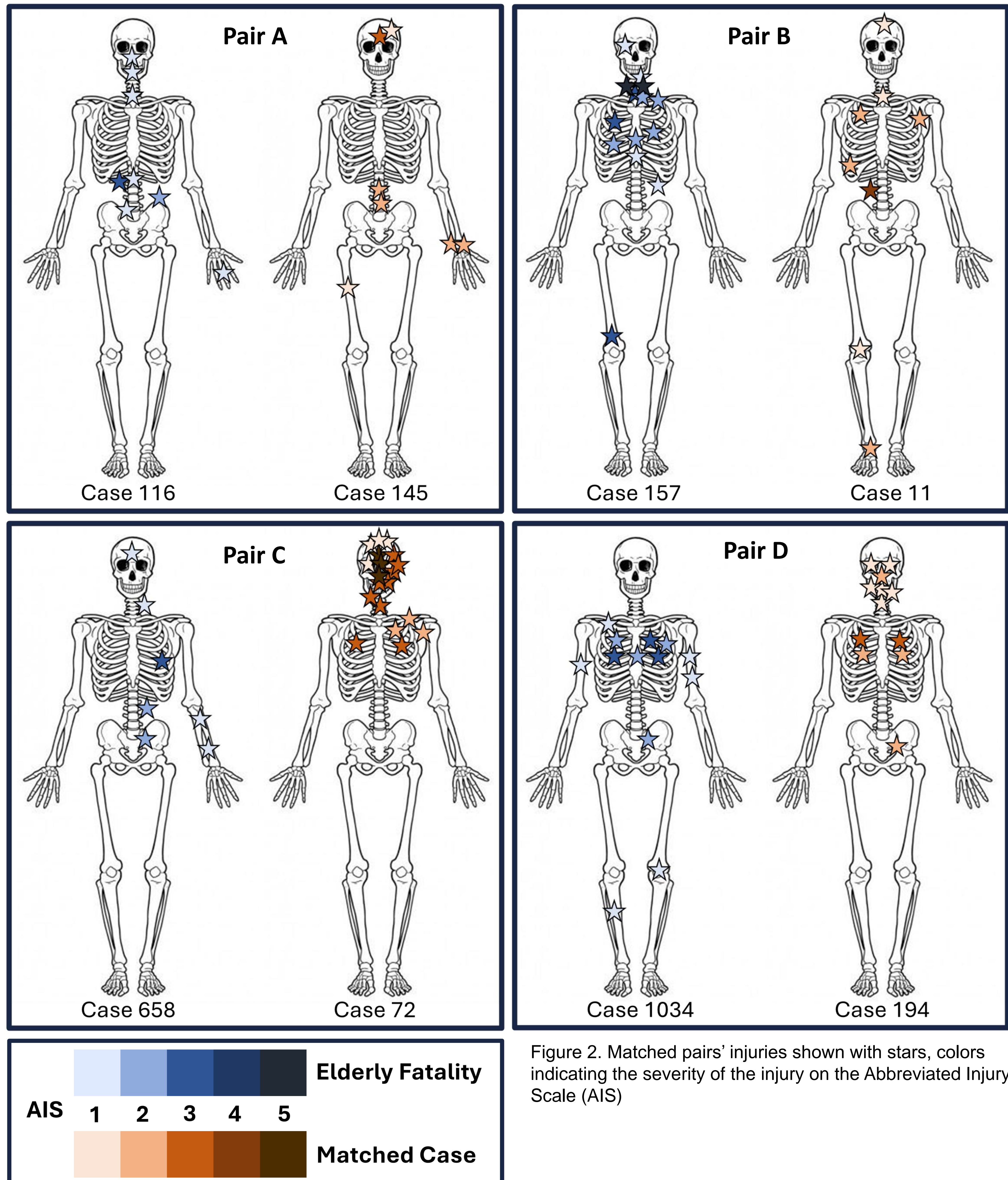


Figure 2. Matched pairs' injuries shown with stars, colors indicating the severity of the injury on the Abbreviated Injury Scale (AIS)

SUMMARY

- A side-by-side comparison of a matched pair demonstrates how an **elderly occupant suffered a fatal outcome while a younger match survived**.
- No significant differences were found in MAIS or ISS between cohorts**, showing that elderly occupants and younger matches sustained similar injury severities.
- Multiple fatality-match pairs exhibited nearly identical trauma, such as shared lumbar vertebral fractures and localized upper-body injuries.
- Results demonstrate that crashes with comparable severity and injury characteristics can **lead to markedly different outcomes based on the individual occupant**.
- A **matched-case approach** provides a framework to identify **physiological and injury-pattern differences between age groups**, offering insight into why fatal outcomes occur in elderly occupants under similar conditions.
- Paired t-tests showed that age differed significantly, but other crash metrics did not.
- Findings are consistent with existing comparisons in FARS database suggesting elderly fatality risk may be driven by fragility rather than crash severity [3].

FUTURE WORK

- Continued research into occupant-specific responses may inform the development of advanced safety features and updated standards for the aging population.
- While the limited number of CIREN cases restricts broad generalization, the results highlight a need for **expanded investigation** as elderly fatalities continue to rise [1].

REFERENCES

- IIHS Crash Testing and Highway Safety
- National Safety Council
- Kent et al., 2005