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Understanding The Profiles Of Adolescents Engaged In Intentional Self-Poisoning With Suicidal Intent And The Role Of Primary Care In Early Intervention In Vermont

Rachael Comeau
University of Vermont

UNDERSTANDING THE PROFILES OF ADOLESCENTS ENGAGED IN INTENTIONAL SELF-POISONING WITH SUICIDAL INTENT AND THE ROLE OF PRIMARY CARE IN EARLY INTERVENTION IN VERMONT

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Rachael A. Comeau

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Jessica Strolin-Goltzman, Ph.D., Advisor
Thomas Delaney, Ph.D., Chairperson
Bernice Garnett, Sc.D., MPH
Sean Hurley, Ph.D.
Cynthia J. Forehand, Ph.D., Dean of the Graduate College

ABSTRACT

Suicide prevention is a top public health priority in Vermont. It is a complex issue, requiring a multi-faceted response from many different public and private stakeholders. Because intentional self-poisoning with suicidal intent is rarely lethal, it presents a particularly good opportunity for secondary interventions in the primary care setting. Extensive research has been done on intentional self-poisoning with suicidal intent and its relationship to subsequent risk of death by suicide, but gaps exist in research utilizing poison center data in the primary care setting. This dissertation employs an explanatory sequential mixed method research design to (a) develop a profile of Vermonters under the age of 20 who intentionally self-poison with suicidal intent, and (b) explore primary care interventions that could be implemented in Vermont. The dissertation study uses data from the Northern New England Poison Control Center (NNEPCC) and a focus group of primary care physicians to answer the research questions. Findings from the study point to implications for how this research can build off of the Consolidated Framework for Implementation Research and be utilized to develop an implementation strategy for one specific intervention in primary care.

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Chapter 1: Introduction

Lowering the suicide rate is a top public health priority in Vermont (*Maternal and Child Health Strategic Plan*, 2016). Between 1999 and 2016, suicide rates rose in all but one US state with 25 states seeing an increase of greater than 30% (Stone et al., 2018). Suicide is now the 10th leading cause of death for all ages (Stone et al., 2018) and is one of only three that is increasing – the other two being unintentional injuries and Alzheimer's disease (Kochanek et al., 2017). Nationally, increases are being seen broadly across age, gender, race, and ethnicity (Stone et al., 2018). Vermont had the second greatest percent increase in the country (48.6%) from 1999-2016, with suicide rates increasing from 13.3 people per 100,000 population to 19.6/100,000 (Stone et al., 2018). This makes suicide the 8th leading cause of death in Vermont, with 125 Vermonters taking their own lives in 2018 according to the Centers for Disease Control and Prevention (*Stats of the State - Suicide Mortality*, 2020).

There are many risk factors for death by suicide including mental health conditions and prior suicide attempts, social and economic problems, access to lethal means, and poor coping and problem solving skills (Stone et al., 2018). It is important to note that intentional self-harm is a strong predictor for later death by suicide, but most deaths by suicide occurred longer than eighteen months after the index intentional self-poisoning attempt (Finkelstein et al., 2015). Although most people who engage in intentional self-harm do not go on to die by suicide, studies show a previous self-harm attempt carries between a 20-66 times greater risk of dying by suicide and a four times greater risk of all-cause mortality than found in the general population (Hawton et al.,

2012; Rhodes et al., 2008a, 2008b). While intentional self-poisoning is the most common method of attempted suicide (Finkelstein et al., 2015) it is also one of the least likely to be fatal (Fowler et al., 2015). In their 2015 paper, Finklestein et al suggest "that ongoing communication with patients following self-poisoning substantially reduces the subsequent risk of attempted and completed suicide" (Finkelstein et al., 2015, p. 574).

This suggests that the primary care community has a major opportunity for secondary interventions with patients who have previously intentionally self-poisoned with suicidal intent. The secondary interventions might include: more timely identification of children and youth at risk; educating primary care providers to increase their confidence in identifying and addressing risk factors for suicide with their patients and their families; counseling patients and their families on the importance of means restriction and other risk reduction techniques; and enhanced communication, referral, and personalized care management between the various providers treating children and adolescents for depression and previous intentional self-harm attempts.

Unlike most databases concerning intentional injury that have a significant time lag, poison control center data can be used to track changes and trends in adolescent intentional self-poisonings in a manner that is close to real time. Although the Annual Report of the American Association of Poison Control Centers (AAPCC) provides a national snapshot, publicly available analysis of state-specific data appears to be rare. The literature search for this current study found published analysis from Ohio and Illinois (Pringle et al., 2017) but no others. Furthermore, to our knowledge, no data from the

Northern New England Poison Control Center (NNEPCC) has been analyzed at the state level by non-poison center researchers.

Adolescent self-poisoning is of increasing concern in both the medical and public health community. A recent annual report of the AAPCC released in November 2019 contains a special section on the nationally emerging trend of self-poisoning attempts by adolescents (Gummin et al., 2019). While this analysis incorporates data from the Northern New England Poison Control Center (NNEPCC), it does not have any state-specific information. In December 2019, the Vermont Department of Health (VDH) released a fact sheet on intentional self-harm and death by suicide (*Intentional Self-Harm and Death by Suicide, 2019 | Vermont Suicide Prevention Center*, 2019). In contrast to the AAPCC report, the VDH analysis relies on data from Vermont Vital Statistics, the Vermont Uniform Hospital Discharge Data System, the Vermont National Violet Death Reporting System, the Vermont Youth Risk Behavior Survey (YRBS) as well as the Center for Disease Control's Web-based Injury Statistics Query and Reporting System (WISQARS) through 2017. Existing Vermont data suggests that populations at higher risk for intentional self-harm include 15-24 year olds, females, and high school students who identify as lesbian, gay, bisexual, transgender, queer (LGBTQ) or students of color (*Intentional Self-Harm and Death by Suicide, 2019 | Vermont Suicide Prevention Center*, 2019).

This existing data does not specifically look at adolescent self-poisonings with suicidal intent in Vermont. This makes the de-identified NNEPCC data especially useful both as a supplement to the State's existing analysis and to inform specific secondary

interventions in primary care that have the potential to lower the subsequent death by suicide rate in Vermont. The purpose of this study was to identify specific information on Vermont adolescent self-poisoning with suicidal intent to help inform secondary interventions in the primary care setting aimed at lowering subsequent death by suicide.

This current study is an explanatory sequential mixed methods design utilizing the Northern New England Poison Control Center's data set to understand the profile of adolescents engaged in intentional self-poisoning in Vermont. After this data was examined, a focus group of four primary care doctors was assembled to help envision how this data could inform secondary interventions that might have implications for suicide prevention in adolescents in Vermont.

Research Problem

The ultimate goal of this study was to help understand how data on adolescent intentional self-poisonings with suicidal intent in Vermont can be used in the primary care setting to reduce the risk of subsequent non-fatal injury or death by suicide. The study integrated observation, review of evidence-based practices, quantitative statistics, and focus group methodology. Specifically, descriptive statistics on intentional self-poisoning with suicidal intent by Vermont adolescents from the Northern New England Poison Control Center (NNEPCC) database were combined with a semi-structured focus group discussion to develop a context-specific pilot plan for primary care in Vermont. Integrating quantitative and qualitative data helped identify specific interventions that might decrease risk factors or increase protective factors that were also adapted well to the political and cultural landscape in Vermont.

Research Aims

The specific aims of this study were threefold. First, a literature review and observational data were gathered on the current adolescent intentional self-poisoning and suicide prevention landscape in Vermont and nationally. Second, quantitative analysis of the NNEPCC database was used to determine descriptive statistics and risk profiles on Vermont adolescents that intentionally self-poison with suicidal intent, including an examination of: use of specific poisoning agents; changes in poisoning trends over time; and if factors such as age, gender, or the impact of rurality on medical effects of self-poisoning. Third, qualitative analysis undertaken with a focus group comprised of primary care clinicians currently providing care to Vermont adolescents was used to enrich the earlier analysis as well as provide contextually-specific information around what educational or clinical interventions could be piloted in Vermont primary care practices.

