



## Child Passenger and Road User Safety

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### The Issue:

The best way to protect child passengers is to place them in the back seat, restrained by a properly installed child safety seat, booster seat or safety belt, as appropriate for their age, size and development. Child passenger safety laws should include provisions to ensure infants and toddlers remain rear facing minimally through age two, to support relatively large heads on weak neck musculature. After children have outgrown the forward facing safety seat, states should mandate all children be secured by a booster seat until they can be properly restrained by a safety belt, which usually occurs around 57 inches in height and ages 9 – 12, as recommended by the Centers for Disease Control and Prevention (CDC) and others.<sup>1</sup> Booster seats are intended to provide a platform that lifts the child up off the vehicle seat to improve the fit of the child in a three-point adult safety belt. An improper fit of an adult safety belt can cause the lap belt to ride up over the stomach and the shoulder belt to cut across the neck, potentially exposing the child to serious abdominal and neck injury.

As vehicle occupants, children are also at risk of injury and death due to pediatric vehicular heat stroke, known as “hot car” incidents, and seatback collapse (when the front seat collapses during a crash, posing risk of death and serious injury to an occupant seated directly behind the front seat passenger), among other issues.

Outside of a vehicle, children are vulnerable as road users (pedestrians, bicyclists) and around vehicles (such as in driveways and parking lots). They are less visible due to their size and are less likely to have the appropriate situational awareness and to know the rules for safe actions around vehicles and on the roads.

### The Impact:

- Motor vehicle crashes are among the leading causes of death for children ages one to 14 in the U.S.<sup>2</sup>
- In 2020, 1,093 children, defined as age 14 and younger, were killed in traffic crashes, a three percent increase from 2019. Of these fatalities, 276 were children ages four through seven, and 244 children were age 3 and younger.<sup>3</sup> This equates to three children killed each day on average.
- An estimated 139,042 children were injured in traffic crashes in 2020, which equals about 380 each day on average.<sup>4</sup>
- In 2020, 177 child pedestrians were killed in traffic crashes, and 5,223 were injured. In the same year, 48 child pedalcyclists were killed, and 5,183 were injured.<sup>5</sup>

### The Facts:

- Across all age groups, injury risk is lowest (less than two percent) when children are placed in an age-appropriate restraint in the rear seat.<sup>6</sup>
- When used properly, child safety seats reduce fatal injury by 71 percent for infants and 54 percent for toddlers in passenger cars.<sup>7</sup>

- Over 325 lives were saved by restraining children four and younger in passenger vehicles in 2017 (the last year for which this calculation is available from the National Highway Traffic Safety Administration (NHTSA)).<sup>8</sup>
- Appropriate child safety seats and restraints are very effective in preventing injury:<sup>9</sup>
  - 47 percent effective in preventing fatalities for ages 1-3 in all crashes;
  - 43 percent effective in preventing fatalities for ages 3-5 in all crashes; and,
  - 67 percent effective in preventing serious to critical injuries for ages 5-8 in all crashes.
- According to the American Academy of Pediatrics (AAP), infants and toddlers are at a particularly high risk of head and spine injuries in motor vehicle crashes because of their relatively large heads and structural features of the neck and spine. By supporting the entire head and spine, a rear facing car seat provides optimal support during a crash.<sup>10</sup>
- Using a booster seat with a seat belt instead of a seat belt alone reduces a child's risk of injury in a crash by 45 percent, according to the Center for Injury Research and Prevention, Children's Hospital of Philadelphia, and the Center for Clinical Epidemiology and Biostatistics, University of Pennsylvania.<sup>11</sup>
- In 2020, 52 unrestrained passenger vehicle occupants under four years old were killed when restraint use was known.<sup>12</sup>
- Of the 108 children killed in passenger vehicles in 2020 in which the driver was alcohol-impaired, 56 percent of them were unrestrained (when child restraint use was known).<sup>13</sup>
- A 2022 poll commissioned by Advocates for Highway and Auto Safety (Advocates) found that 65 percent are "extremely" or "very concerned" about lack of seat belt or child safety seat use on our roadways.<sup>14</sup>

## **The Solutions: Laws, Technology and Roadway Safety Infrastructure**

### **Comprehensive State Laws to Incentivize Proper Child Safety Seat Use** ([\*See Advocates' Roadmap to Safety Report for more information about specific state laws.\*](#))

- According to the Insurance Institute for Highway Safety (IIHS), expanded child restraint laws covering children through at least age seven were associated with:<sup>15</sup>
  - Five percent reduction in the rate of children with injuries of any severity;
  - Seventeen percent reduction in the rate of children with fatal and incapacitating injuries;
  - Children being nearly three times as likely to be in child restraints; and,
  - Six percent increase in the number of booster-seat aged children seated in the rear seat of the vehicle where children are better protected.

