

Trends in Emergency Department Visits for Intentional Injury at Virginia Commonwealth University Medical Center, Ages 10 - 24 Years, 2003-2020

Background

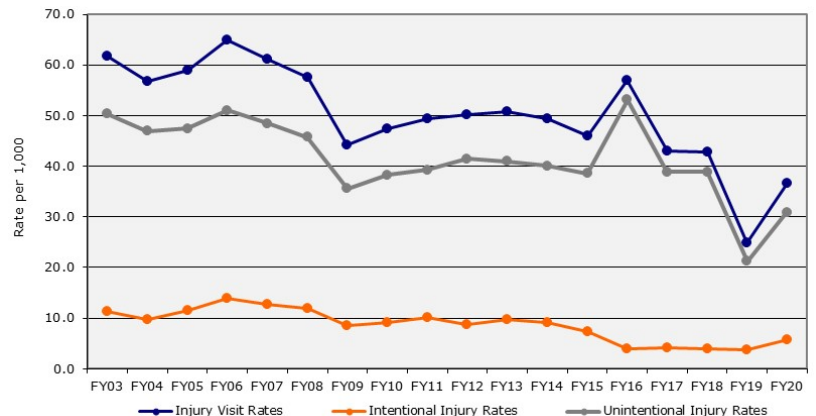
The Clark-Hill Institute for Positive Youth Development regularly examines trends of youth violence in Richmond City. This factsheet examines trends of intentional injury visits at Virginia Commonwealth University Medical Center's Emergency Department (VCU ED) from July 2002 through June 2020 among 10-24 year-old Richmond City residents. The VCU ED is the only level I trauma center in Central Virginia and is estimated to serve approximately three-quarters of Richmond City's trauma patients.

Data were analyzed in fiscal years, starting July 1st and ending June 30th. To determine injury groupings, the CDC-recommended framework for categorizing external cause of injury was used¹. Specifically, data from 2003-2015 were coded using ICD-9 codes. In October 2015, ICD-10 codes were implemented in the VCU Health System, thus the 2016 fiscal year injury groupings were coded using both ICD-9 and ICD-10 codes, and 2017 used ICD-10 codes only. This change may impact how injuries were coded by ED staff and, subsequently, rates by injury groupings may be affected. Caution should be exercised when interpreting changes observed across multiple ICD coding systems. The injury groupings included external injury, assault, abuse, suicide, and firearm injury. A composite variable for intentional injuries was created for this analysis where a visit for assault, abuse, or suicide injuries was defined as an intentional injury. Patients' residential addresses were geocoded using ArcGIS software and examined at the census tract level. Rates for intentional injury visits to the VCU ED were calculated by dividing the number of visits by population estimates derived from the U.S. Census Bureau's American Community Survey 5-year population data.

Rates of Injury Visits

The rate of injury visits to the VCU ED among 10-24 year-olds declined overall between 2003 (61.7 per 1,000) and 2020 (36.6 per 1,000). The trend for the subset of injuries that were unintentional mirrored that of all injury visits. Rates of intentional² injury remained relatively stable, with a less pronounced decreasing trend than the overall and unintentional injury rates during this time period. Intentional injury rates were generally higher in the mid-2000s (i.e., 13.9 per 1,000 in 2006) and were at their lowest between 2016 and 2020 where rates ranged from 3.7 to 5.7 per 1,000. The corresponding numbers and rates per 1,000 for intentional injury and all injury visits are shown in Alternative Table 1 in the Appendix.

