

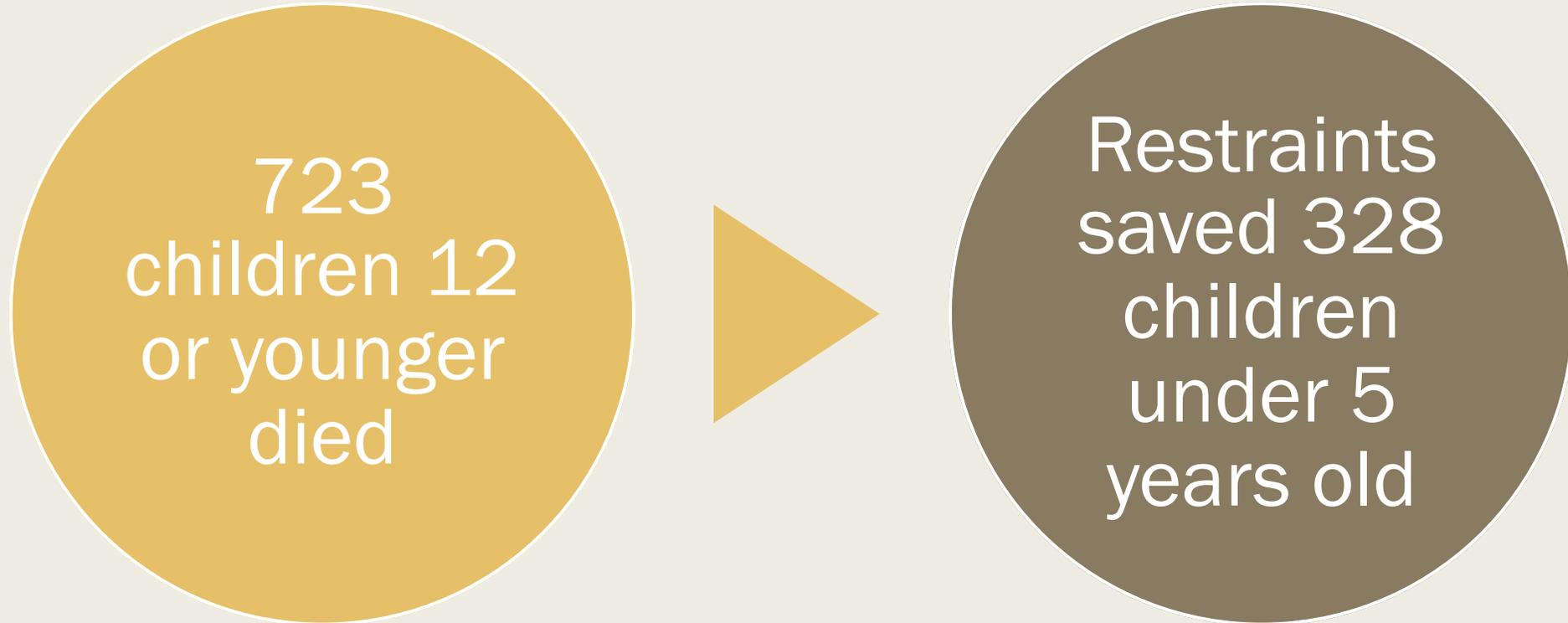


INJURIES FROM CHILD RESTRAINT MISUSE

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Scope of the problem (2016)



Scope of the problem (2016)



128,000 children 12 or younger
were injured

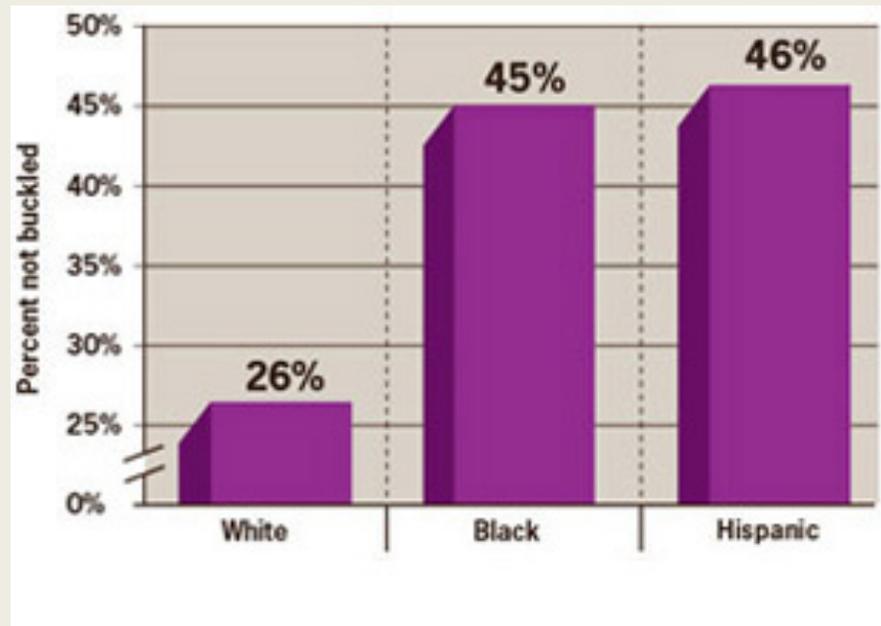


Car seat use reduced injuries by
71-82%



Booster seats reduce the risk
for serious injury by 45% for
children 4-8 years old

