



Multiple Epidemics of Fatal and Non-fatal Firearm Injuries in Colorado Children

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Summary

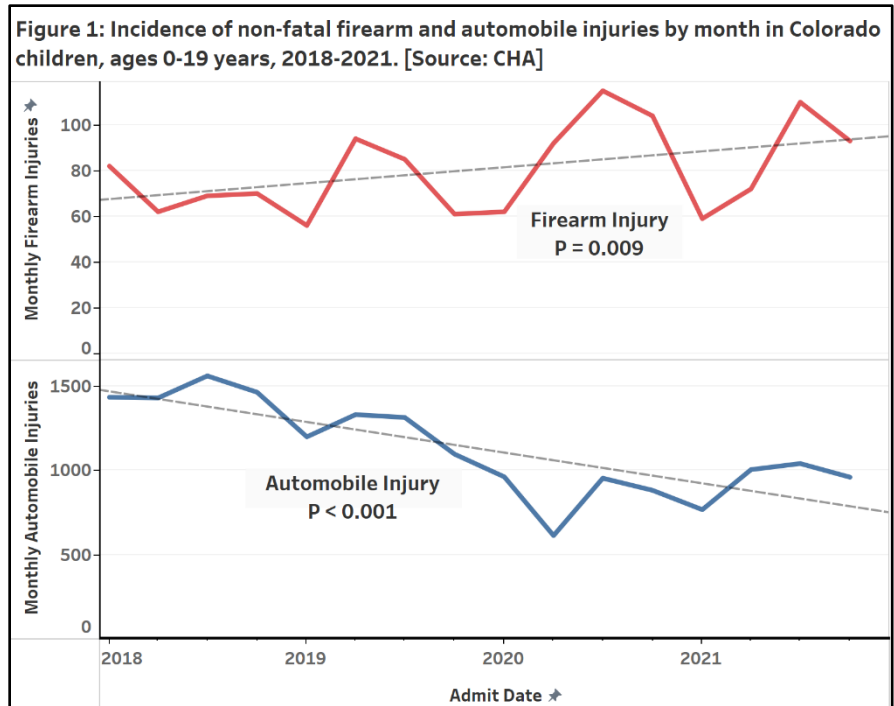
- **From 2018 to 2021, firearm injuries have increased in Colorado children (0-19 years of age), averaging almost one injury every day.**
- **The firearm mortality rate in Colorado children (averaging more than one death per week) now exceeds the automobile injury mortality rate and has become the leading cause of death in children beyond the newborn period.**
- **Firearm injuries and deaths are increasing in multiple intent categories (unintentional, suicide and homicide), each with differing epidemiological characteristics and potential preventive remedies.**
- **The firearm mortality rate in Colorado children is increasing as the firearm ownership rate increases (as estimated by the cumulative number of background checks for firearm purchase or transfer).**

Methods:

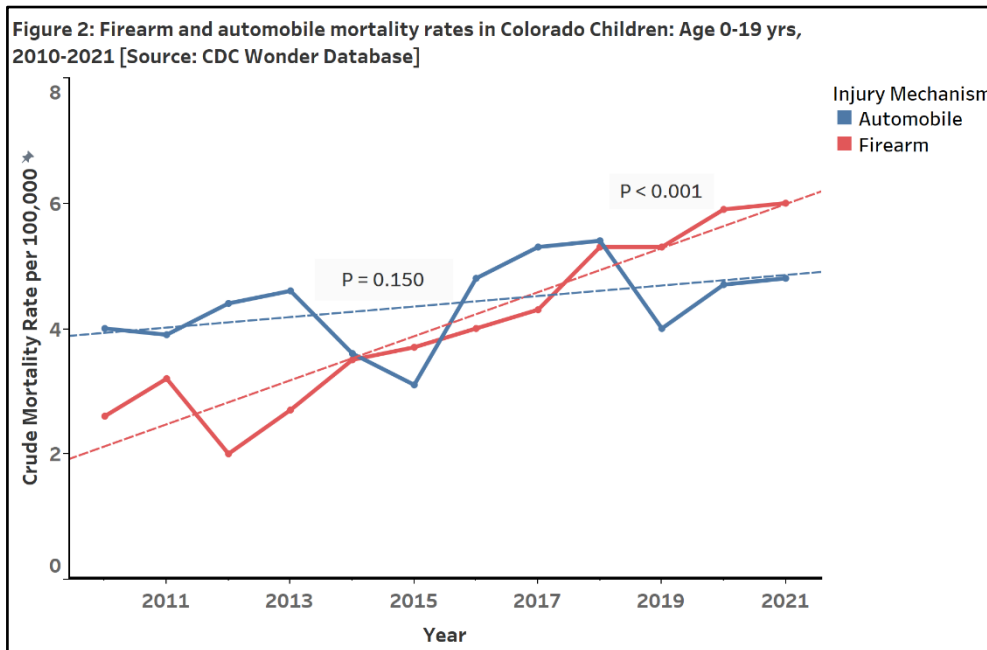
The numbers of non-fatal firearm and automobile injuries during 2018-2021 in Colorado children were estimated using the Colorado Hospital Association (CHA) inpatient and emergency department databases.¹ Firearm and automobile injury patients were identified by the presence of specific ICD-10 codes (see Appendix Tables 3a-c for more details). Because different codes were used prior to 2018, previous years were analyzed in a separate publication.² To adjust for possible double-counting, caused by transfers or readmissions related to the same injury, cases with proximate dates of visit (within that year), and the same birth year, birth month, gender and ZIP code were consolidated into a single record based on the first date of injury contact. Because the majority of automobile and firearm fatalities are not accounted for in Colorado Hospital Association emergency department or hospital records, we independently estimated them using the CDC Wonder database from 2010 to 2021, giving a longer period of analysis.³ The cumulative yearly increase in number of firearms (new purchase or transfer) in Colorado was estimated from Colorado Bureau of Investigation (CBI) InstaCheck Statistics.⁴