Figure 1: Rate of Injury Visits, Ages 10-24 Years, VCU Emergency Department



Demographic Characteristics

Overall, males accounted for two-thirds of intentional injury visits to the VCU ED and, similar to females, were on average 19.3 year of age at the time of their visit (Table 1). Further, rates of intentional injury by sex, race, and ethnicity fluctuated from year to year (Figure 2). Black males had the highest rates of intentional injury visits. While the rate increased generally and peaked in 2011, it then declined and stabilized through 2019; however, this was followed by an increase in 2020. Rates among black females had a similar trend pattern compared to their male counterparts. The trend among Hispanic males differed in that the rate decreased in 2011 and 2012, prior to an increase in 2013 and subsequent annual fluctuations. Rates among Hispanic and white females and white males were comparatively low and varied yearly. Additionally, white males, white females, and Hispanic males seen in the ED for intentional injuries tended to be older at 20.7, 20.2 and 20.1 years of age on average during this time period whereas black males, black females, and Hispanic females were comparatively younger overall with mean ages of 19.1, 18.9, and 18.2, respectively (not shown).

¹ ICD Injury Matrices: https://www.cdc.gov/nchs/injury/injury_matrices.htm

² Intentional injuries include visits for assault, firearm, abuse, or attempted suicide

Note: The specific yearly rates for figures can be found in the alternative tables in the appendix.

Trends in Emergency Department Visits for Intentional Injury at Virginia Commonwealth University Medical Center, Ages 10 - 24 Years, 2003-2020

	Number of Injuries (%)			Mean Age	
	Female	Male	Total	Female	Male
FY2003	36.1	63.9	501	18.8	19.0
FY2004	36.1	63.9	424	18.6	18.7
FY2005	32.1	67.9	498	18.7	18.7
FY2006	38.1	61.9	593	18.4*	19.2*
FY2007	40.0	60.0	548	19.2	19.2
FY2008	44.3	55.7	508	18.9*	19.4*
FY2009	39.5	60.5	440	18.8	18.9
FY2010	41.1	58.9	453	19.4	19.4
FY2011	41.1	58.9	509	19.3	19.7
FY2012	42.1	57.9	437	19.6	19.8
FY2013	42.9	57.1	476	19.4	19.7
FY2014	40.2	59.8	393	18.9*	19.9*
FY2015	43.2	56.8	336	19.3	19.7
FY2016	37.5	62.5	176	19.4	19.7
FY2017	42.6	57.4	183	19.5	19.0
FY2018	41.6	58.4	178	19.4	19.8
FY2019	42.1	57.9	164	18.7	18.9
FY2020	44.0	56.0	257	18.3	18.9

* Denotes statistically significant mean age difference, p-value <= 0.05

Figure 2: Rate of Intentional Injury Visits by Sex, Race, and Ethnicity, Ages 10-24 Years, VCU Emergency Department