ALMOST 1/2 OF BLACK
AND HISPANIC
CHILDREN WHO
DIED WERE NOT
RESTRAINED (2009-
2010)



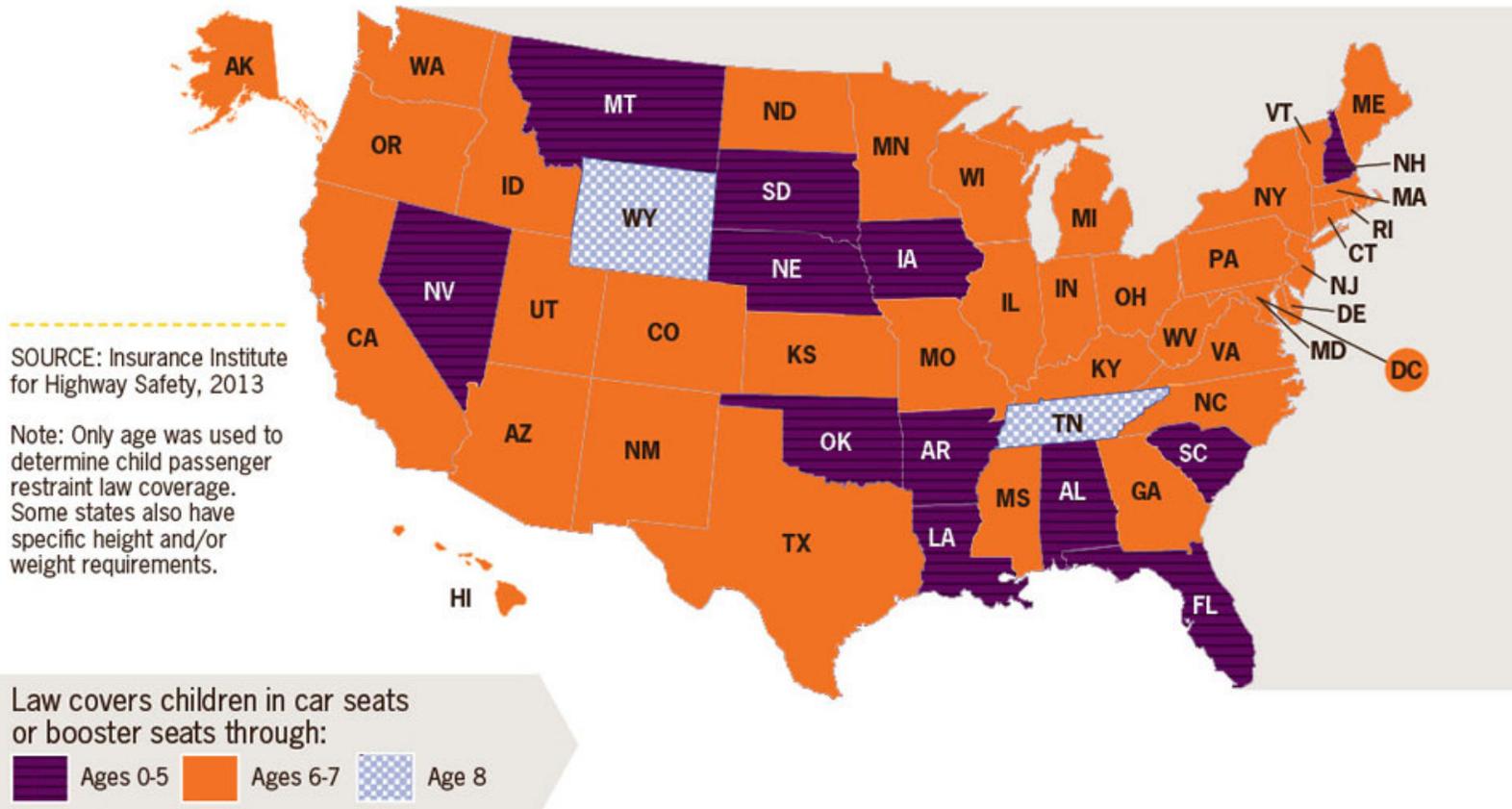
**1/3 OF ALL
CHILDREN WHO DIED
IN CRASHES IN 2011
WERE NOT BUCKLED!**

SOURCES: Fatality Analysis Reporting System, 2002 – 2011; National Highway Traffic Safety Administration, 2013