### **Safety Technologies and Improved Safety Standards Can Protect Children and Other Road Users**

The U.S. Department of Transportation (DOT) must expeditiously use its authority to advance minimum performance standards for vehicle safety technologies that can prevent or mitigate crashes and protect vehicle occupants and road users. These safety technologies should be standard, not optional, equipment in new vehicles. This action will achieve safety equity by both ensuring that the technology responds to and benefits all road users and that consumers buying new vehicles are not charged extra for the technology. Moreover, requiring equipment as standard can reduce the base cost of technology due to economies of scale.

- *Advanced Driver Assistance Systems (ADAS)*: According to the AAA Foundation for Traffic Safety, equipping all cars, pickup trucks, vans, minivans and SUVs with forward collision warning (FCW) / automatic emergency braking (AEB) that respond to pedestrians / bicyclists as well as vehicles could prevent 1.9 million crashes, nearly 900,000 injuries, and more than 4,700 deaths annually.<sup>16</sup>
  - The Infrastructure Investment and Jobs Act (IIJA, Pub. L. 117-58), signed into law on November 15, 2021, directs the U.S. DOT to issue final rules on minimum performance standards and

requirements for ADAS technologies including AEB, FCW, lane departure warning (LDW) and lane keeping assist (LKA). However, the law does not ensure that the technology will be capable of responding to pedestrians, bicyclists and other road users as appropriate, does not include a date certain for rulemaking and compliance for ADAS in passenger vehicles, and does not include Class 3 – 6 trucks for the AEB requirement.<sup>17</sup>

- *Occupant detection and alert technology to prevent hot car incidents:* More than 1,000 children have died in hot cars since 1990.<sup>18</sup> Inexpensive safety systems to end these incidents are currently available and should be required in new passenger vehicles. These systems must be required to detect the presence of an occupant in the passenger compartment to ensure that children who access a vehicle on their own or who are left in a vehicle are saved from injury or death. While the IIJA includes a directive for a reminder system, it does not require the system to detect the presence of an occupant in the entire passenger compartment.<sup>19</sup>
- *Rear seat belt reminders:* Children and teens constitute a large proportion of rear seat occupants in crash data.<sup>20</sup> Between 2011 and 2020, approximately 900 unbelted second row occupants of passenger cars and light trucks died in crashes on U.S. roads annually.<sup>21</sup> Between 2011 and 2020, on average over 18,000 unbelted second row occupants were injured annually.<sup>22</sup> Considering the effectiveness of seat belts and the fact that more than half of all fatally injured rear seat occupants in passenger cars and light trucks were unbelted during that time,<sup>23</sup> rear seat belt reminders and seat belt use could have helped to eliminate or mitigate a large portion of these fatalities and injuries. IIHS estimates that improved seat belt alerts could increase belt use by as much as 34 percent, preventing an estimated 1,500 front seat occupant fatalities every year.<sup>24</sup> The 2012 Moving Ahead for Progress in the 21<sup>st</sup> Century Act (MAP-21, Pub. L. 112-141) directed the U.S. DOT to issue a requirement for rear seat belt reminders by October 1, 2015, yet this directive remains unfulfilled. The U.S. DOT should issue the overdue standards and requirements immediately.
- *Preventing frontovers:* Children, small adults, people in wheelchairs and other assistive devices, recumbent bicycle riders, and others may not be visible to a driver who may inadvertently hit them and/or run over them with a vehicle. Technology to prevent such incidents must be identified by the U.S. DOT and required in all new vehicles. Upgrading the hood and bumper standards to better protect those outside the vehicle should also be accomplished.
- *Preventing seatback failure:* Children who are properly restrained in the rear seat of a vehicle are being needlessly killed and suffering serious injuries when the seat back of the front seat fails. The federal standard for seat backs has remained relatively unchanged since 1967 and is known to be insufficient. The IIJA only directs an advanced notice of proposed rulemaking on this issue, not a final rule which is needed.<sup>25</sup>
- *Side impact protection for children:* Front and side impact crashes account for most child occupant fatalities. Side impacts affecting the passenger area are especially dangerous because of a lack of energy-absorbing structures compared to front or rear-end crashes.<sup>26</sup> A NHTSA rule issued on June 22, 2022, originally required in MAP-21 and due six years ago, makes child passengers safer by adding a side impact test using child-sized anthropomorphic test devices, also referred to as crash test dummies. However, the rule only applies to child seats designed for children weighing up to 40 pounds or up to 43.3 inches tall.<sup>27</sup>

### **Road Safety Infrastructure Improvements and The Safe System Approach<sup>28</sup>**

The Safe System Approach (SSA) assumes that humans will make mistakes and that we must anticipate this and make accommodations to account for limited human injury tolerances through five elements: Safe Vehicles, Safe Road Users, Safe Roads, Safe Speed and Post-Crash Care. By improving the design and operation of roadways to accommodate all road users safely, the SSA seeks to avoid conflicts between road users (drivers of vehicles, motorcycle riders, pedestrians, bicyclists, micromobility riders,

wheelchair users and others) and minimize impact forces when they do occur in order to prevent fatalities and serious injuries.