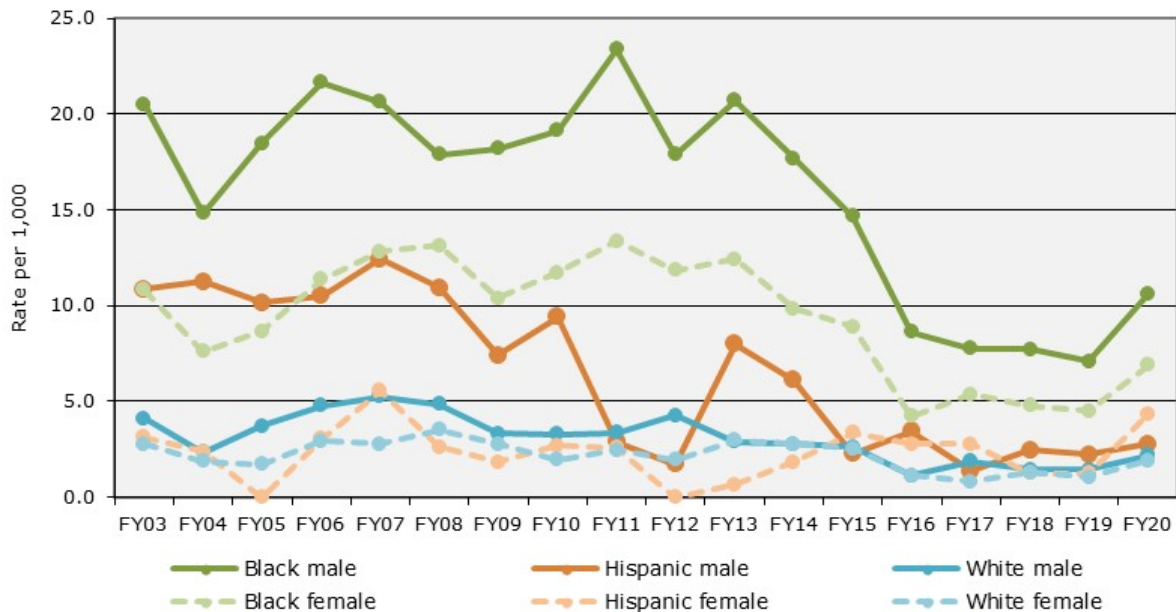
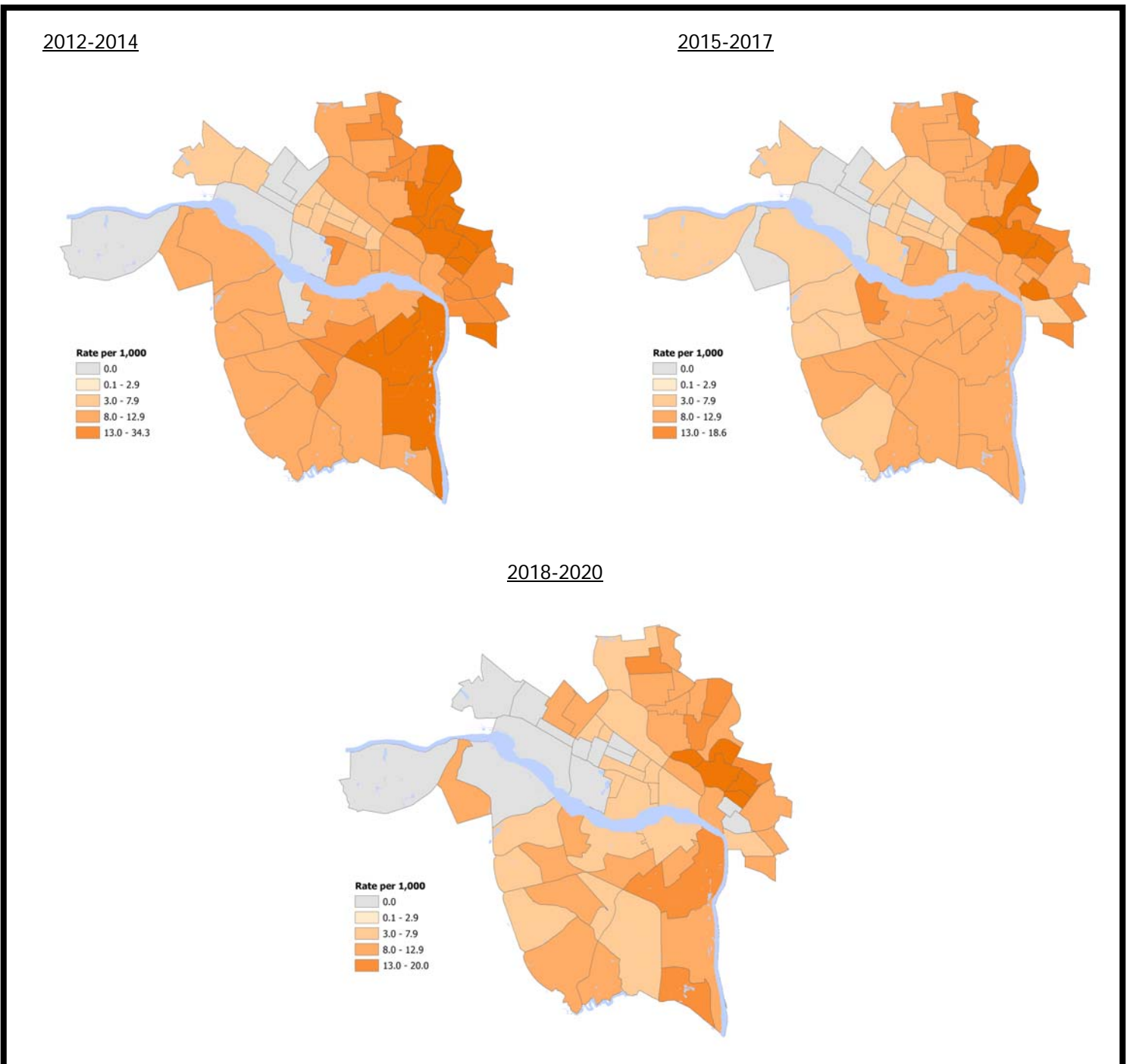