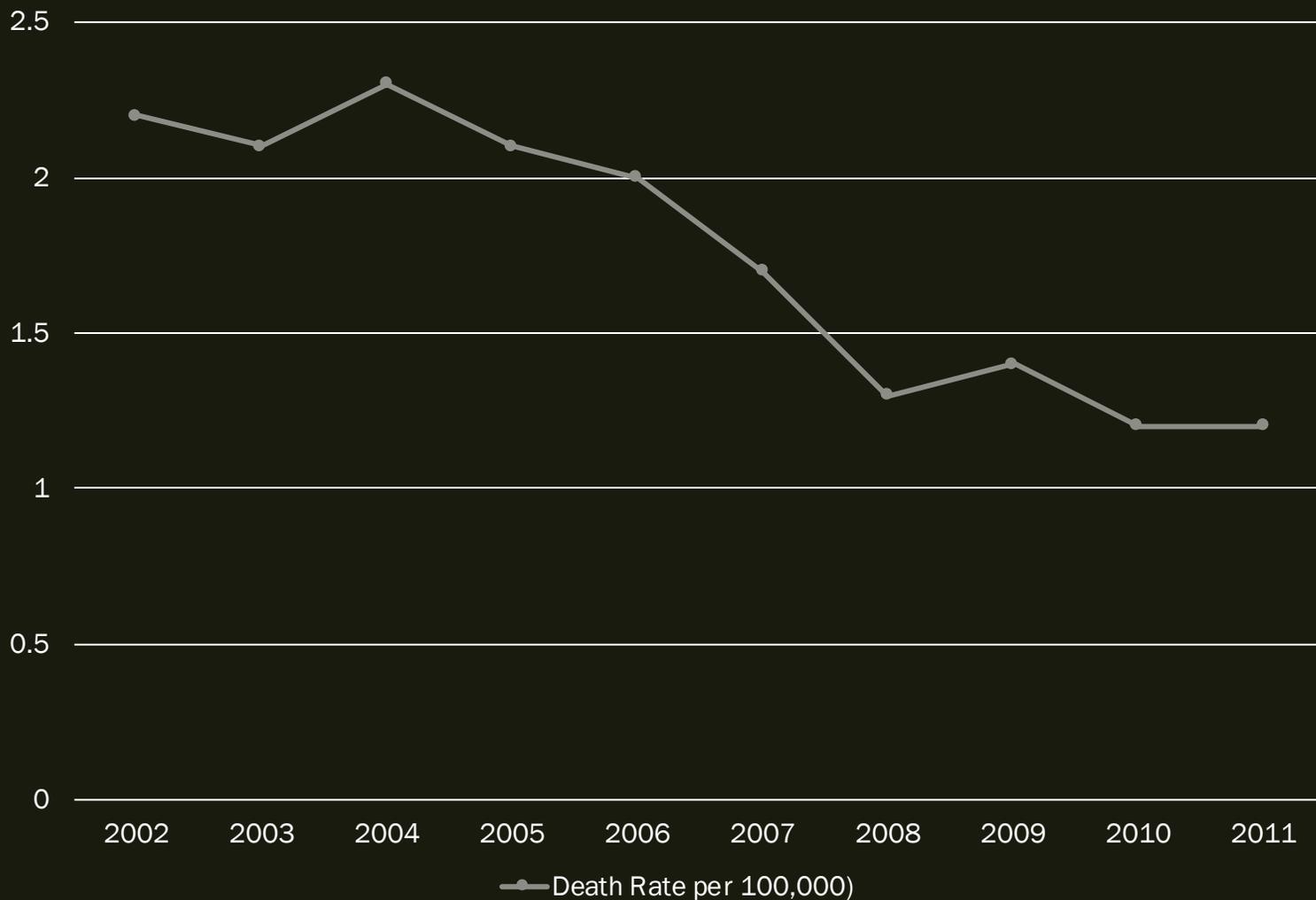
Evidence shows that state laws result in more children being buckled up.

Only 2 states (Tennessee and Wyoming) have child passenger restraint laws requiring car seat or booster seat use for children age 8 and under.

Child passenger restraint laws that increase the age for car seat or booster seat use result in more children being buckled up. Among five states that increased the required car seat or booster seat age to 7 or 8 years, car seat and booster seat use tripled, and deaths and serious injuries decreased by 17%.



Death Rate per 100,000)



Death rate per 100,000 children aged 12 or younger 2002-2011

- 2002 – 2.2
- 2003 – 2.1
- 2004 – 2.3
- 2005 – 2.1
- 2006 – 2.0
- 2007 – 1.7
- 2008 – 1.3
- 2009 – 1.4
- 2010 – 1.2
- 2011 – 1.2

SOURCES: Fatality Analysis Reporting System, 2002 – 2011; National Highway Traffic Safety Administration, 2013



MORE THAN 800 ADDITIONAL LIVES COULD
HAVE BEEN SAVED IF CAR SEATS WERE USED
BY 100% OF 0-4 YEAR OLDS FROM 2002-
2011.





Buckle Up: Restraint Use in CALIFORNIA



Keep California safe. Encourage drivers and passengers to buckle up.

This fact sheet provides a snapshot of **motor vehicle occupant deaths and seat belt use** and an overview of proven strategies for increasing the use of seat belts, car seats, and booster seats. The information can help local public health decisionmakers and community partners see gaps and identify relevant strategies to encourage people to buckle up.

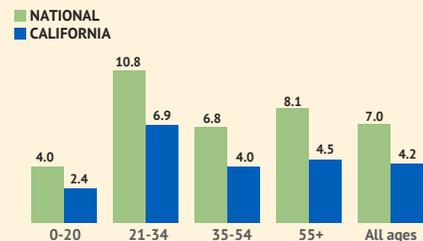
Fast Facts

- Motor vehicle crashes are a leading cause of death during the first three decades of Americans' lives.
- By wearing seat belts and properly buckling children into age- and size-appropriate car seats and booster seats, people can reduce the risk of serious injury and death in a crash by half.
- Although most drivers in the United States follow these safety measures on every trip, there are still millions who don't.
- These data show what's happening in your state.