Research Protections

This dissertation research received approval from the University of Vermont Institutional Review Board and a data use agreement governed the use of a de-identified data extract received from the Northern New England Poison Control Center.

Chapter 2: Literature Review

Search Strategy

A systematic search of several databases for intentional self-poisonings in teens and young adults yielded 786 articles. Because suicide prevention spans many medical and behavioral disciplines, this initial search was intentionally broad and included the National Library of Medicine's Ovid MedLine (367 articles); the Cumulative Index to Nursing and Allied Health Literature database, CINAHL (57 articles); the American Psychological Association's PsychINFO (272 articles); the U.S. Department of Education's Education Resources Information Center, ERIC (10 articles); and ProQuest's Sociological Abstracts database (5 articles). There were no date or language parameters constraining the database searches.

Abstracts from all 786 articles were reviewed and 85 were selected for more in-depth analysis based on the following criteria: publication after the year 2000, applicability to the research questions, and similarity to the research demographics of adolescents in Western, highly developed countries.

Because this dissertation topic also spans the area of population health, further additional resources were examined from national and state websites; for example, research supported by non-governmental organizations like the Brady Center and data briefs from the Vermont Department of Health. Finally, the references of these publications were reviewed for additional resources that expanded upon the topic areas of adolescent intentional self-poisoning, death by suicide, and primary care interventions.

This yielded an ultimate research base of over 135 journal articles, reports, data briefs, and toolkits for the purposes of this dissertation.

National Trends in Death by Suicide

According to an article in the Centers for Disease Control and Prevention's Morbidity and Mortality Weekly Report by Deborah Stone et al. (2018), US suicide rates have risen nearly 30% overall from 1999 to 2016. In 2016, nearly 45,000 persons died by suicide in the United States. Stone's analysis used data from both the National Vital Statistics System for all 50 states and the District of Columbia from 1999-2016 as well as for 27 states in 2015 using the NVDRS. Her age-adjusted analysis shows a significant increase in suicide rates in all states over that time period except Nevada. Significant increases greater than 30% were observed in 25 states, including Vermont, with the largest increase in Vermont coming in the early 2000s (Stone et al., 2018). Suicide is now the 10th leading cause of death for all ages and one of only three of the 10 leading causes that is increasing (Stone et al., 2018).

Vermont Trends in Death by Suicide And Intentional Self-Harm

According to the fact sheet released by the Vermont Department of Health in December 2019 (*Intentional Self-Harm and Death by Suicide, 2019 | Vermont Suicide Prevention Center*, 2019), Vermont's suicide rates are significantly higher than the US as a whole. In 2017, the suicide rate nationwide was 14.0 per 100,000 residents while Vermont's was 18.8. During the decade ending in 2017, Vermont's rate has fluctuated

from a low of 12.9 in 2012 to a high of 18.7 in 2014 although the rate of suicide has not increased or decreased significantly in that time frame.

A breakdown of death by suicide rates by county of residence shows that, for the first time since 2002, rates are significantly different between Vermont counties. Specifically, rates are significantly higher in Caledonia County (34.6/100,000) and significantly lower in Addison County (6.5/100,000) than in Vermont overall (18.3/100,000). In general, different rates among Vermont counties represents a public health opportunity to possibly identify and explore different promising or best practices.

Link Between Intentional Self-Harm and Death by Suicide

Doctor Anne Rhodes from the University of Toronto, Canada and Dr. Keith Hawton from the University of Oxford, England have done much of the foundational work on medically serious medicinal self-poisonings and their link to subsequent mortality (see Hawton, Bergen, et al., 2015; Hawton et al., 2011, 2012; Hawton & Harriss, 2008; Hawton, Witt, et al., 2015; Rhodes et al., 2008a, 2008b, 2014). Their research has involved large scale (population-based) studies of Emergency Department presentations. Unlike data obtained from the Northern New England Poison Control Center, much of this data fails to identify intent (Rhodes et al., 2014) although Rhodes in particular has confirmed an increase in high clinical intensity of intentional self-harm after 2004 (Rhodes et al., 2014). While rarely fatal, self-poisonings make up 90% of intentional self-harm presentations to hospital emergency rooms and about three quarters of the medically serious deliberate self-harm visits (Rhodes et al., 2008b, p. 643). In a large multi-center study in England, Hawton et al. (2015) found that an episode of self-

harm is the most important lifetime risk factor for suicide with approximately 50-60% of suicide decedents having a history of deliberate self-harm (Hawton et al., 2015, p. 147). In this study, the age-adjusted risk of suicide in individuals in the first year following an episode of self-harm was 49 times the rate of the general population (Hawton et al., 2015, p. 149).

Previous studies have identified significant differences between people who intentionally self-poison and individuals who go on to die by suicide. Specifically, young women tend to deliberately self-poison whereas it is more often males that die by suicide, with males more frequently using other, more lethal, methods (Rhodes et al., 2008b, p. 643). Hawton (2007) found the strongest difference in males and females to be in youths under the age of 15. In this age group, girls presenting for deliberate self-harm in the emergency department (ED) outnumber boys by a ratio of five to one (Hawton et al., 2007). Hawton et al. (2012) also found a higher level of suicidal intent among girls who self-poison than self-cut (the two most common methods of intentional self-harm). However, self-cutting is more predictive of eventual suicide (Hawton et al., 2012). Presentations among youth were predominately associated with the acetaminophen agent-group (not prescribed agents) and most commonly associated with medical severity (defined as requiring an in-patient stay) with more severity in females – possibly relating to a lower physical tolerance based on typically smaller body size (Rhodes et al., 2008b, p. 649). This is of significant concern given the general availability of acetaminophen (including being sold in retail containers with hundreds of doses), its toxicity, and therefore its increased ability to be used impulsively with significant possible harm.

Rhodes and colleagues also noted that males were less likely to be coded for deliberate self-harm and find this discrepancy troubling given that males have a statistically higher risk of death by suicide. They note this to be the case:

> even when the agent-groups were psychotropic-prescribed or when more than one agent-group was taken . . . While the specific mechanisms that contribute to potential under detection in males are not known, potential explanations are: a greater physical tolerance; greater problems with substance misuse, impulsivity and emotional expression . . . together with histories of fragmented care . . . Therefore, more comprehensive assessments and treatment for males aged 18–64 in the ED would seem especially prudent. (Rhodes et al., 2008b, p. 650)

Dr. Rhodes and colleagues (2008a) have also studied the differences in suicide rates among people based on urban or rural residence. Like previous research that has identified generally higher suicide rates in rural communities related to geographic, psychological, and cultural barriers (Hirsch, 2006), she found:

> Compared to non-rural residents, deliberate intent was identified less often in rural residents, particularly males . . . The rural–medical severity association was best explained by disparities in the delivery systems serving rural and nonrural residents, important to rural suicide prevention efforts. (Rhodes et al., 2008a, p. 552)

Of note, Vermont is a predominantly rural state, with 11 out of 14 counties classed by the US Office of Management and Budget as rural/nonmetro (*List of Rural Counties And Designated Eligible Census Tracts in Metropolitan Counties*, 2018). Examination and analysis of Vermont-specific poisoning data will enable us to see if these national geographic, gender, and agent trends hold true for Vermont as well.

Other Relevant Studies

It is important to examine other studies that have been done utilizing Poison Control Center data because valuable information can be gleaned from the similarities and differences between them and the Vermont-specific poison center data. In particular, other studies have had the advantage of having more poisoning events in their databases that might help increase the face-validity of the Vermont results if the same trends are shown to hold true across states. For example, a recent study in Ohio utilizing data from three poison control centers found a total of 115,025 cases of drug poisonings in patients aged 10-29 years old from 2002-2014 (Pringle et al., 2017). Vermont's numbers from the NNEPCC are substantially smaller at 4,175 unique intentional self poisonings in children and youth less than 20 years old from 2005 to 2019.