Figure 2 Note: Between FY2003 and FY2010, patient race and ethnicity were not captured independently; however, starting in FY2011, ethnicity was collected separately from race, thus race and ethnicity data from FY2011 forward are not comparable to previous years. The yearly specific rates can be found in Figure 2 Alternative Table in the Appendix.

Trends in Emergency Department Visits for Intentional Injury at Virginia Commonwealth University Medical Center, Ages 10 - 24 Years, 2003-2020

Three-year averaged rates of intentional injury visits among 10-24 year-olds by census tract of residence are shown for 2012 through 2020 in Figure 3. In 2012-2014, the tracts with the highest rates were located in the northeastern and southeastern areas of the city and were more widespread compared to 2015-17 and 2018-2020. In the subsequent 3-year periods, tracts with the highest rates were located only in the northeastern areas and in relatively fewer tracts. Further, rates generally tended to be lower in the western areas of the city.

Figure 3: Intentional Injury Visits by Census Tract of Patient's Residence, Ages 10-24 Years, VCU Emergency Department, 2012-2020



Trends in Emergency Department Visits for Intentional Injury at Virginia Commonwealth University Medical Center, Ages 10 - 24 Years, 2003-2020

Assault-Related Injury Visits

The rate of ED visits due to assault among 10-24 year olds was highest in 2006 at 11.1 per 1,000 and subsequently declined through 2019 to 2.3 per 1,000. In 2020, the rates increased slightly overall to 3.1 per 1,000; this increase was observed among all races and ethnicities. Rates were consistently highest among black individuals and followed the same general pattern as the overall rate but with more pronounced peaks and fluctuations. The rate was lowest among whites and has shown a gradual overall decline since 2008. Among Hispanics the rate differed between 2004 and 2007 compared to the rate overall and among blacks in that it increased during this time. The rate then declined overall and stabilized to 1.4 per 1000 in 2019, despite increases in some years (Figure 4).

Figure 4: Rate of Assault Visits by Race and Ethnicity, Ages 10-24 Years, VCU Emergency Department

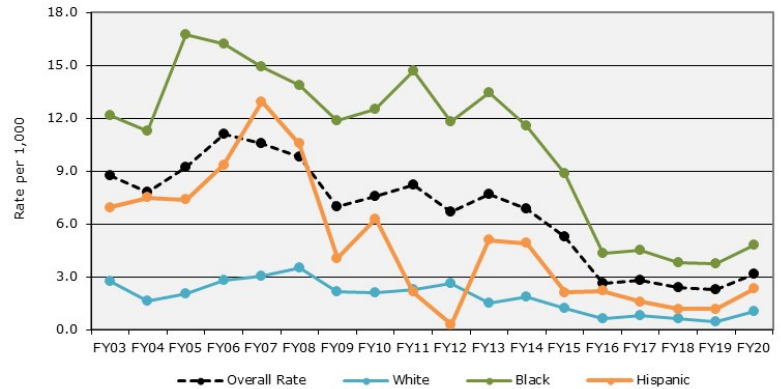
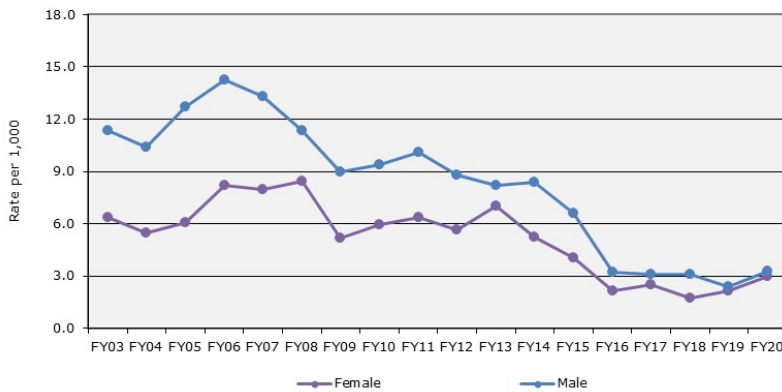