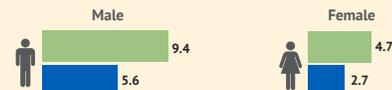
MOTOR VEHICLE OCCUPANT DEATHS



Rate of Deaths by Age (per 100,000 population), 2012



Rate of Deaths by Gender (per 100,000 population), 2012



Source: Fatality Analysis Reporting System (FARS).

RESTRAINT USE

Percentage of Drivers and Front Seat Passengers Wearing Seat Belts

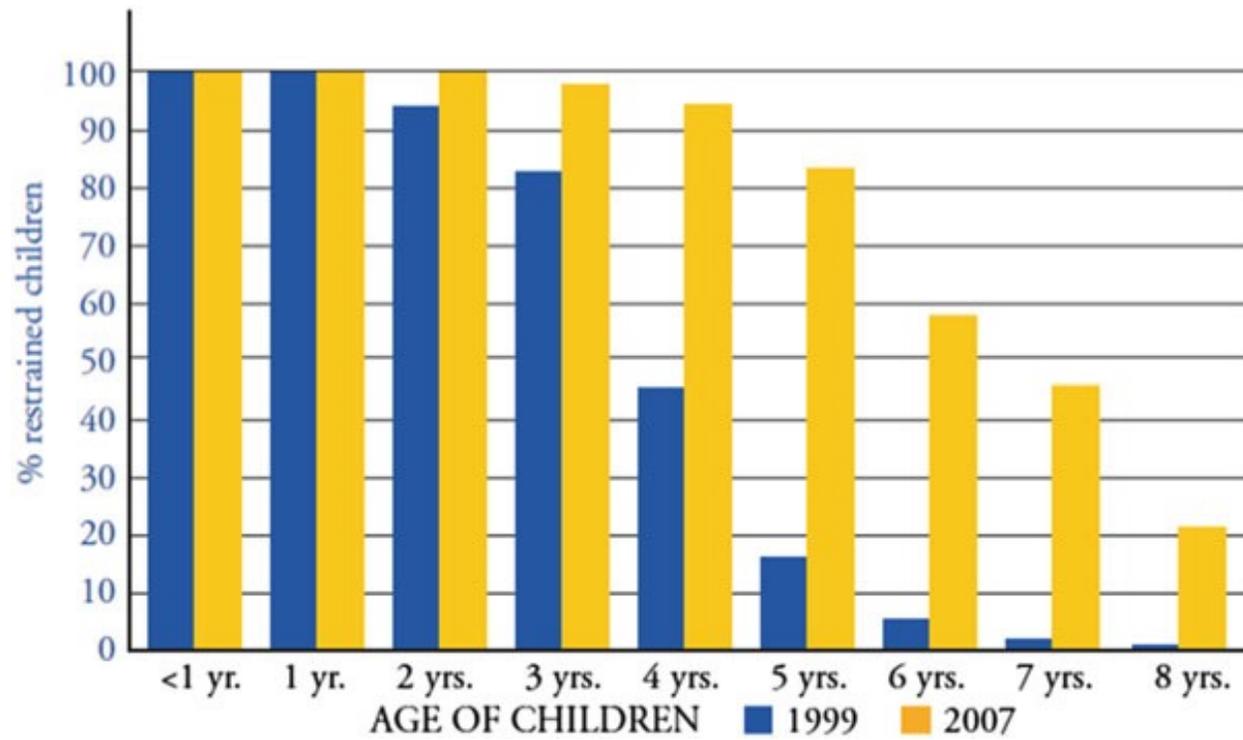


Source: National Occupant Protection Use Survey (NOPUS), 2012. Source: State Observational Survey of Seat Belt Use, 2012.



Centers for Disease Control and Prevention
National Center for Injury Prevention and Control

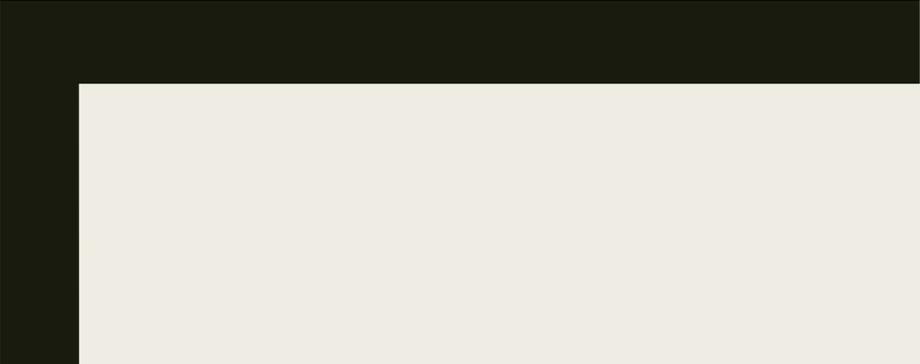
Working together, we can help keep people safe on the road—every day.



Research on the effectiveness of RFCRS has found them to reduce fatal injury by 71% for infants <1 year of age in passenger cars and by 58% in light trucks (Hertz 1996).