Like other studies utilizing different data sources, the Ohio study found that females were more likely than males to self-poison. The most common age group for self-poisoning was 18-24 and the most prevalent poisoning agent was analgesics, which includes acetaminophen and other nonsteroidal anti-inflammatory drugs (NSAIDs), and opioids used to relieve pain. Also similar to data already discussed on suicide rates in Vermont, the Ohio study noticed a difference in self-poisoning rates among their

counties. The authors of the Ohio study hypothesize that these higher rates might be related to border counties with easy access to major highways that facilitate higher traffic and illegal drug flows (Pringle et al., 2017, p. 657).

Studies such as Naun et al. (2011) confirm the potential validity of using poisoning control center data for more timely and sensitive pharmaceutical poisoning population health surveillance than currently provided by other data sources. In addition, useful national trend and comparison information can also be found in the annual reports of the American Association of Poison Control Centers' National Poison Data System (NPDS), which receives data from all the regional poison control centers serving the entire population of the United States as well as specific US overseas territories. These annual reports do not have state- or poison control center-specific data but are instead useful for grounding the Vermont state data in the national landscape. The data from the 2018 national report, including a special emphasis on poisonings in children under the age of 20 years old, is presented in depth in the sections below.

National Data on Intentional Self Poisonings

The American Association of Poison Control Centers' National Poison Data System (NPDS) receives data from 55 regional poison control centers serving the entire population of the 50 United States, American Samoa, District of Columbia, and the Federated States of Micronesia, Guam, Puerto Rico, and the US Virgin Islands. The 36th Annual Report was released for 2018 data in November 2019 (Gummin et al., 2019). These annual reports provide a wealth of information on the national landscape. The summary of the 2018 report finds:

> In 2018, 2,530,238 closed encounters were logged by NPDS: 2,099,751 human exposures, 57,017 animal exposures, 368,025 information requests, 5,346 human confirmed nonexposures, and 99 animal confirmed nonexposures (Gummin et al., 2019, p. 1223).

United States Poison Control Centers (PCC) also made 2,621,242 follow-up calls in 2018. Total encounters showed a 2.96% decline from 2017, while health care facility (HCF) human exposure cases remained nearly steady with a slight decrease of less than one percent (0.261%). All information requests decreased by 15.5%, medication identification (Drug ID) requests decreased by 30.2%, and human exposure cases decreased by 0.729%. Human exposures with less serious outcomes have decreased 2.33% per year since 2008, while those with more serious outcomes (moderate, major or death) have increased 4.45% per year since 2000.

Consistent with the previous year, the top five substance classes most frequently involved in all human exposures (intentional and unintentional) were analgesics (10.8%), household cleaning substances (7.28%), cosmetics/personal care products (6.53%), sedatives/hypnotics/antipsychotics (5.53%), and antidepressants (5.22%). For cases with more serious outcomes, sedative/hypnotics/antipsychotics exposures were the class that increased most rapidly, by 1,828 cases/year (9.21%/year) over the past 18 years. Over just the past 10 years (for cases with the most serious outcomes) antidepressant exposures increased most rapidly, by 1,887 cases/year (7.02%/year)" (Gummin et al., 2019, p. 1223). The data also shows that 92% of cases occurred in a residence and that 66% of cases were managed at home or in a non-healthcare facility setting (Gummin et al., 2019,

p. 1235). Treatment site also shows significant variance by age, with only 12.5% of children aged five and under and 18.4% of children aged 6 to 12 managed in a healthcare facility (HCF) compared to 66.0% of teens aged 13-19 and 50.0% of adults over 20 years and older (Gummin et al., 2019, p. 1235-6).

The 2018 Report provides information on the population-adjusted exposures by age group as well as the age and gender distributions of human exposures. In 2018, children less than 20 years of age accounted for 1,235,741 of all exposures, with the majority of those (925,347 or 74.88%) found in the age group five and under (Gummin et al., 2019, p. 1232). Males with exposure outnumber females with exposure in all age groups under 20 years old except for teens ages 13-19 where there were 65,006 male exposures and 106,442 female exposures in 2018. As the figure below shows, when the distribution of reason for exposure is examined by age, unintentional exposure is much higher than intentional exposure in every age category below 20 years old except ages 13-19.

The 2018 Annual Report further breaks down intentional exposure into the sub-categories of "suspected suicidal", "intentional misuse", and "intentional abuse" (Gummin et al., 2019, p. 1250). These categories are defined by Gummin et al. (2019) as below:

- Suspected suicidal: An exposure resulting from the inappropriate use of a substance for reasons that are suspected to be self-destructive or manipulative.

- Intentional misuse: An exposure resulting from the intentional improper or incorrect use for reasons other than the pursuit of a psychotropic effect.
- Intentional abuse: An exposure resulting from the intentional improper or incorrect use where the patient was likely attempting to gain a high, euphoric effect or some other psychotropic effect, including recreational use of a substance for any effect. (Gummin et al. 2019, p. 1250)

In the national data, thirteen percent of all age group exposures were suspected suicidal, with intentional misuse and intentional abuse suspected in 2.73% and 2.23% of exposures respectively (Gummin et al., 2019, p. 1235) Within the 13-19 year old age group, 73.21% of the intentional exposures resulting in death were suspected suicide, 1.78% were intentional-misuse, 19.64% were intentional-abuse, and 5.35% were intentional-unknown. No fatalities in children aged 12 and under were classed as intentional (Gummin et al., 2019, p. 1234).

Figure 1

Data on distribution for reason of exposure by age groups from the 2018 Annual Report of the American Association of Poison Control Centers' National Poison Data System (Gummin et al., 2019, p. 1234).

Table 7. Distribution of reason for exposure by age.

	<=5 y		6-12 y		13-19 y		>=20 y		Unknown child		Unknown adult		Unknown age		Total	
Reason	N	Row %	N	Row %	N	Row %	N	Row %	N	Row %	N	Row %	N	Row %	N	%
Unintentional	921,977	60.12	110,987	7.24	56,804	3.70	434,700	28.35	3,733	0.24	72,282	4.71	9,047	0.59	1,609,530	76.65
Intentional	42	0.01	15,405	3.92	107,988	27.50	266,259	67.80	233	0.06	8,187	2.08	3,014	0.77	401,128	19.10
Adverse reaction	3,313	7.14	2,614	5.64	3,675	7.93	35,881	77.38	138	0.30	6,259	13.50	886	1.91	52,766	2.51
Unknown	870	4.97	979	5.59	2,178	12.44	12,660	72.30	56	0.32	1,084	6.19	823	4.70	18,650	0.89
Other	1,285	8.46	1,602	10.55	1,767	11.63	10,181	67.02	95	0.63	2,391	15.74	356	2.34	17,677	0.84
Total	**927,487**	**46.25**	**131,587**	**6.56**	**172,412**	**8.60**	**759,681**	**37.88**	**4,255**	**0.21**	**90,203**	**4.50**	**14,126**	**0.70**	**2,099,751**	**100.00**

Each year, the report explores an area of particular interest that their data reveals, which they designate as an Emerging Trend. Of particular interest to this dissertation, the 2018 Report notes that "[s]elf-poisoning suicide attempts by adolescents comprise an important **Emerging Trend**" (Gummin et al., 2019, p. 1224). Figure 2 below shows that adolescents 10-19 years old made up 28.7% of all intentional suspected suicides in 2000, dropped slowly to its lowest point of 21.8% in 2010 and has since increased rapidly to 31.7% in 2018 (Gummin et al., 2019, p. 1230).