Figure 5: Rate of Assault Visits by Sex, Ages 10-24 Years, VCU Emergency Department



While males comprised 60% of the ED visits for assault injuries overall, the difference in the proportion of visits and rates among males and females has decreased over time (Table 2, Figure 5). The rate peaked for males in 2006, whereas the rate for females was highest in 2008 at 14.2 and 8.4 per 1,000, respectively. Then rates for both sexes declined generally to 2016. Rates then stabilized with some yearly fluctuations among males while among females, rates initially fluctuated but then increased between 2018 and 2020 to 3.3 per 1,000. (Figure 5). Additionally, the average age for males and females was similar at 19 years overall, however, in 2006 and 2008, there were statistically significant age differences by sex (Table 2).

Table 2: Assault-Related Injury Visits to the VCU Emergency Department by Sex, Ages 10-24 Years, 2003-2020

	Number of Injuries (%)			Mean Age	
	Female	Male	Total	Female	Male
FY2003	37.7	62.3	385	18.9	19.3
FY2004	36.3	63.7	339	18.5	18.7
FY2005	34.2	65.8	398	18.7	18.6
FY2006	38.4	61.6	474	18.4*	19.1*
FY2007	39.2	60.8	451	19.4	19.3
FY2008	44.5	55.5	422	18.8*	19.4*
FY2009	38.8	61.2	363	19.0	19.0
FY2010	41.6	58.4	380	19.3	19.3
FY2011	41.0	59.0	410	19.4	19.9
FY2012	42.0	58.0	355	19.8	19.8
FY2013	43.3	56.7	372	19.5	19.7
FY2014	36.1	63.9	327	19.0	19.6
FY2015	40.5	59.5	242	19.1	19.7
FY2016	42.5	57.5	120	19.9	19.8
FY2017	46.8	53.2	126	19.7	18.7
FY2018	38.0	62.0	108	19.8	19.4
FY2019	49.9	51.0	102	19.3	18.8
FY2020	49.6	50.4	141	19.1	18.8

Note: The specific yearly rates for figures can be found in the alternative tables in the appendix.

* Denotes statistically significant mean age difference, p-value < 0.05

Trends in Emergency Department Visits for Intentional Injury at Virginia Commonwealth University Medical Center, Ages 10 - 24 Years, 2003-2020

The majority of firearms-related injury visits were by males. While rates for males initially increased and peaked in 2006 at 6.2 per 1,000, this was followed by an overall decline through 2019 to 2.1 per 1,000 and a subsequent increase in 2020 to 3.6 per 1,000. Firearm-related injury visits for females were generally consistent and below 1.0 per 1,000 during this time period (Figure 6). The mean age of males and females seen in the ED for firearms-related injuries were similar overall and ranged from 18 to 21 years, however males tended to be slightly older in general (Table 3).