In Sweden, children remain rear facing up to the age of 4 years and transition directly from the RFCRS to a booster seat

- 
- Children age 0-23 month across all types of crash are 76% more likely to be seriously injured if restrained in forward facing child restraint system when compared to children in rear facing child restraints
- 



- 12% of fatalities due to gross misuse of the child restraint.

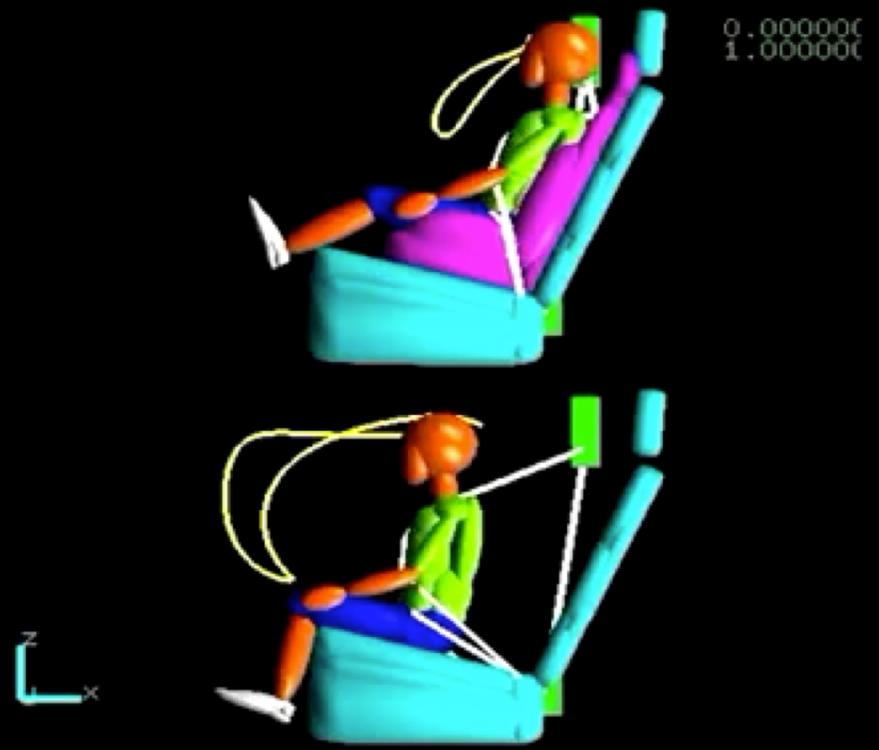
Restraint Misuse



Decina and Lococo 2005
72.6% of 5000 children
observed had some form of
misuse



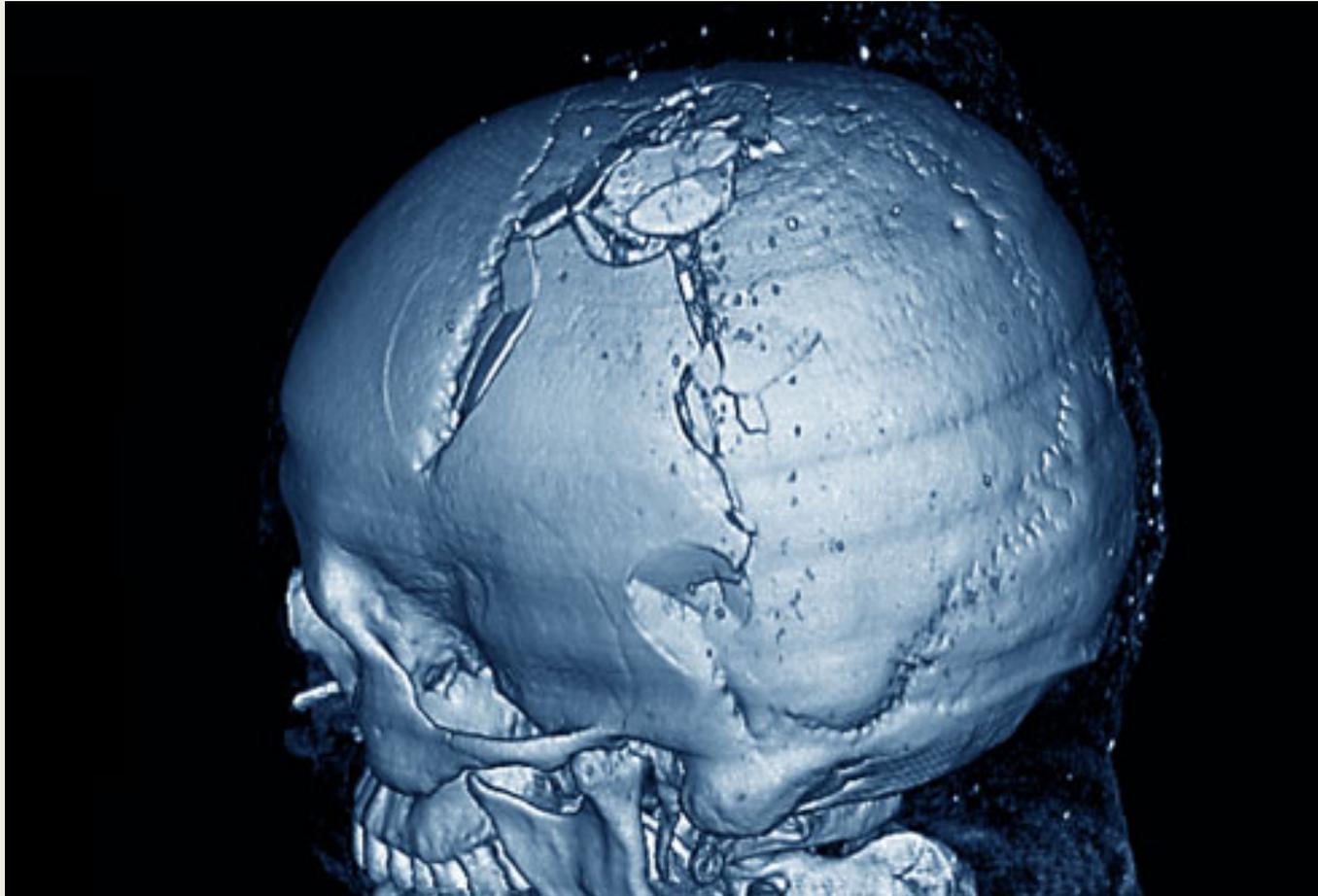
Greenwell 2015 46% misuse



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Contact Head Injuries

- Excursion of the head
- Intrusion
- Looseness of restraint harness.
- Looseness of restraint attachment.