Figure 2

Data on Adolescent Intentional-Suspected Suicides from the 2018 Annual Report of the American Association of Poison Control Centers' National Poison Data System (Gummin et al., 2019, p. 1230).

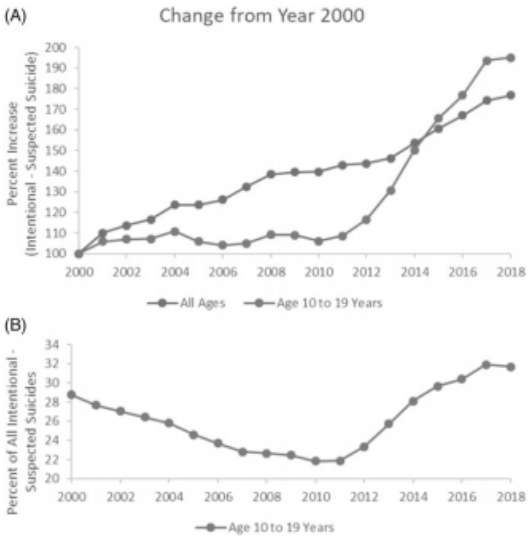


Figure 6. Change in intentional – suspected suicides from year 2000. The figure shows the percent change from baseline (year 2000) for human exposure cases for Intentional – Suspected Suicide for all ages and those aged 10-19 years. Panel A: Intentional – Suspected Suicide exposures increased in both groups, with those in the 10-19 year ages increasing more rapidly since 2010. Panel B: The percentage of all 10-19 year old Intentional – Suspected Suicides started at 28.7% in year 2000, slowly declined reaching a nadir of 21.8% in year 2010 and then rapidly increased to 31.7% by year 2018.

The 2018 AAPCC Annual Report also shows reported fatalities among children younger than 20 years of age increased from 2017 by 21.1% and represented 6.35% of all deaths

(Gummin et al., 2019, p. 1243). Of the 65 fatalities reported with documented reason among adolescents (ages 13-19) in 2018, 56 were classed as intentional, three as unintentional, five as unknown reason, and one as other (Gummin et al., 2019, p. 1245).

> The first ranked pharmaceuticals associated with these fatalities included: analgesics (42), stimulants and street drugs (18), antihistamines (8), antidepressants (7), cardiovascular drugs (6), unknown drug (4), antimicrobials (2), electrolytes and minerals (2), sedative/hypnotics/antipsychotics (2), anesthetics (1), anticonvulsants (1), gastrointestinal preparations (1) and miscellaneous drugs (1). The first ranked nonpharmaceutical associated with these fatalities included: alcohols (2), chemicals (2), fumes/gases/vapors (2) and hydrocarbons (1) (Gummin et al., 2019, p. 1245).

The Emerging Trend analysis also details the substance groups with the highest percentage increase and greatest morbidity index from 2011 through 2018 in the adolescent (10-19 year old) population. As shown in Figure 3 below, the most rapidly increasing substance categories used in intentional-suspected suicides among ages 10-19 are selective serotonin reuptake inhibiters (SSRIs), NSAIDs, acetaminophen alone, sedating antihistamines and miscellaneous sedatives/hypnotics/antipsychotics (Gummin et al., 2019, p. 1241-2). Figure 4 below details "The top five generic codes associated with the largest morbidity indices in single-substance adolescent suicide attempts were clonidine, bupropion, antihypertensives alone, amitriptyline, and diphenhydramine alone" (Gummin et al., 2019, p. 1242).

Figure 3

Data on substance groups with the greatest rate of exposure increase for serious outcomes in adolescents ages 10-19 from the 2018 Annual Report of the American Association of Poison Control Centers' National Poison Data System (Gummin et al., 2019, p. 1230

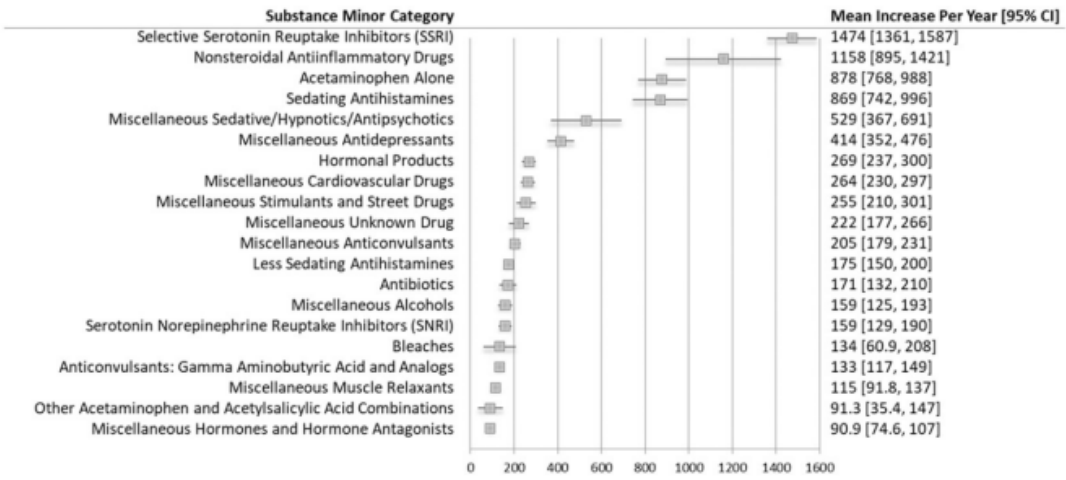


Figure 7. Substance categories with the greatest rate of exposure increase since 1 January 2011 for serious outcomes in 10 to 19 year intentional – Suspected Suicide exposures. The Forest Plot shows the 20 substance categories with the greatest rate of exposure increase from year 2011 for Intentional – Suspected Suicide exposures in the 10-19 year age group. Substance categories include single or multi-substance exposures. The boxes show the mean increase per year determined by least-squares linear regression with the whiskers depicting the 95% confidence interval on the regression.

Figure 4

Data on substances with the greatest morbidity index for ages 10-19 from the 2018 Annual Report of the American Association of Poison Control Centers' National Poison Data System (Gummin et al., 2019, p. 1230.)

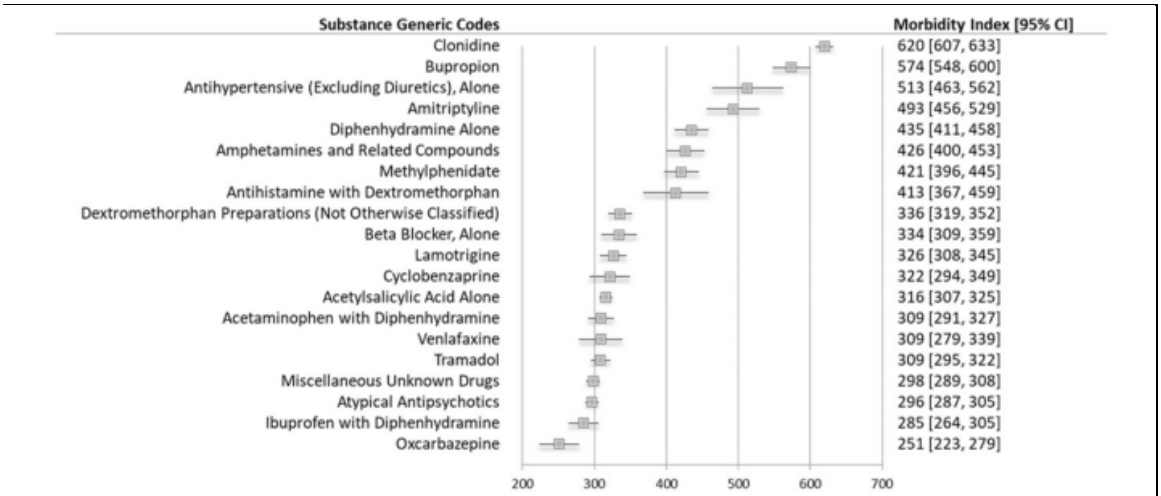


Figure 8. Generic substance codes with the greatest morbidity index since 1 january 2011 for 10 to 19 year intentional – suspected suicide exposures. The Forest Plot shows the 20 generic codes with the greatest Morbidity Index since year 2011 for single-substance Intentional – Suspected Suicide exposures in the 10-19 year age group. The morbidity index was calculated as the rate of serious medical outcomes (serious cases divided by all cases X1000) over the 8-year time period. Serious medical outcomes were defined as moderate, major or death. The boxes show the Morbidity Index with the whiskers depicting the 95% confidence interval for a binomial distribution.