Figure 6: Rate of Firearm-Related Visits by Sex, Ages 10-24 Years, VCU Emergency Department

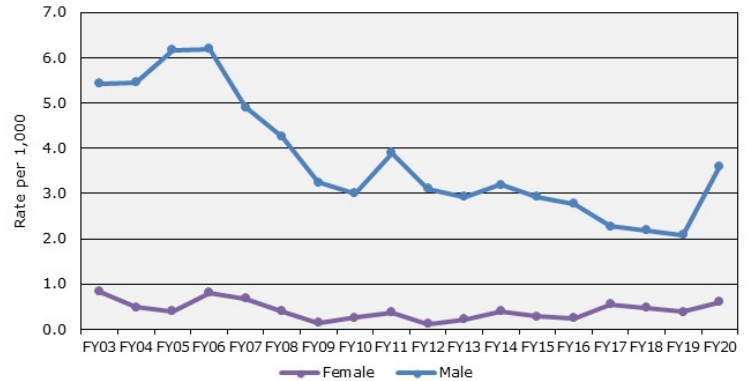


Table 3: Firearm-Related Injury Visits to the VCU Emergency Department by Sex, Ages 10-24 Years, 2003-2020

	Number of Visits (%)			Mean Age	
	Female	Male	Total	Female	Male
FY2003	14.2	85.8	134	18.9	18.8
FY2004	8.9	91.1	124	19.4	20.2
FY2005	6.6	93.4	136	18.9	19.1
FY2006	12.4	87.6	145	19.3	18.2
FY2007	12.9	87.1	116	18.9	19.3
FY2008	9.3	90.7	97	19.9	20.0
FY2009	4.8	95.2	84	15.5*	18.8*
FY2010	9.0	91.0	78	19.7	19.8
FY2011	9.7	90.3	103	18.7	20.0
FY2012	3.9	96.1	76	18.0	20.2
FY2013	6.3	93.8	80	21.6	20.0
FY2014	11.1	88.9	90	19.7	20.5
FY2015	9.9	90.1	71	21.6	20.1
FY2016	9.1	90.9	66	20.2	19.1
FY2017	21.0	79.0	62	18.6	19.6
FY2018	19.0	81.0	58	18.9	20.1
FY2019	16.7	83.3	54	17.7	19.2
FY2020	15.4	84.6	91	17.1	19.0

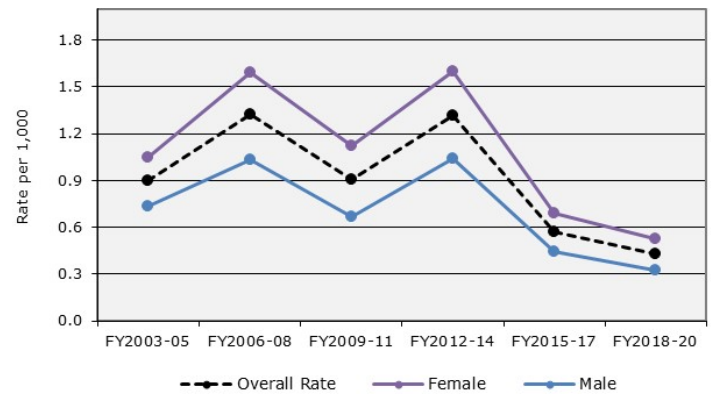
* Denotes statistically significant mean age difference, p-value < 0.05

Note: The specific yearly rates for figures can be found in the alternative tables in the appendix.

Trends in Emergency Department Visits for Intentional Injury at Virginia Commonwealth University Medical Center, Ages 10 - 24 Years, 2003-2020

The overall rate of suicide-related injury visits fluctuated between 2003 and 2014 ranging from 0.9 to 1.3 per 1,000 and was followed by a decrease through 2020 to 0.3 per 1,000 for the combined 3-year periods. Rates for females and males followed a similar trend as the overall rates with females slightly higher than both overall rates and male (Figure 7). Further, compared to males, females tended to be younger when they visited the VCU ED for suicide-related injuries and in 2014 and 2018, this difference was statistically significant (Table 4).

