

Fatal and Nonfatal Firearm Injuries Compared to Automobile Injuries in Colorado Children



Carl Armon, PhD; Jessica Cataldi, MD; Edwin Asturias, MD; Cameron Todd; James Todd, MD



Summary

From 2014 to 2019, firearm injuries and deaths have increased in Colorado children (0-19 years of age), averaging one injury every day and one fatality every week while, concurrently, automobile injuries are consistently decreasing. Firearm injuries in children represent a public health problem that occurs in both rural and urban areas, affects all races and peaks during the summer months. Since 1999, the childhood mortality rate attributed to automobile injury in Colorado has consistently decreased while it is currently increasing for firearm injury. For the first time, the mortality rate for childhood firearm injury in Colorado children exceeds that for automobile injury. The fatality rate for firearm injury in Colorado children is 18 times greater than for automobile injury. Similar to public health policies that have reduced automobile injuries and fatalities, many firearm injuries and deaths in Colorado children can be prevented by increasing risk awareness and firearm safety best practices that limit access to unsecured weapons and ammunition.

Methods: The numbers of firearm and automobile injuries during 2014-2019 in Colorado children were estimated using the Colorado Hospital Association inpatient and emergency department databases.¹ The Colorado Department of Local Affairs website provided population estimates by age, gender, and race/ethnicity by Colorado County for 2014-2019. Firearm injury patients were identified by the presence of external cause of injury E-codes for 2014 through September 2015, and equivalent ICD-10 codes for the last quarter of 2015 as well as 2016-2019 (see Appendix for more details). To adjust for possible double counting caused by transfers related to the same injury, cases with proximate dates of visit, and the same birth year, birth month, gender and ZIP code were consolidated into a single record. Because the majority of firearm fatalities are not accounted for in emergency department or hospital records, we independently estimated overall fatalities due to firearm injury using the CDC Wonder database from 1999 to 2019.²

Results

Table 1 shows the aggregated number of firearm injuries (ED and hospital) and fatalities for Colorado children (ages 0-19 years) for the 6-year period from 2014 to 2019. Firearm injuries in children averaged one every 1.3 days with one fatality every week. Unintentional firearm injuries were by far the most common, accounting for 54% of all firearm injuries in children. 43% of these unintentional firearm injuries occurred in children 0-14 years of age. Firearm injury occurred in children of all race/ethnicities (White, 48.7%; Hispanic, 14.2%; Black, 13.1%) and in both urban and rural Regional Accountable Entities (RAEs). Overall, 86% of non-fatal firearm injuries occurred among male children.

Table 1: Case count of firearm injury and death in Colorado children 0-19 years, 2014-2019.

Injury Intent	Non-fatal Injury	Fatal Injury*	Total Injuries	Average Cases per Month
Unintentional	912	*	(912)	(12.7)
Suicide	40	218	258	3.6
Assault	335	129	464	6.4
Undetermined	58	*	(58)	(0.8)
Total	1,345	366	1,711	23.8

* CDC Wonder Database reporting restrictions prohibit publishing individual category case counts < 10
() Minimum estimate

Non-fatal firearm and automobile injuries:

Figure 1 shows that the monthly number of non-fatal firearm injuries in children 0-19 years significantly increased from 2014-2019 for both assaults and unintentional injuries with unintentional injuries predominating (other categories not shown due to reporting restrictions required by data source). Dramatic peaks of firearm injury occurred each summer, presumably because children are home alone with unsupervised access to loaded firearms.