Results:

For many years, the incidence of non-fatal automobile injuries in children has been decreasing while firearm injuries has been increasing. Figure 1 shows the incidence of non-fatal firearm (red) and automobile (blue) injuries in Colorado children, 0–19 years of age. While non-fatal firearm injuries are less frequent than automobile injuries, they are increasing significantly ($P = 0.009$) in Colorado children while automobile injuries are simultaneously decreasing ($P < 0.001$). Non-fatal firearm injuries show a tendency to peak in the summer months.



Similarly, Figure 2 shows that the firearm mortality rate in Colorado children is increasing significantly ($P < 0.001$) and now exceeds the automobile mortality rate which is not increasing ($P = 0.150$).



The fatality rate (19.6%) for firearm injuries is orders of magnitude higher than for automobile injuries (0.9%). For the first time (2019-2021), firearm-related injuries are the leading cause of death (17.1%) in Colorado children beyond the perinatal period, exceeding automobile injuries (13.5%), poisoning (11.7%), cancer (5.2%) and other causes. [Source: CDC Wonder database].

Figure 3 shows the increasing firearm mortality rate in Colorado children as compared to the increase in firearm purchases and/or transfers in Colorado, as estimated by the yearly cumulative number of firearm background checks since 2010. It supports the assertion that the more firearms are accessible in the home, the more likely they will be used to cause injury and death (both intentional and unintentional, Table 1) in Colorado children.

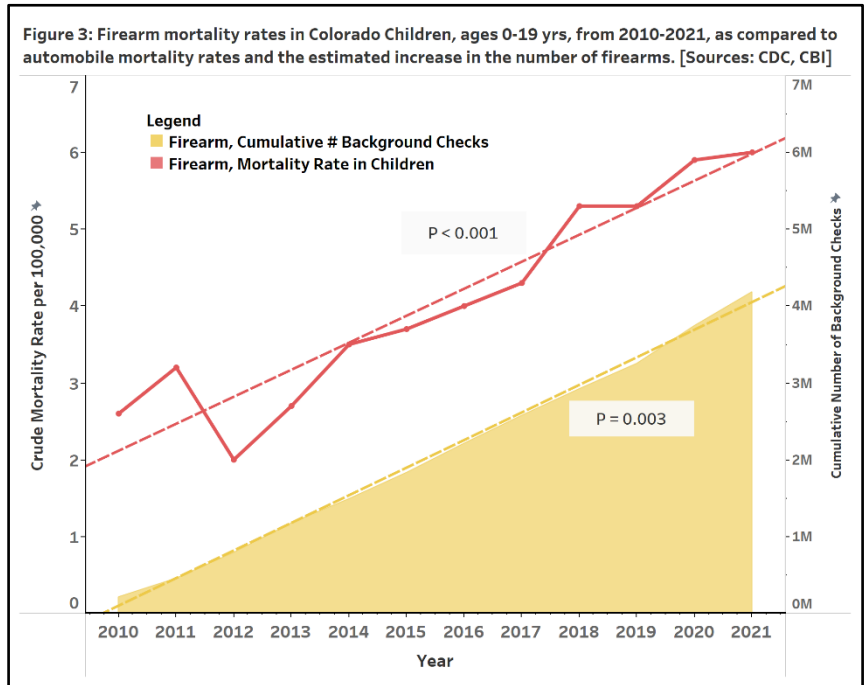


Table 1: Case counts of firearm injury and death in Colorado children 0-19 years, 2018-2021.