**Figure 7: Rate of Suicide-Related Visits,
Ages 10-24 Years, VCU Emergency Department**



**Table 4: Suicide-Related Injury Visits to the VCU Emergency Department
by Sex, Ages 10-24 Years, 2003-2019**

	Number of Visits (%)			Age (Mean)	
	Female	Male	Total	Female	Male
FY2003	53.3	46.7	45	17.8	18.0
FY2004	81.3	18.8	32	18.8	18.5
FY2005	52.5	47.50	40	18.4	19.8
FY2006	58.7	41.3	63	18.7	20.3
FY2007	64.3	35.7	56	18.7	20.0
FY2008	64.6	35.3	51	19.7	20.1
FY2009	67.4	32.6	46	18.3	18.1
FY2010	57.5	42.5	40	19.7	19.6
FY2011	67.3	32.7	55	18.7	18.1
FY2012	65.4	34.6	52	18.8	19.2
FY2013	55.4	44.6	74	18.5	19.5
FY2014	60.6	39.4	66	18.5*	21.5*
FY2015	70.0	30.0	60	19.5	20.2
FY2016	37.5	62.5	8	20.0	21.0
FY2017	40.0	60.0	10	17.8	21.0
FY2018	57.9	42.1	19	18.1*	21.6*
FY2019	53.8	46.2	13	17.1	18.3
FY2020	73.1	26.9	25	16.4	18.7

* Denotes statistically significant mean age difference, p-value < 0.05

Note: The specific yearly rates for figures can be found in the alternative tables in the appendix.

**Trends in Emergency Department Visits for Intentional Injury at
Virginia Commonwealth University Medical Center, Ages 10 - 24 Years, 2003-2020**

Appendix: Data tables as an alternative to figures

Figure 1 Alternative Table: Injury Visits, Ages 10-24 Years, VCU Emergency Department					
	Intentional Injury Visits (%)	Unintentional Injury Visits (%)	All Injury Visits (n)	Injury Visit Rate per 1,000	Intentional Injury Rate per 1,000
FY03	18.5	81.5	2,709	61.7	11.4
FY04	17.3	82.7	2,455	56.7	9.8
FY05	19.6	80.4	2,543	59.0	11.6
FY06	21.4	78.6	2,767	64.9	13.9
FY07	20.9	79.1	2,618	61.2	12.8
FY08	20.6	79.4	2,471	57.6	11.8
FY09	19.2	80.8	2,286	44.1	8.5
FY10	19.1	80.9	2,372	47.3	9.0
FY11	20.5	79.5	2,481	49.4	10.1
FY12	17.4	82.6	2,508	50.2	8.7
FY13	19.3	80.7	2,463	49.3	9.5
FY14	18.7	81.3	2,338	48.2	9.2
FY15	15.9	84.1	2,112	43.5	6.9
FY16	6.8	93.2	2,581	57.0	3.9
FY17	9.5	90.5	1,932	43.0	4.0
FY18	9.3	90.7	1,919	42.8	4.0
FY19	14.7	85.3	1,115	24.9	3.7
FY20	15.7	84.3	1,642	36.6	5.7

Figure 2 Alternative Table: Intentional Injury Visits by Sex, Race, and Ethnicity (Rate per 1,000), Ages 10-24 Years, VCU Emergency Department						
	Black female	Black male	White female	White male	Hispanic female	Hispanic male
FY03	10.8	20.5	2.8	4.1	3.1	10.9
FY04	7.6	14.8	1.9	2.4	2.4	11.3
FY05	8.7	18.5	1.7	3.7	0.0	10.1
FY06	11.4	21.7	2.9	4.8	3.1	10.5
FY07	12.8	20.6	2.8	5.3	5.6	12.4
FY08	13.2	17.9	3.5	4.8	2.6	10.9
FY09	10.4	18.2	2.8	3.3	1.8	7.4
FY10	11.7	19.1	2.0	3.3	2.7	9.4
FY11	13.4	23.4	2.5	3.4	2.6	2.9
FY12	11.9	17.9	2.0	4.3	0.0	1.7
FY13	12.4	20.7	3.0	2.9	0.7	8.0
FY14	9.8	17.7	2.8	2.8	1.8	6.1
FY15	8.9	14.7	2.5	2.6	3.4	2.3
FY16	4.2	8.6	1.1	1.1	2.8	3.4
FY17	5.4	7.8	0.8	1.9	2.8	1.4
FY18	4.8	7.7	1.3	1.5	1.2	2.5
FY19	4.5	7.1	1.0	1.5	1.2	2.2
FY20	6.9	10.6	1.9	2.2	4.3	2.8