Vermont Data on Intentional Self Poisonings

Like Vermont's rate of death by suicide, the state rate of intentional self-harm of 191.4 per 100,000 is significantly higher than the national rate of 157.2/100,000 (*Intentional Self-Harm and Death by Suicide, 2019 | Vermont Suicide Prevention Center*, 2019). From 2008 to 2014, Vermont's rate of intentional self-harm increased by 51% (*Intentional Self-Harm and Death by Suicide, 2019 | Vermont Suicide Prevention Center*, 2019). For the purposes of this dissertation, it is worth noting that a change in hospital billing codes from ICD-9 to ICD-10 in 2015 (the source of this data in the 2019 Vermont Department of Health brief) makes a comparison difficult between data from 2008-2014

and 2016-2017 but the rates from 2016 to 2017 also rose (*Intentional Self-Harm and Death by Suicide, 2019 | Vermont Suicide Prevention Center*, 2019). Poisonings are the most common reason for intentional self-harm visits to the hospital and account for 57% of the total amount of visits coded as self-harm, (the next highest cause was cutting at 31%). Hospital visits for intentional self-harm are higher among females than males (254.4 vs 115.0 per 100,000) and young Vermonters ages 15-24 have intentional self-harm rates significantly higher than any other age group. As with Vermont suicide rates, a breakdown of hospital visit rates for intentional self-harm by county of residence shows that rates varied among Vermont counties for the period 2015-2017. Specifically, rates per 100,000 residents are significantly higher in Bennington (345.1), Franklin (328.0), and Windham (261.2) counties and significantly lower in Chittenden (147.8), Lamoille (121.8) and Orange (109.1) counties than in Vermont overall (191.4). For all Vermont statistics concerning intentional self-harm, please see *Intentional Self-Harm and Death by Suicide, 2019 | Vermont Suicide Prevention Center*, 2019.

Datasets Used to Inform Vermont and National Studies

Nationally, data on intentional self-harm and death by suicide is usually collected from the National Violent Death Reporting System (NVDRS), the National Trauma Databank, national or regional poison control centers, administrative claims databases, or the National or State Youth Risk Behavior Survey (YRBS), or extracted via the Center for Disease Control's Web-based Injury Statistics Query and Reporting System (WISQARS).

Specific Vermont data to inform the Vermont Department of Health brief was collected from Vermont Vital Statistics, the Vermont Uniform Hospital Discharge Data System, the Vermont National Violet Death Reporting System, the Vermont Youth Risk Behavior Survey (YRBS), as well as the CDC's WISQARS system.

Poison Control Center Data

As discussed above, the American Association of Poison Control Centers' National Poison Data System (NPDS) consolidates information from 55 state and territorial poison control centers and analyzes it to understand the national intentional and unintentional poisoning landscape in near real time. The Northern New England Poison Control Center (NNEPCC) is nationally accredited by the American Association of Poison Control Centers and serves Maine, New Hampshire and Vermont and contributes their data to the national analysis. Like other poison control centers, NNEPCC provides a free, 24 hour poison emergency and information helpline by phone, on-line chat or text. It is staffed by health care professionals, mainly nurses and pharmacists, highly trained in toxicology (poisons and poisonings). It serves both the general public and health care professionals and also provides toxicology consultation to health care providers through its medical director and attending physicians. The NNEPCC manages nearly 30,000 potential human poisonings a year (*About the Northern New England Poison Center | Northern New England Poison Center*, n.d.). It is funded by Maine Medical Center, the Maine Department of Health and Human Services, the New Hampshire Department of Health and Human Services, the Vermont Department of Health, the University of Vermont Medical Center, and funds received through grant #H4BHS15557, awarded by

the Health Resources and Services Administration. Nine out of ten poisonings reported to the NNEPCC were treated with advice over the phone and did not require further medical treatment. It is estimated that by keeping a high percentage of less severe poisoning cases out of busy emergency rooms and other resource-intensive services, poison center treatment advice saves more than $13 per $1 spent (*About the Northern New England Poison Center | Northern New England Poison Center*, n.d.).

To my knowledge, no Vermont-specific data on adolescent intentional self-poisonings from the NNEPCC dataset has been analyzed or presented publicly by non-poison center researchers. Further, since the data in the NNEPCC dataset does not rely on ICD codes for categorization, it avoids the data continuity problems associated with the change from ICD-9 to ICD-10 in 2015.

Evidence-Based Suicide Prevention Interventions

Current Suicide Prevention Methodologies in Use in Vermont

Further research was undertaken to quantify the tools, practices, systems, laws, and policies that are currently in use in Vermont in the field of suicide prevention and treatment. Specifically, in-person observations were undertaken at an all-day learning session for Vermont primary care providers on the topic of adolescent mental health. These providers participate in a University of Vermont Larner College of Medicine (LCOM) quality improvement network called CHAMP. I spent approximately five hours observing relevant parts of the learning session held on the University of Vermont campus. The learning community at the session is broad-based and includes: primary care providers working with children and youth ages 0 to 26 in Vermont; practitioners

working in public and private outpatient substance and mental health treatment centers; and experts in some treatment modality or practice currently in use in Vermont. The CHAMP Network provides care to a significant number of Vermont's under twenty-one population. The latest data shows that 51% of children 0-21 years with claims in the all-payer claims database in 2017 were attributed to the clinical teams in CHAMP (V. Harder, personal communication, September 28, 2020).

The observations were taken over five sessions:

1. Caring for our Adolescent's Well Being
2. The Brief Intervention with Adolescents: The Power of Relationships in Primary Care
3. The Brief Negotiated Interview: An Intervention for Moderate to High Risk Positive Screens
4. Substance Misuse: Local trends and Recent Innovations in Adolescent and Family Treatment
5. Suicide Prevention in Pediatric and Family Medicine Practices

The sessions provided a wealth of information on best and current practices for identifying, treating, and referring adolescent mental health issues within the primary care setting. Analysis of my observational notes enabled me to quickly get a sense of the major components in use throughout the public and private primary care sectors in Vermont. In summary, specific evidence-based tools in use in Vermont are:

- ***UMatter*** (gatekeeper training and educational campaign usually implemented in schools);

- ***CAMS*** (Collaborative Assessment and Management of Suicidality, 100s trained in state Designated Mental Health Agencies, three-day training, relatively expensive);
- ***Zero Suicide*** (approach to identify gaps in service delivery and treatment models, and to choose tools);
- ***CALM*** (Counseling on Access to Lethal Means, a free, on-line, two-hour training that increases provider confidence in addressing access and safe storage of firearms, medication, and alcohol);
- ***CBT*** (Cognitive Behavioral Therapy);
- ***DBT*** (Dialectical Behavior Therapy – originally used to treat personality disorders but also saw an impact of reduced suicide rates);
- ***Gun Shop Project*** (type of gatekeeper training and education for gun shop owners);
- screening tools (***PHQ9, PHQ2, AUDIT, CRAFFT, GAD 7, and DAST***); and
- ***Door to door outreach*** for hard to reach communities.

