**Appendix**

Figure A 1 EES Distributions by Seating Position

Figure A 2 MAIS by Age Group

Figure A 3 Chest Injury Severity by Seating Position

Table A 1 Mean ETS by Seating Position and Occupant Age

|  |  |
| --- | --- |
| **Seating Position** | **Mean ETS (km/h)** |
| **<40****(Young)** | **40-64****(Middle-aged)** | **65+****(Old)** |
| Driver | 26.68 | 26.20 | 25.88 |
| FSP | 26.13 | 25.16 | 25.24 |

Table A 2 MAIS for Front Seat Occupants

|  |  |
| --- | --- |
| **Injury Severity**  | **Front Seating Position** |
| **Driver** | **Front passenger** | **All occupants** |
| MAIS 0,1 | 85.2%(n=3666) | 77.0%(n=718) | 83.8%(n=4384) |
| MAIS 2 | 9.8%(n= 422) | 16.7%(n=156) | 11.0%(n=578) |
| MAIS 3+ | 5.0%(n=213) | 6.2%(n=59) | 5.2%(n=272) |

Table A 3 List of AIS 2+ Chest Injury

|  |  |
| --- | --- |
| **Injury Area** | **Injury Description** |
| **Skeletal Injury (328)** | Single rib fracture (6) | pneumothorax (5) |
| haemothorax (1) |
| 2-3 ribs fracture (26) | Stable chest (13) |
| pneumothorax (7) |
| haemothorax (3) |
| haemo-pneumothorax (3) |
| 4+ ribs fracture (87) | stable chest (42) |
| pneumothorax (7) |
| haemothorax (16) |
| haemo-pneumothorax (13) |
| flail chest (9) |
| Sternum fracture (209) | stable chest (200) |
| pneumothorax (8) |
| haemothorax (1) |
| **Organ Injury (88)** | Pneumothorax (9) |
| Haemothorax (3) |
| Pneumomediastinum (1) |  |
| Lung (44) | laceration (2) |
| contusion (42) |
| Pleural cavity/ sac (2) | tear (1) |
| laceration (1) |
| Parietal pleura laceration (1) |
| Pericardium (7) | contusion (2) |
| rupture (1) |
| disruption (1) |
| haemorrhage (3) |
| Myocardial (4) | tear (2) |
| contusion (2) |
| Heart contusion (3) |
| Atrium (3) | tear (2) |
| laceration (1) |
| Ventricle disruption (1) |
| Diaphragm (8) | tear (3) |
| laceration (2) |
| rupture (3) |
| Oesophagus tear (1) |
| Chordae tendineae rupture (1) |
| **Vessel Injury (11)** | Aorta (9) | laceration (3) |
| rupture (1) |
| transection (5) |
| Venacava avulsion (1) |
| Subclavian artery rupture (1) |

**CCIS In-depth Crash Injury Database**

The CCIS sampling prescribed passenger cars, less than 7 years old, with at least one injured occupant and towed away from the crash scene. The database contained detailed information on vehicle crash severity, estimated by the Equivalent Energy Speed (EES), structural performance and restraint performance together with photographic documentation of the vehicle exterior and interior. Occupant injury mechanisms were deduced by the case investigators based on forensic evidence in each vehicle and an assessment of occupant kinematics. The EES was evaluated on the assumption that the vehicle deformation was caused by an impact with a rigid, immovable object (Lenard, Hurley, et al. 1998). Injury outcome was recorded using the Abbreviated Injury Scale AIS 90, (Association for the Advancement of Automotive Medicine 1990). Additional injury coding using AIS 2005 (Association for the Advancement of Automotive Medicine 2005) was added in the latter stages of the study, but was only available for a limited number of cases. AIS 90 was available for all cases and was therefore chosen as the injury scale for analysis.

**Type of AIS 2+ chest injury:**

The recorded numbers of injuries to the thoracic skeletal, organ and vessel were 328 (77%), 88 (20%) and 11 (3%) respectively. Sternum fractures made up a large proportion of all AIS 2+ chest injury occurring in 209 occupants. Multiple rib fracture with more than 4 fractured ribs was the second most common type of skeletal chest injury occurring in 87 occupants. 26 occupants had fractures to 2 or 3 ribs. Injury to the lungs was the most common type of intrathoracic organ injury, 44 such injuries were recorded in the sample. Lung contusion was the most common type of lung injury (n=42) and was mostly rated at AIS 3 or 4 levels. Pneumothorax (n=9) was the second most common type of intra-thoracic organ injury followed by injury to the diaphragm (n=8) and pericardium (n=7). Other intrathoracic organ injuries occurred for fewer occupants. Vessel injuries were most likely to be rated at AIS 4+ and occurred more sporadically. Injury to the aorta (n=9) was the most common type of vessel injury.