**Trends in Emergency Department Visits for Intentional Injury at
Virginia Commonwealth University Medical Center, Ages 10 - 24 Years, 2003-2020**

**Figure 4 Alternative Table: Assault Visits by Race and Ethnicity
(Rate per 1,000), Ages 10-24 Years, VCU Emergency Department**

	Black	White	Hispanic	Overall Rate
FY03	12.2	2.7	6.9	8.8
FY04	11.3	1.6	7.5	7.8
FY05	16.7	2.1	7.4	9.2
FY06	16.2	2.8	9.3	11.1
FY07	14.9	3.0	12.9	10.5
FY08	13.9	3.5	10.6	9.8
FY09	11.9	2.2	4.0	7.0
FY10	12.5	2.1	6.3	7.6
FY11	14.7	2.2	2.1	8.2
FY12	11.8	2.6	0.3	6.7
FY13	13.4	1.5	5.1	7.7
FY14	11.6	1.9	4.9	6.9
FY15	8.9	1.2	2.1	5.3
FY16	4.3	0.6	2.2	2.6
FY17	4.5	0.8	1.6	2.8
FY18	3.8	0.6	1.2	2.4
FY19	3.7	0.5	1.2	2.3
FY20	4.8	1.0	2.3	3.1

**Figure 5 Alternative Table: Assault Visits by Sex
(Rate per 1,000), Ages 10-24 Years, VCU Emergency Department**

	Female	Male
FY03	6.4	11.3
FY04	5.5	10.4
FY05	6.0	12.7
FY06	8.2	14.2
FY07	8.0	13.3
FY08	8.4	11.3
FY09	5.2	9.0
FY10	6.0	9.4
FY11	6.4	10.1
FY12	5.6	8.8
FY13	7.0	8.2
FY14	5.3	8.4
FY15	4.1	6.6
FY16	2.2	3.2
FY17	2.5	3.1
FY18	1.8	3.1
FY19	2.1	2.4
FY20	3.0	3.3

**Trends in Emergency Department Visits for Intentional Injury at
Virginia Commonwealth University Medical Center, Ages 10 - 24 Years, 2003-2020**

Figure 6 Alternative Table: Firearm-Related Injury Visits by Sex (Rate per 1,000), Ages 10-24 Years, VCU Emergency Department

	Female	Male
FY03	0.8	5.4
FY04	0.5	5.5
FY05	0.4	6.2
FY06	0.8	6.2
FY07	0.7	4.9
FY08	0.4	4.3
FY09	0.1	3.2
FY10	0.3	3.0
FY11	0.4	3.9
FY12	0.1	3.1
FY13	0.2	2.9
FY14	0.4	3.2
FY15	0.3	2.9
FY16	0.3	2.8
FY17	0.6	2.3
FY18	0.5	2.2
FY19	0.4	2.1
FY20	0.6	3.6

Figure 7 Alternative Table: Suicide-Related Injury Visits (Rate per 1,000), Ages 10-24 Years, VCU Emergency Department

	FY2003-05	FY2006-08	FY2009-11	FY2012-14	FY2015-17	FY2018-20
Female	0.9	1.3	0.9	1.3	0.6	0.4
Male	1.0	1.6	1.1	1.6	0.7	0.5
Overall Rate	0.7	1.0	0.7	1.0	0.4	0.3

Suggested citation: Bishop DL, Chapman DA, and Wilson TL. November 2020. Trends in Emergency Department Visits for Intentional Injury at Virginia Commonwealth University's Medical Center, Ages 10-24 Years, 2003-2020. The VCU Clark-Hill Institute for Positive Youth Development. www.clarkhill.vcu.edu (and date accessed).

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