Understanding tools currently in use helped direct my research into additional evidenced-based tools that are not currently in use in Vermont. In addition, it is likely that there will be different implementation strategies needed depending on whether or not the tool is already in use in Vermont – albeit in a different sector – than if it is a completely new modality.

Evidence-Based Interventions Not Currently in Use in Vermont

There is a relatively recent review (Zalsman et al., 2016) of suicide prevention strategies discussed in the literature from January 1, 2005 through Dec 31, 2014. Seven types of interventions were examined, including: public and physician education, media strategies, screening, restricting access to lethal means, treatment, and internet or hotline support. It finds no convincing evidence that one particular strategy is better than others, and suggests that combinations of evidenced-based strategies be employed and tailored to the individual and population level based on local circumstances. Those strategies with the strongest evidence base include restricting access to lethal means, school-based awareness programs, pharmacological and psychological treatments of depression, and education of physicians. Importantly for the research questions addressed by this dissertation, the review notes a gap in research related to evidence of benefits for screening in primary care and recommends that this area be studied more robustly (Zalsman et al., 2016, p. 647).

There is another source for information on promising interventions specific to primary care – a technical package on preventing suicide released in 2017 by the Centers for Disease Control's National Center for Injury Prevention and Control Division of Violence Prevention (Stone et al., 2017). While not specifically focused on intentional self-poisonings or primary care, several interventions are relevant for the purposes of this dissertation.

Intervention: Identify and Support People at Risk. Specifically, identifying and supporting people at risk involves dissemination of data profiles and effective

linkages between the various behavioral and medical health professionals providing care (Stone et al., 2017, p. 35-39). Several of the evidenced-based practices highlighted by Stone et al. include gatekeeper training, crisis intervention, the Improving Mood – Promoting Access to Collaborative Treatment (IMPACT) model, the Collaborative Assessment and Management of Suicidality (CAMS) training, active-follow-up contact approaches intended to increase a sense of connection and decrease feelings of isolation, and numerous therapy modalities including Dialectical Behavioral Therapy (DPT), Translating Initiatives for Depression into Effective Solutions (TIDES), Attachment-Based Family Therapy (ABFT), and Cognitive Behavioral Therapy for Suicide Prevention (CBT-SP). Earlier research shows that many of these practices are already in place in certain sectors of Vermont and were discussed in the section above. Stone details three additional interventions that show particular promise for extension into the adolescent primary care setting including IMPACT, TIDES, and active-follow-up contact approaches that are discussed further below.

Improving Mood – Promoting Access to Collaborative Treatment (IMPACT). This intervention has been studied in primary care with elderly adults. It follows a model of personalized care management around depression and has both an intensive bi-weekly support phase and a monthly continuation phase. It has been shown to reduce depression and suicidal ideation as well as improve general quality of life relative to control groups receiving treatment as usual (Stone et al., 2017, p. 37).

Translating Initiatives for Depression into Effective Solutions (TIDES). This intervention is also a care coordination model but studied primarily in the veteran

population. It uses a “depression care liaison” to provide both assessment and education around depression, as well as link primary care and specialized mental health services. With the medical (primary care) home taking the lead on services, TIDES shows an increase in compliance with medication and follow-up visits, as well as a decrease in depression severity scores (Stone et al., 2017, p. 38).

Active Follow-up Contact Approaches. “Approaches that engage and connect people who have attempted to peers and providers are especially important because many attempters do not present to aftercare; 12%-25% re-attempt within a year, and 3%-9% of attempt survivors die by suicide within 1 to 5 years of their initial attempt” (Stone et al., 2017, p. 36). There is significant international research on a post-crisis contact intervention often called “Postcards from the EDge.” A Google search for scholarly articles alone yielded articles from Iran, Australia, New Zealand, and the United States. There have been different versions of this intervention tested, but it usually entails a standardized program of written or verbal contact over a period of time after a patient presents in the Emergency Department with attempted death by suicide. A randomized control trial in the United States showed a significant difference in subsequent suicide death rates between the contact and the no contact group (Motto & Bostrom, 2001). Finally, individual studies have tested out more specific promising interventions. Some that are especially relevant to this dissertation are studies highlighted in Rhodes et al. (2008a) showing improvements to the management of depression in primary care that have been associated with lowering suicide rates, but only in women.

Intervention: Means Restriction. Since some methods of attempted suicide are substantially more likely to result in death, much research focuses on the suicide prevention strategy of "means restriction." Although much of the literature focuses on restricting access to firearms, comprehensive means restriction also encompasses safe storage of medications and alcohol in homes.

According to the 2018 Brady Center Report: *The Truth about Suicide and Guns*, in the United States in 2016 nearly 23,000 people died by suicide using a firearm. This included 867 children under the age of 18 (p. 8). Due to their high lethality rate, annual suicidal deaths by firearm are approximately two times the number that die each year by suffocation, three times the number who die by poisoning, and twenty times more than die by intentional falls (p. 4). Estimates are that 4.6 million children live in a home with an unsecured and loaded firearm (p. 9). A study utilizing 2001-2002 data from the National Violent Injury Statistics System (the precursor to the CDC's National Violent Death Reporting System) found that four-fifths of teen suicides using firearms took place in the child's home and that, in most cases, the firearms were owned by the child's parents (Johnson et al., 2010).

Specifically, studies show that family guns are used in 82% of completed teen suicide attempts (*The Truth About Suicide and Guns*, 2016, p. 14), and that restricting means of obtaining a firearm, and otherwise reducing access to firearms, would be an effective intervention to lower suicide rates (Brent et al., 1999). Outright reduction of gun ownership has proved politically difficult in the US, but studies show that simply having a gun in the home increases the risk of death by suicide by three times (*The Truth About*

Suicide and Guns, 2018, p. 10). According to data collected by Vermont Public Radio, and the Vermont Department of Health and presented by the Vermont Suicide Prevention Center, 82 Vermonters died from gunshots in 2018. Of these deaths, 85% were suicides. Seventy of the decedents were male, and twelve were female (Jones, n.d.). The youngest person to die was an 18 year old male.

There are several ways to make substances and firearms less likely to be used for suicide, namely ways which make it more difficult to access them impulsively, as 71% of suicide attempts are impulsive acts with the time between a decision and a suicide attempt under one hour (Simon et al., 2002). In addition, 90% of people who survive attempts never repeat (*The Truth About Suicide and Guns*, 2018, p. 5). Vermont has already undertaken a media campaign to reduce the mistaken idea that suicide is not preventable. (*Umatter | Vermont Suicide Prevention Center*, n.d.).

Additional policies and education could be used to emphasize that guns, medications and alcohol should be locked away (and stored without ammunition). The Brady Campaign calls this technique "Suicide Proofing" and has aligned it with the well accepted childproofing most parents agree is critical. Safe storage techniques with firearms reduces the odds of death by 73% and 70% respectively (*The Truth About Suicide and Guns*, 2016, p. 15). Stone et al. (2017, p. 24) also cite a case-control study by Grossman et al. (2005) of 37 counties and five trauma centers across multiple states, which demonstrated that safe storage practices (storing firearms unloaded, separate from ammunition, in a locked place or secured with a safety device) were protective against adolescent suicide attempts. Evaluation of a similar program in Rhode Island shows that

97% of parents think the message is important and over half of them had made or planned to make changes in their homes as a result (Cote et al., 2012).

Another recent study reported that only 4% of caregivers currently stored their medications in a locked or latched place but 92% of them would use a medication lock box if given one (Webb et al., 2020). After an intervention in the emergency department that consisted of education and the provision of a lock box, 90% reported safe storage of their medications at two week follow-up (Webb et al., 2020). It is likely that training providers and caregivers on means restriction would significantly reduce teen suicide completion rates. Safe storage of medications, alcohol, and firearms are all part of the Counseling on Access to Lethal Means (CALM) training discussed above.