Infrastructure improvements consistent with the SSA to limit conflicts include:

- Curbing speed - This can be accomplished by reducing speed limits, employing automated enforcement to augment traditional enforcement, adding speed humps, using real-time speed feedback signs, performing road diets and installing roundabouts.
- Prioritizing infrastructure to promote safety - This includes changes such as adding lighting and sight lines, leading intervals, pedestrian hybrid beacons, curb extensions, accessible sidewalks, rumble strips, protected intersections, separated bike lanes, and road separations that take into account all users.

Localities can advance these and other infrastructure improvements systemically by requiring their adoption as appropriate in all road design and maintenance projects.

The IJA includes multiple provisions that advance the SSA including expanded funding for safety infrastructure upgrades. It also provides support and guidance for localities planning to apply for such, permits use of certain federal funds for automated enforcement programs in school and work zones, directs requirements for vehicle safety improvements including crash avoidance technologies, and ensures funds are used to improve vulnerable road user safety.

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- <sup>1</sup> Child Passenger Safety, Centers for Disease Control and Prevention, available at [https://www.cdc.gov/transportationsafety/child\\_passenger\\_safety/resources.html](https://www.cdc.gov/transportationsafety/child_passenger_safety/resources.html).
  - <sup>2</sup> WISQARS, Leading Causes of Death Reports, 1981-2020, 2020, Top 10 leading causes of death, Ages 1 to 14, <https://wisqars.cdc.gov/fatal-leading>, last queried Nov. 2022.
  - <sup>3</sup> Traffic Safety Facts 2020 Data: Children, NHTSA April 2022, DOT HS 813 285, available at <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813285>
  - <sup>4</sup> Traffic Safety Facts 2020 Data: Children, NHTSA April 2022, DOT HS 813 285, available at <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813285>
  - <sup>5</sup> Traffic Safety Facts 2020 Data: Children, NHTSA April 2022, DOT HS 813 285, available at <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813285>
  - <sup>6</sup> Risk of Child Injury by Seat Row and Restraint Type, 1998-2002, Age 0-12 years, Children’s Hospital of Philadelphia, 2014. Available at [https://injury.research.chop.edu/sites/default/files/documents/seat\\_row\\_0.pdf](https://injury.research.chop.edu/sites/default/files/documents/seat_row_0.pdf).
  - <sup>7</sup> Revised Estimates of Child Restraint Effectiveness, NHTSA, Dec. 1996, DOT HS 96 855, available at <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/96855>.
  - <sup>8</sup> Traffic Safety Facts 2020: A Compilation of Motor Vehicle Crash Data, NHTSA, Oct. 2022, DOT HS 813 375, available at <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813375>.
  - <sup>9</sup> Evaluation of Child Restraint System Effectiveness, NHTSA, December 2020, DOT HS 813 047, available at <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813047>.
  - <sup>10</sup> Policy Statement – Child Passenger Safety, American Academy of Pediatrics, Committee on Injury, Violence, and Poison Prevention, 2018, available at <https://pediatrics.aappublications.org/content/142/5/e20182460>.
  - <sup>11</sup> Kristy B. Arbogast, Jessica S. Jermakian, Michael J. Kallan and Dennis R. Durbin, “Effectiveness of Belt Positioning Booster Seats: An Updated Assessment,” *Pediatrics* 2009;124;1281, October 19, 2009, available at <https://pediatrics.aappublications.org/content/124/5/1281>.
  - <sup>12</sup> Traffic Safety Facts 2020 Data: Children, NHTSA, April 2022, DOT HS 813 285, available at <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813285>.
  - <sup>13</sup> Traffic Safety Facts 2020 Data: Children, NHTSA, April 2022, DOT HS 813 285, available at <https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/813285>.
  - <sup>14</sup> ENGINE’S CARAVAN SURVEY Public Opinion Poll, January 2022, available at <https://saferoads.org/wp-content/uploads/2022/01/Advocates-January-2022-Poll-Report-Final.pdf>.
  - <sup>15</sup> Effects of booster seat laws on injury risk among children in crashes, Eichelberger, Angela H.; Chouinard, Aline O.; Jermakian, Jessica S. *Traffic Injury Prevention* November 2012, available at <https://pubmed.ncbi.nlm.nih.gov/23137094/>.
  - <sup>16</sup> Benson, A., Tefft, B.C., Svancara, A.M. & Horrey, W.J., September 2018. Potential Reduction in Crashes, Injuries and Deaths from Large-Scale Deployment of Advanced Driver Assistance Systems (Research Brief). Washington, D.C.: AAA Foundation for Traffic Safety, Available at: <https://aaaoundation.org/potential-reduction-in-crashes-injuries-and-deaths-from-large-scale-deployment-of-advanced-driver-assistance-systems/>.
  - <sup>17</sup> Infrastructure Investment and Jobs Act (IIJA, Pub. L. 117-58), November 15, 2021, Sections 24208 and 23010, available at: <https://www.govinfo.gov/content/pkg/PLAW-117publ58/pdf/PLAW-117publ58.pdf>.
  - <sup>18</sup> Kids and Car Safety: Heatstroke, last accessed on 7/15/22, available at: <https://www.kidsandcars.org/how-kids-get-hurt/heat-stroke/>.
  - <sup>19</sup> Infrastructure Investment and Jobs Act (IIJA, Pub. L. 117-58), November 15, 2021, Section 24222, available at: <https://www.govinfo.gov/content/pkg/PLAW-117publ58/pdf/PLAW-117publ58.pdf>.