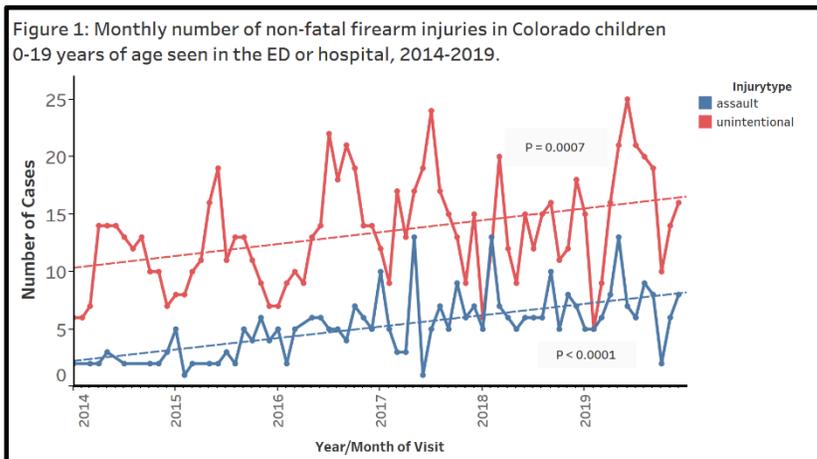


Figure 2 demonstrates that significant increases ($P < 0.05$) in the annual number of nonfatal firearm injuries in children 0-19 years of age were seen in six of the seven Colorado Regional Accountable Entities (except RAE 4) from 2014-2019.

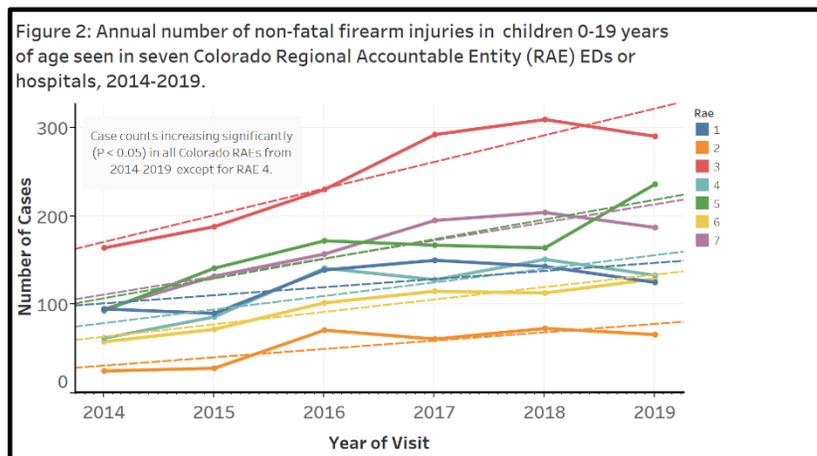
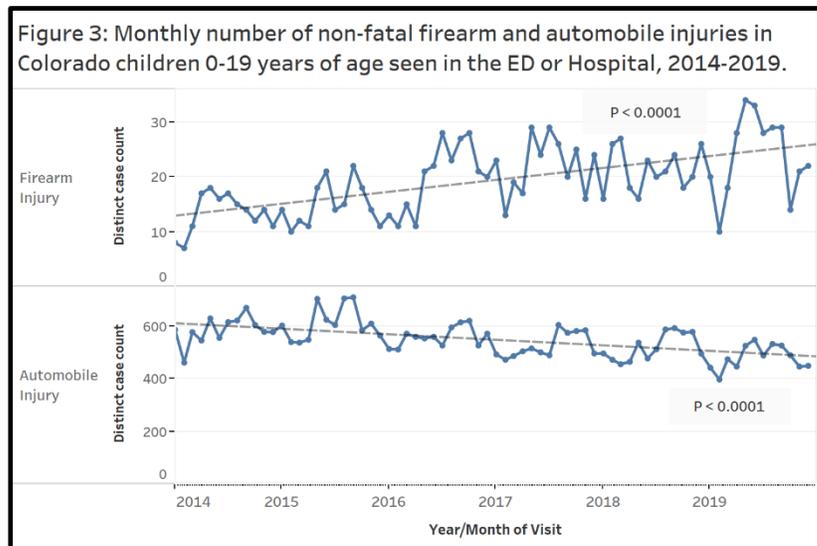


Figure 3 documents that the monthly number of nonfatal firearm injuries significantly increased in Colorado children 0-19 years of age from 2014-2019 while, during the same time period, nonfatal automobile injuries significantly decreased.