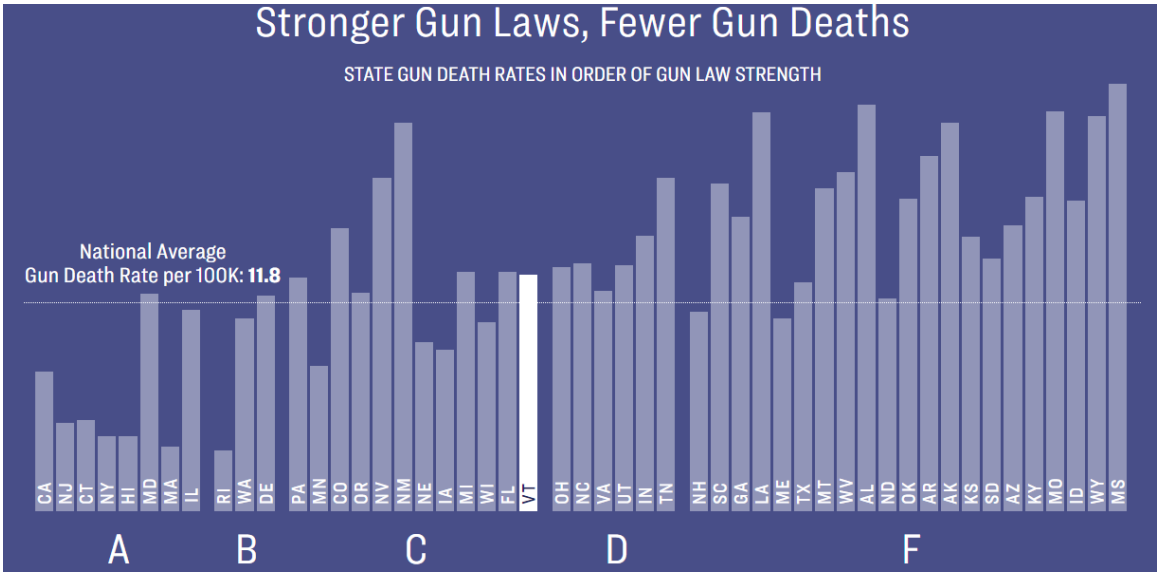
Intervention: Legislative Action and Policy Change. The Vermont legislature enacted three new statutes governing firearms in 2018. They are: S.221 An Act relating to establishing extreme risk protection orders, S.55 An act relating to the disposition of unlawful and abandoned firearms, and H. 242 Any person who commits misdemeanor stalking, sexual assault or aggravated assault is prohibited from possessing a firearm. Applicable to this dissertation topic, these included minimum purchase age laws and extreme risk protection orders. Additional legislation that sought to require a waiting period on gun purchases and child access prevention laws have so far failed to pass.

According to the Giffords Law Center's Annual Gun Law Score Card (n.d.), Vermont gun death rate is 12.63 per 100,000 people compared to a national average of 11.8 per 100,000 people. Vermont currently ranks 23 out of 50 states in gun law strength and 28/50 in gun death rate. This earned Vermont an overall grade of C- from the Law

Center. There is a direct correlation between gun law strength and gun death rates – as shown in Figure *5* below.

Figure 5

State gun death rates in order of gun law strength in Giffords Law Center's Annual Gun Law Scorecard



The Giffords Law Center report card states:

> In 2018, Vermont significantly strengthened its very weak gun laws. The state has the 23rd-lowest gun death rate in the country and supplies crime guns to other states at the 15th-highest rate. To build on the state's recent progress, Vermont legislators could require a waiting period before all gun purchases, strengthen laws regarding gun possession by domestic abusers, and close the loophole that allows guns to be transferred before a background check is complete.

Although legislative action aimed at reducing young peoples' access to agents commonly used in intentional self poisonings is not currently part of Vermont's legislative agenda, efforts aimed at reducing firearm access/promoting safe storage might provide a blueprint for moving the discussion forward concerning means restriction generally.

Research Questions

It is clear that much research has been done on the topic of adolescent intentional self-poisoning and its relationship to subsequent risk of death by suicide. However, much of this research has not had access to relatively real-time Vermont-specific poisoning data. There is also a need for more research to inform and test interventions specifically in adolescent primary care settings, and to better understand the role that providers in these setting might play in broader public health prevention efforts. This dissertation will therefore use the NNEPCC dataset and focus group data with practicing pediatricians and family medicine providers to answer the following research questions:

1) What is the risk profile of intentional self-poisonings with suicidal intent among Vermont adolescents:
    A. By age, gender, and exposure site;
    B. By substances utilized and chronicity;
    C. By year and seasonality, and by caller site, relationship to patient, and location;
    D. By medical outcome and disposition of cases;

E. By the relationship of age, gender, exposure site, and rurality (independent variables) on medical effect (dependent variable).

2) Upon reviewing findings from research question one, what are the perceptions of practicing pediatricians about effective clinical or educational interventions that could be implemented in primary care settings in Vermont?

Chapter 3: Methodology

Theoretical Basis

This study uses the epistemological lens of pragmatism. As a research paradigm, pragmatism attempts to balance scientific inquiry with the need to address complex, messy, real world problems. It focuses on what is practical and effective in a particular sociopolitical situation. Charles Sanders Peirce is generally regarded as the originator of the conceptual framework in the 1870s. Tashakkori & Teddlie (2010), and Creswell & Clark (2018) undertook much of the modern formative work on the paradigm including its particular appropriateness for mixed methods research in behavioral sciences (Kaushik & Walsh, 2019).

As an applied pragmatic researcher, I seek "actionable knowledge of direct practical value in the context being studied" (Greene & Hall, 2010, p. 138). The goal of this study was to answer the research questions in order to inform the creation of a set of possible interventions that can be of value in the primary care/prevention setting. The philosophy of pragmatism shapes my research design and the methods used so that I can improve the usefulness of the results, not necessarily the generalizability of the results. For example, a rigorous and structured literature search on the topics of adolescent suicide, intentional self-poisoning, and primary care interventions yields information that can augment the NNEPCC data analysis and the focus group discussion. Neither the literature search nor the focus group were or are intending to be exhaustive. Instead "just enough" information is gathered to identify emerging practices and promising interventions that can be then tested in a primary care practice in Vermont. The flexible

approach of pragmatism, coupled with the use of mixed methods to gather both rigorous and contextually specific data, is especially important in understanding and making sense of "wicked problems" such as suicide prevention (Kral et al., 2012, p.236).

The particular methodologies of quality improvement (Berwick, 1998) and implementation science (Damschroder et al., 2009) are an offshoot of pragmatism that offer practical frameworks for testing changes and facilitating adoption of promising practices in real world situations. These methodologies will be of particular importance when attempting to support the adoption of evidenced-based practices into busy primary care settings. Finally, this epistemology extends through to my choice of research tools: rigorous secondary data analysis informs a semi-structured focus group where predetermined questions invite participants to converse informally (Longhurst, 2003).

A pragmatic lens enables me to ground my work in state- and age-specific data and conduct a focus group with primary care providers that currently see adolescents in Vermont. While many researchers have examined risk factors that increase individual suicide risk, fewer have approached this area with a pragmatic population health lens specifically addressing intentional self-poisoning with suicidal intent in primary care settings.

Data Collection, Analysis and Integration Plan

The data sources include the NNEPCC data extract, and existing publicly available state and national health information, publicly available information on treatment modalities, policies, and laws with implications for suicide risk, and

information gleaned from the semi-structured focus group (Longhurst, 2003). This included the following phases as shown in Table 1 below:

Table 1

Data procedures and products

Phase	Procedure	Product
1. Quantitative Data Analysis	Analysis of the Northern New England Poison Control Center database in SPSS version 27 and Microsoft Excel 16.	Descriptive and relational statistics on adolescent intentional self-poisoning with suicidal intent in Vermont.
2. Qualitative Data Collection	Semi-structured focus group of Vermont primary care providers informed by the results of the quantitative data analysis results.	Data coded for context-specific challenges and opportunities for clinical and educational support of at-risk adolescents in Vermont primary care settings.