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- <sup>20</sup> Durbin, D. R., Jermakian, J. S., Kallan, M. J., McCartt, A. T., Arbogast, K. B., Zonfrillo, M. R., & Myers, R. K. (2015). Rear seat safety: Variation in protection by occupant, crash and vehicle characteristics. *Accident Analysis & Prevention*, 80, 185–192. doi: 10.1016/j.aap.2015.04.006, Available at: <http://onlinepubs.trb.org/onlinepubs/webinars/durbinoc272016.pdf>.
- <sup>21</sup> Traffic Safety Facts 2019, NHTSA, DOT HS 813 141, Aug. 2021 (2019 Annual Report); Traffic Safety Facts 2018, NHTSA, DOT HS 812 981, Nov. 2020 (2018 Annual Report); Traffic Safety Facts 2017, NHTSA, DOT HS 812 806, Sep. 2019 (2017 Annual Report); Traffic Safety Facts 2016, NHTSA, DOT HS 812 554, May 2018 (2016 Annual Report); Traffic Safety Facts 2015, NHTSA, DOT HS 812 384 (2015 Annual Report); Traffic Safety Facts 2014, NHTSA, DOT HS 812 261 (2014 Annual Report); Traffic Safety Facts 2013, NHTSA, DOT HS 812 139 (2013 Annual Report), Available at <https://crashstats.nhtsa.dot.gov/#!/DocumentTypeList/12>.
- <sup>22</sup> 2019 Annual Report; 2018 Annual Report; 2017 Annual Report; 2016 Annual Report; 2015 Annual Report; 2014 Annual Report; 2013 Annual Report;. NOTE: Injury data was not provided for 2016 and 2017 as the database structure was changed.
- <sup>23</sup> Traffic Safety Facts 2019, NHTSA, DOT HS 813 141, Aug. 2021 (2019 Annual Report).
- <sup>24</sup> The Effects of Persistent Audible Seat Belt Reminders and a Speed-Limiting Interlock On The Seat Belt Use Of Drivers Who Do Not Always Use A Seat Belt; Kidd, D.G., Singer, J., Nov. 2019, *Journal of Safety Research*.
- <sup>25</sup> Infrastructure Investment and Jobs Act (IIJA, Pub. L. 117-58), November 15, 2021, Sections 24204, available at: <https://www.govinfo.gov/content/pkg/PLAW-117publ58/pdf/PLAW-117publ58.pdf>.
- <sup>26</sup> U.S. Department of Transportation, National Highway Traffic Safety Administration, 49 CFR Part 571, Docket No. NHTSA-2022-0051, RIN 2127-AK95 Federal Motor Vehicle Safety Standards; Child Restraint Systems, Child Restraint Systems--Side Impact Protection, Incorporation by Reference available at: <https://www.nhtsa.gov/sites/nhtsa.gov/files/2022-06/Final-rule-FMVSS-213a-side-impact-child-restraint-systems-web.pdf#page=6>.
- <sup>27</sup> Department of Transportation, NHTSA, Federal Motor Vehicle Safety Standards: Final Rule on Child Restraint Systems—Side Impact Protection, available at: <https://www.nhtsa.gov/sites/nhtsa.gov/files/2022-06/Final-rule-FMVSS-213a-side-impact-child-restraint-systems-web.pdf>.
- <sup>28</sup> “Recommendations of the Safe System Consortium,” Johns Hopkins University Center for Injury Research and Prevention, May 2021. Available here: <https://www.jhsph.edu/research/centers-and-institutes/johns-hopkins-center-for-injury-research-and-policy/our-impact/documents/recommendations-of-the-safe-system-consortium.pdf>.