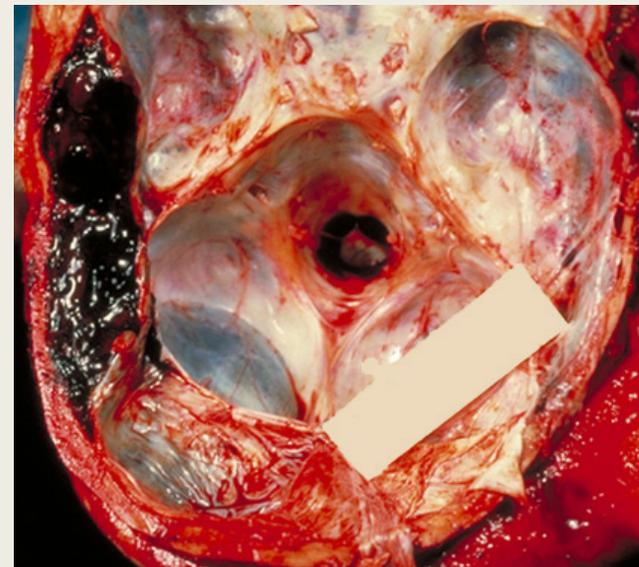


Contact Injuries

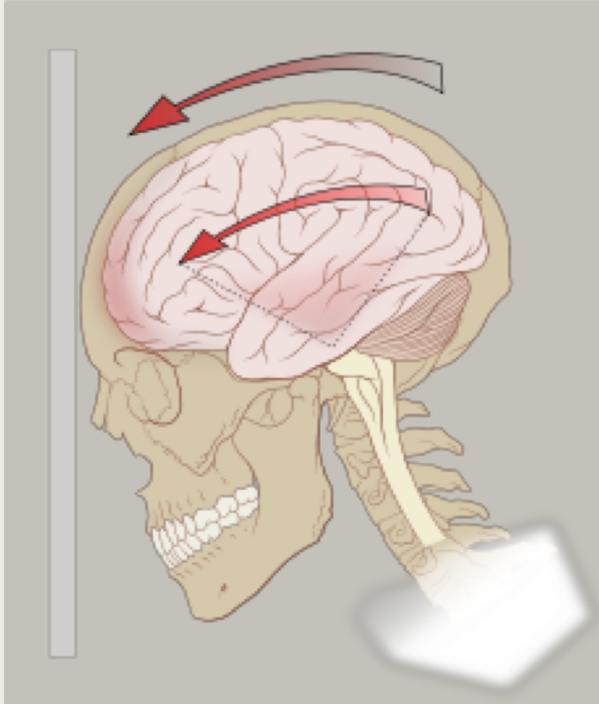
- Skull Fracture

Contact Injuries

- Epidural Hematoma



Contact Injuries



- Frontal Lobe Contusion



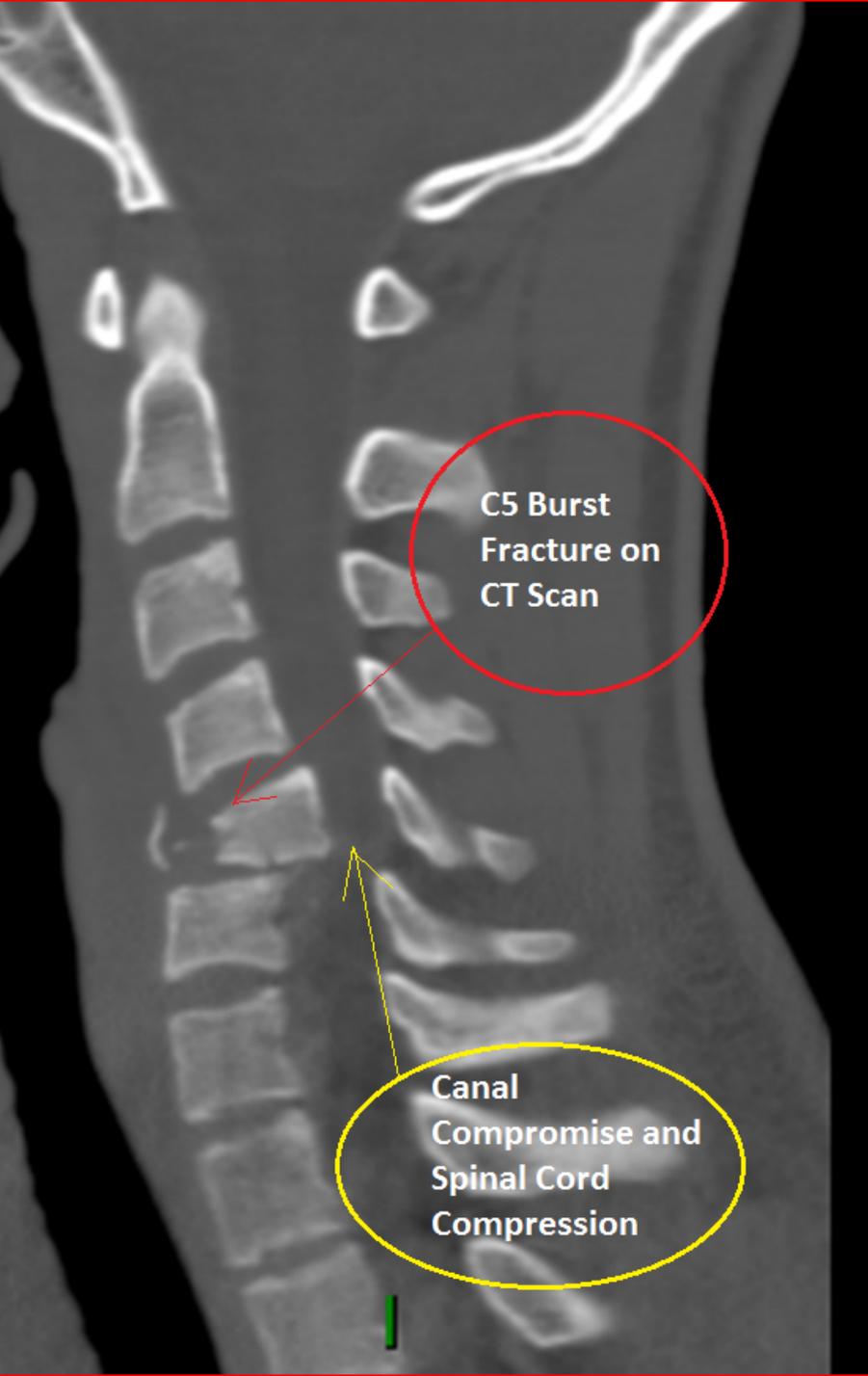
Non Contact Head Injuries

- Loose attachment to vehicle limits effectiveness of vehicle energy management systems.
- Loose harness allows movement between torso and back of seat.
- Produce brain injuries without external trauma.

Extremity Injuries

- Increased movement of FF CRS allows lower extremities to contact front seatback.

Cervical Spine



- Rare in restrained children.
- Higher mortality due to upper cervical spine
- Under 8-9 years may injuries of upper C Spine and SCIWORA

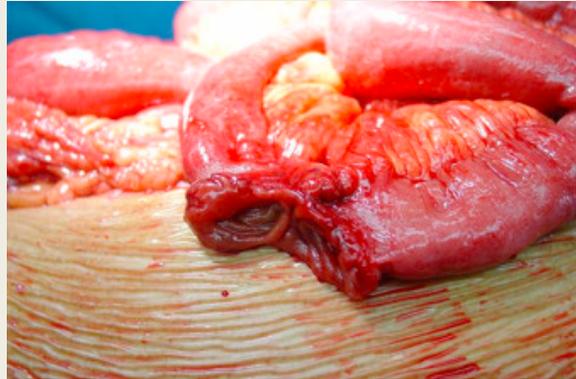
DURBIN ET AL
2003 59% LOWER
ODDS OF INJURY IN
4-7 YEAR OLDS
VERSUS SEATBELTS



Belt
positioning
booster

Seat-Belt Syndrome

- Distinct pattern of injury associated with lap belts.
 - *Hip and abdominal contusions aka seatbelt sign*
 - *Pelvic fractures*
 - *Lumbar spine injuries*
 - Subluxations
 - Compression fractures of L2-L4
 - *Intra-abdominal injuries of solid organs and hollow viscera*
 - GI perforation
 - Small bowel mesenteric tears and perforation



SEAT BELT SYNDROME

Seat Belt Syndrome



Risk Factors:

Age 4-8

Poor fit of belt

Child movement forward prior to crash

Shoulder belt placed behind back



Children with appropriate CRS 1/3 as likely as suboptimally restrained to sustain abdominal injury



Seat Belt Syndrome

- Lumbar Fractures: Due to excessive flexion
 - *Chance fractures*
 - *Compression fractures*