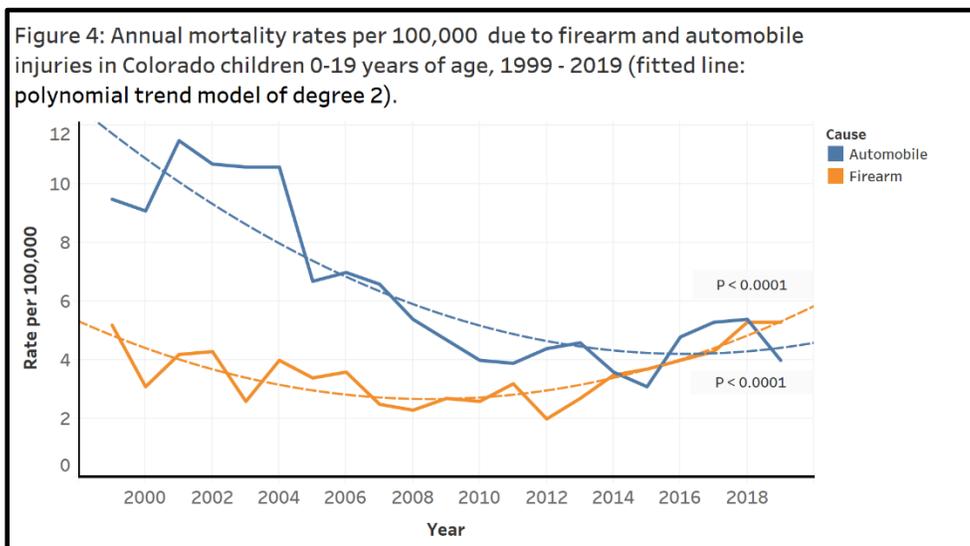


Firearm and Automobile Fatalities:

Not all firearm and/or automobile fatalities are seen in an ED or hospital, so they are not accurately reflected in the CHA databases. Using the CDC Wonder national death certificate database, we identified 366 Colorado children who died due to firearm injury between 2014 and 2019 (Table 2), the majority (62.8%) by suicide. Similar to non-fatal firearm injuries, deaths due to firearm injury also increased significantly ($P = 0.003$) from 2014 to 2019 while a similar total number of childhood automobile-related deaths (368) did not increase from 2014 to 2019 ($P = 0.272$) (Table 2). Overall, the fatality rate for firearm injury was 18 times higher than for automobile injury (21.4% versus 1.2%; $P < 0.0001$, Chi Square). Expanding the analysis to 1999 through 2019 (Figure 4), clearly shows a consistent decrease in childhood mortality rate in Colorado children due to automobile injury with a recent upswing in mortality due to firearm injury – for the first time exceeding the automobile mortality rate.

Table 2: Total case counts and fatality rates of firearm injuries as compared to auto injuries in Colorado children 0-19 years, 2014-2019.

Injury Type	Non-fatal Injury	Fatal Injury	Total Injuries	Fatality Rate
Firearm	1,345	366	1,711	21.4%
Automobile	29,846	368	30,214	1.2%



Comment:

Firearm injuries and deaths are common and increasing in Colorado children (0-19 years of age), occurring, on average, once every day with deaths, on average, once every week. They reflect an increasing public health crisis that occurs in both rural and urban areas and affects all races and ethnicities. The great majority of non-fatal injuries are unintentional while the majority of firearm fatalities are due to suicide. Beginning decades back, efforts to improve automobile safety for children have resulted in significant decreases in automobile accident-related injury and death.³⁻⁶ Contrary to the misperception that “firearms in the home keep families safe”, firearm injury and death in minors is an increasing public health crisis in Colorado that requires similar safety-focused approaches.⁷⁻¹³ The American Academy of Pediatrics has recommended policy measures and effective strategies to limit children’s access to firearms and improve firearm safety.¹⁴ A recent policy brief from Colorado’s Eugene S. Farley, Jr. Health Policy Center documents how such measures could successfully address this significant and increasing risk on behalf of Colorado’s children.¹⁵