Injury Intent	Non-fatal Injury	Fatal Injury*	Total Injuries	Average Cases per Month	Fatality Rate
Unintentional	826	*	826	(17.2)	
Assault	360	133	493	10.3	27.0%
Suicide	32	160	192	4.0	83.3%
Undetermined	59	21	80	1.7	26.3%
Law enforcement	9	*	9	(0.2)	
Total	1,286	(314)	(1,600)	(33.3)	

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

Table 1, consolidates the information for fatal and non-fatal firearm injuries in Colorado children from 2018 through 2021. The greatest number of non-fatal firearm injuries (64%) are unintentional. The greatest number of fatal firearm injuries (51%) are caused by suicide, which also has the highest fatality rate (83.3%) as compared to other causes. Taken in

aggregate, there is one firearm injury every day in Colorado children and more than one fatality every week. As shown in Figure 1, the monthly incidence of all non-fatal firearm injuries peaks each year in the summer months when Colorado children are out of school and at home. This is also true for unintentional, non-fatal firearm injuries which are significantly ($p= 0.02$) increasing in Colorado children 0-19 years of age from 2018-2021, peaking each year in the summer months.

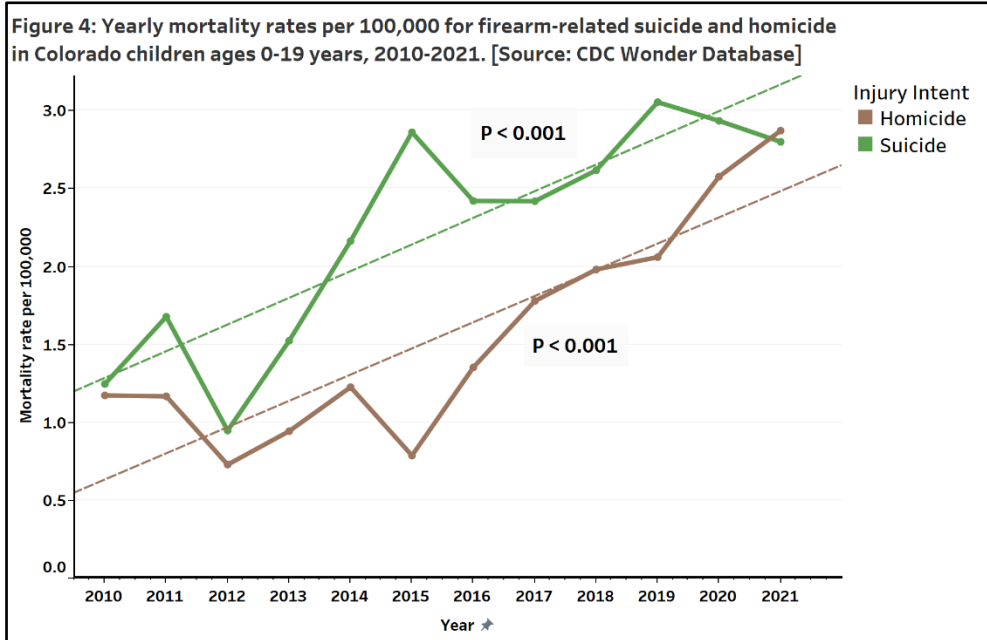


Figure 4 shows that the mortality rates for both suicide and homicide are increasing in Colorado children with suicide deaths consistently exceeding homicide ($P < 0.001$). Both rate lines are increasing significantly ($P < 0.001$). The suicide rate line is significantly higher ($p < 0.001$) than the homicide rate. Over all categories of intent in Table 1, 84.5% are male. For 2010-2020, homicides (n=227) occurred

primarily in children 15-19 years of age (4.5 per 100,000), although seven occurred in children under five years of age. During the same time, suicides (n=333) occurred at the highest rate in children 15-19 years of age (7.2 per 100,000) with none under 10 years of age. Homicides (n=227) occurred most commonly in Black or African American children (7.1 per 100,000) while suicides (n=333) were most common among White children not of Hispanic or Latino origin (2.7 per 100,000) [Source CDC Wonder database].

Comment:

Firearm injuries and deaths are common and increasing in Colorado children, 0-19 years of age. On average, firearm injury occurs once every day, with death occurring once each week. This reflects an increasing public health crisis that occurs in both rural and urban areas and affects all races and ethnicities.² The great majority of non-fatal injuries are unintentional while the majority of firearm fatalities are due to suicides and homicides, that are increasing at alarming rates in Colorado and the US.⁵ We identify multiple epidemics of gun injury and death (unintentional, homicide and suicide), at the same time as the number of firearms in Colorado increases. For the first time, the mortality rate for childhood firearm injury in Colorado children exceeds that for automobile injury, with a 21 times greater fatality rate. Beginning decades back, efforts to improve automobile safety for children resulted in significant decreases in automobile accident-related injury and death.⁶⁻⁹ Policies that increase risk awareness and encourage and enforce firearm safe storage best practices, limiting access to unsecured weapons, can prevent many firearm injuries and deaths in Colorado children.¹⁰ Contrary to the misperception that ‘firearms in the home keep families safe’, easy access to an increasing number of firearms is a major risk factor for childhood injury and death. This is an increasing public health crisis in Colorado that requires more rigorous approaches to access to firearms.^{5,11-17}

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APPENDIX

Table 3a: 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)
Law enforcement	Y350 (intervention involving firearm discharge)
Terrorism	Y384 (terrorism involving firearms)

Table 3b: 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 3c: 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