Airbags



- Children 12 and younger should not be placed in the front seat especially with active airbag.
 - *Atlanto-occipital fracture*
 - *Brainstem injuries*
 - *Diffuse axonal injury*



SEATING POSITION

Center rear seat considered safest for children in
child restraints (Lund 2005)



Table 2.4 Patterns of AIS2+ injury stratified by restraint type

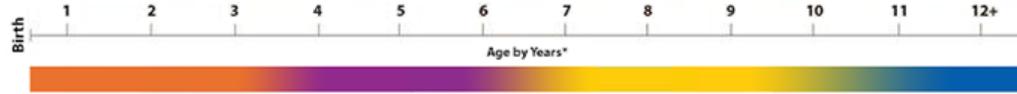
	RFCRS, 0–11-month-olds	FFCRS, 12–47-month-olds	Belt-positioning booster seats, 4–7-year-olds	Seat belt (lap and lap–shoulder), 4–7-year-olds	Seat belt (lap and lap–shoulder), 8–15-year-olds
Overall AIS2+ injury risk (per 1,000 children in crashes)	2.3	3.0	4.9	16.6	13.6
Head (%)	83.3	56.9	61.1	67.3	62.5
Face (%)	0.0	8.3	7.0	5.8	6.5
Chest (%)	2.4	2.8	5.7	1.3	5.9
Abdomen (%)	2.4	3.3	8.9	17.8	7.1
Neck/spine (%)	0.0	1.7	1.3	0.7	1.6
Upper extremity (%)	7.1	8.3	7.0	4.5	11.0
Lower extremity (%)	4.8	18.8	8.9	2.5	5.4

Data from PCPS from 12/1/98-11/30/07. Limited to model year 1998 and newer vehicles. Differences between restraint types should not be interpreted as statistically significant differences

Table 2.3 Summary of restraint effectiveness data

Restraint	Effectiveness for reducing fatalities	Comparison group	Effectiveness at reducing serious injuries	Comparison group
RFCRS	71% reduction (Hertz 1996)	Unrestrained occupants up to 1 year of age	44% reduction (Henary et al. 2007) 90% reduction (Jakobsson et al. 2005)	Children aged 0–23 months in FFCRS Unrestrained occupants up to 4 years of age
FFCRS	71% reduction for correctly used seats (Kahane 1986)	Unrestrained occupants 0–4 years of age	72% reduction (Winston et al. 2000)	Seat belt restrained 2–5-year-olds
	54% reduction (Hertz 1996)	Unrestrained occupants 1–4 years of age	71% reduction (Arbogast et al. 2004b)	Seat belt restrained 1–4-year-olds
	28% reduction (Elliott et al. 2006)	Seat belt restrained 2–6-year-olds	82% reduction (Zaloshnja et al. 2007)	Seat belt restrained 2–3-year-olds
BPB	67% reduction (Rice and Anderson 2009)	Unrestrained children aged 3 and under	59% reduction (Durbin et al. 2003a)	Seat belt restrained 4–7-year-olds
			45% reduction (Arbogast et al. 2009a)	Seat belt restrained 4–8-year-olds
			45% reduction in MAIS ≥ 2 injuries (NHTSA 2010)	Seat belt restrained 4–8-year-olds
	67% reduction for children aged 4–5 years (Rice and Anderson 2009)	Unrestrained 4–5-year-olds		
	55% reduction for children aged 6–8 years (Rice and Anderson 2009)	Unrestrained 6–8-year-olds		
Seat belts	29% reduction in frontal impact crashes (Morgan 1999)	Unrestrained occupants aged 5 and older		

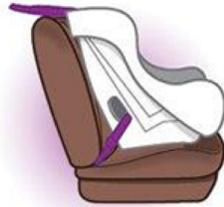
Using the correct car seat or booster seat can be a lifesaver: make sure your child is always buckled in an age- and size-appropriate car seat or booster seat.



REAR-FACING CAR SEAT

Birth until age 2-4

Buckle children in a rear-facing car seat until they reach the maximum weight or height limit of their car seat. Keep children rear-facing as long as possible.



FORWARD-FACING CAR SEAT

After outgrowing rear-facing seat until at least age 5

When children outgrow their rear-facing car seat, they should be buckled in a forward-facing car seat until they reach the maximum weight or height limit of their car seat.



BOOSTER SEAT

After outgrowing forward-facing seat and until seat belts fit properly

Once children outgrow their forward-facing seat, they should be buckled in a booster seat until seat belts fit properly. Proper seat belt fit usually occurs when children are 4 feet 9 inches tall and age 9-12.



SEAT BELT

Once seat belts fit properly without a booster seat

Children no longer need to use a booster seat once seat belts fit them properly. Seat belts fit properly when the lap belt lays across the upper thighs (not the stomach) and the shoulder belt lays across the chest (not the neck).

Keep children ages 12 and under properly buckled in the back seat. Never place a rear-facing car seat in front of an active air bag.

**Recommended age ranges for each seat type vary to account for differences in child growth and height/weight limits of car seats and booster seats. Use the car seat or booster seat owner's manual to check installation and the seat height and weight limits, and proper seat use.*

Child safety seat recommendations: American Academy of Pediatrics.
 Graphic design: adapted from National Highway Traffic Safety Administration.
www.cdc.gov/motorvehiclesafety/cps