REFERENCES

1. Armon C, Todd J. Firearm Injuries in Colorado Children, 2014 - 2015. *State of the Health of Colorado's Children*. 2017;XIII:1-5. Available at: <https://www.childrenscolorado.org/globalassets/healthcare-professionals/firearm-injury-2017-final.pdf>
2. Centers for Disease Control and Prevention. Underlying Cause of Death 1999-2019 on CDC WONDER Online Database. Available at: <http://wonder.cdc.gov/ucd-icd10.html>. Accessed April 7, 2020 PM
3. Hodges NL, Smith GA. Car safety. *Pediatrics in review*. 2014;35(4):155-60
4. Durbin DR. Child passenger safety. *Pediatrics*. 2011;127(4):788-793. Available at: <http://pediatrics.aappublications.org/content/pediatrics/early/2011/03/21/peds.2011-0213.full.pdf>
5. Durbin DR. New recommendations on motor vehicle safety for child passengers. *American family physician*. 2013;87(7):472-474
6. Kahane CJ. Lives Saved by Vehicle Safety Technologies and Associated Federal Motor Vehicle Safety Standards, 1960 to 2012 – Passenger Cars and LTVs. Available at: <https://www-esv.nhtsa.dot.gov/Proceedings/24/files/24ESV-000291.pdf>
7. Dahlberg LL. Guns in the Home and Risk of a Violent Death in the Home: Findings from a National Study. *American Journal of Epidemiology*. 2004;160(10):929-936
8. Lester D. Association of gun-related measures in American states and child and adolescent firearm mortality. *Psychol Rep*. 2005;97(3):757-758
9. Mozaffarian D, Hemenway D, Ludwig DS. Curbing gun violence: lessons from public health successes. *JAMA*. 2013;309(6):551-552
10. Miller M, Azrael D, Hemenway D. Firearm availability and unintentional firearm deaths, suicide, and homicide among 5-14 year olds. *J Trauma*. 2002;52(2):267
11. Cummings P, Grossman DC, Rivara FP, Koepsell TD. State gun safe storage laws and child mortality due to firearms. *JAMA*. 1997;278(13):1084-1086
12. Firearm-related injuries affecting the pediatric population. Committee on Injury and Poison Prevention. American Academy of Pediatrics. *Pediatrics*. 2000;105(4 Pt 1):888-895
13. Connor SM. The association between presence of children in the home and firearm-ownership and -storage practices. *Pediatrics*. 2005;115(1):43
14. Dowd MD, Sege RD. Firearm-related injuries affecting the pediatric population. *Pediatrics*. 2012;130(5):23
15. Mijer J, Wong S. Protecting Colorado Youth from Gun Violence. 2019; April:1-8. Available at: <http://farleyhealthpolicycenter.org/wp-content/uploads/2019/05/Protecting-Colorado-Youth-from-Gun-Violence-Brief-FHPC.pdf>

APPENDIX

Table 3a: ICD-9 E-codes for causes of firearm injuries

Cause of injury	E code and description
Assault	E965.0-E965.4 (assault by firearms)
Suicide attempt	E955.0-E955.4, E955.6, E955.9 (suicide and self-inflicted injury by firearms)
Unintentional	E922.0-E922.4, E922.8-E922.9 (accidental caused by firearms and air gun missiles)
Undetermined	E985.0-E985.4, E985.6 (injury by firearms or air guns undetermined whether accidentally or purposefully inflicted)

E code, external-cause-of-injury code

Table 3b: ICD-10 codes for causes of firearm injuries

Cause of injury	ICD-10 code and description
Assault	X93, X94, X95 (gun homicide, attempted or completed)
Suicide attempt	X72, X73, X74 (gun suicide, attempted or completed)
Unintentional	W32, W33, W34 (unintentional shooting, fatal or non-fatal)
Undetermined	Y22, Y23, Y24 (unknown cause, fatal or non-fatal)

Table 3c: ICD-9 E-codes for causes of automobile injuries

Cause of injury	E code
Collision with another motor vehicle	E811
Other motor vehicle traffic accident involving collision with motor vehicle	E812
Collision with other vehicle	E813
Pedestrian collision	E814
Collision on highway	E815
Loss of control	E816
Injured person code	(4th digit)
Driver of motor vehicle other than motorcycle	0
Passenger in motor vehicle other than motorcycle	1
Motorcyclist	2
Passenger on motorcycle	3
Pedal cyclist	6
Pedestrian	7

Table 3d: ICD-10 codes for causes of automobile injuries

Cause of injury	ICD-10 code and description
V40-V49	Car occupant injured in collision
V50-V59	SUV or pickup truck occupant injured in collision