Data Analysis Plan and Procedures

Phase 1: NNEPCC Data

I conducted a secondary data analysis of de-identified data gathered by the NNEPCC concerning intentional self-poisoning with suicidal intent by Vermont adolescents. The Northern New England Poison Control Center provides a 24-hour phone and text informational service to the general public and health care providers in the states of Vermont, New Hampshire, and Maine. It is nationally accredited by the American Association of Poison Control Centers and staffed by health care professionals, primarily

nurses and pharmacists, who are highly trained in toxicology (poisons and poisonings). The data set used for analysis was all intentional self-poisonings in the State of Vermont in children and young adults under the age of twenty from 2005-2019. The aggregated findings will be used to convene an appropriate focus group of primary care providers and formulate specific questions in order to help illuminate potential preventative practice opportunities.

Software. The data were analyzed using IBM SPSS Statistics (Version 27) predictive analytics software and Microsoft Excel 2016.

Variables. The Northern New England Poison Control Center data extract provided contained the following variables:

- Case number
- Total number of substances used
- Case start date (DD/MM/YYYY)
- Reason for exposure (intentional-abuse, intentional-misuse, intentional-suspected suicide, intentional-unknown)
- AAPCC substance category, subcategory, generic code, generic code name, and Poisindex code
- NNEPCC SASRS database substance group, subgroup
- County of caller
- Caller site, site subgroup
- Caller relationship to patient

- Patient age group number, age group name, exact age number
- Patient gender
- Exposure site
- Management site
- Disposition
- Medical outcome
- Chronicity (acute, chronic, acute on chronic, unknown)
- Route of poison (ingestion, inhalation, aspiration, ocular, dermal, bite, parenteral, otic, rectal, vaginal, other, unknown)

The variables of specific interest to this dissertation are age, gender, exposure site, county of caller, caller relationship to patient, substances used, type and place of treatment, and medical outcome. Table 2 below relates each variable back to the research questions discussed in Chapter 2, page 32:

Table 2

Relation of NNEPCC variables to specific research questions

Research Question	Variable Name	Role in Analysis
1.A	Age, Gender, Exposure Site	Descriptive
1.B	Total Number of Substances Used, AAPCC Substance Category, Chronicity	Descriptive
1.C	Case Start Date, Caller Site, Caller Relationship to Patient, County of Caller	Descriptive
1.D	Medical Outcome, Disposition of Cases	Descriptive
1.E	Age, Gender, Exposure Site, Rurality/ Medical Outcome	Independent/ Dependent
2	All variables used in Research Question 1A-1E	

Data Cleaning. The data were imported from Microsoft Excel into SPSS in order to convert each multi-line case into a single record for ease of analysis. The data were then cleaned to ensure data integrity and meaningful analysis. Specifically, the data were checked to see if there were any missing values, mis-typed values, outliers, or distribution patterns that might affect measures of central tendency. No variable of interest had more than 4% of data missing, with most missing none or less than 1%.

Data Recoding Process. In order to answer research questions 1A-1E, several variables had to be recoded. Some variables were recoded into binary variables, both for the regression analysis and for descriptive analysis. Specifically, the variable PatGenderTxt was recoded from Male/Female into RC_PatientGenderBinary with binary values of 0=Male and 1=Female. The variable PatientAgeGroupNumber was recoded into RC_PatientAgeDich where 0= ages 17 and older and 1=ages 16 and under. The year of exposure was recoded into RC_YearBinary where 0=years 2005-2012 and 1=years 2013-2019. The variable CallerCounty was recoded into a new binary variable RC_Rurality representing 0=Urban (Franklin, Grand Isle, and Chittenden counties) and 1=Rural (all other counties).

Several other variables were recoded based on logical cut points revealed by the frequency analysis. The variable TotalSubstances was recoded into RC_SubstancesBinary where 0=exposure involved only one substance, and 1=exposure involved more than one substance. The variable ExposureSite was recoded into RC_ExposureSiteNumber where dummy variables represent nine discrete categories of exposure location (health care facility, other, other residence, own residence, public area,

restaurant/food service, school, unknown and workplace). After examining the frequency of these categories, RC_ExposureSiteNumber was then recoded into RC_ExposureResidence to represent 0=all exposure sites except for own residence and 1=exposure at own residence.

The variable MedicalOutcome was recoded into dummy variables representing five discrete categories of outcomes to explore potential cut points for the descriptive analysis. Specifically, this new variable, *RC_MedicalOutcome* includes:

- 0=*no effect* plus *confirmed non-exposure* plus *not followed, judged as nontoxic exposure (clinical effects not expected)* plus *unrelated effect, the exposure was probably not responsible for the effect(s)* ;
- 1=*minor effect* plus *not followed, minimal clinical effects possible (no more than minor effect possible)*;
- 2=*moderate effect* plus *unable to follow, judged as a potentially toxic exposure*;
- 3=*major effect*
- 4=*death*

Second, a new variable, *RC_MedicalOutcomeNoMinMod* was created with three outcome states: no effect; minor effect; and at least a moderate effect. This variable kept most of the original information but combined all the outcomes into meaningful buckets while ensuring that there were enough cases in each bucket to statistically analyze. This *RC_MedicalOutcomeNoMinMod* variable includes:

- 0=*no effect* plus *confirmed non-exposure* plus *not followed, judged as nontoxic exposure (clinical effects not expected)* plus *unrelated effect, the exposure was probably not responsible for the effect(s)* ;
- 1=*minor effect* plus *not followed, minimal clinical effects possible (no more than minor effect possible)*;
- 2=*moderate effect* plus *unable to follow, judged as a potentially toxic exposure*; plus *major effect*; plus *death*

Finally, a new binomial variable *RC_MedicalOutcomeEffect* was created by grouping various categories of MedicalOutcome into effect/no effect in order to be able to perform the logistical regression tests. *RC_MedicalOutcomeEffect* is defined as:

- 0=*no effect* plus *confirmed non-exposure* plus *not followed, judged as nontoxic exposure (clinical effects not expected)* plus *unrelated effect, the exposure was probably not responsible for the effect(s)* ;
- 1=*minor effect* plus *not followed, minimal clinical effects possible (no more than minor effect possible),* plus *unable to follow, judged as a potentially toxic exposure,* plus *moderate effect* plus *major effect* plus *death*

Each new variable was relabeled in SPSS and appropriate value definitions added to all for ease of interpretation.

Descriptive Analysis Plan. After data cleaning and recoding, descriptive analysis was performed on the following variables to answer research questions 1A-1D: age,

gender, exposure site, county of caller, caller relationship to patient, type and number of substances used, type and place of treatment, and medical outcome. As appropriate, I conducted the following descriptive analysis on the variables: measure of frequency (count, percent, frequency); measures of central tendency (mean, median, mode); and measures of variation (range, variance, standard deviation). These descriptive tests also allowed me to make informed decisions on how to group and recode variables for later analysis.

The measures of frequency summarize about how often intentional self-poisoning with suicidal intent occurs among Vermonters under the age of 20. Results from the measures of central tendency elucidated the most common profile of young Vermonters engaged in this behavior including gender, age, location of event, number and type of poisoning agents used, and whether or not there was a medical effect. Finally, the measures of variation showed if there was a particular concentration, pattern, or spread of these events that might have implications for informing clinical practice.

Bivariate Analysis:

Regression Analysis. Once these descriptive statistics were analyzed and explored, I used (binomial) logistic regression analysis to answer RQ#1E: Does age, gender, and/or rurality predict medical outcome in Vermont as they have been shown to do in other studies (Rhodes et al., 2008; Pringle et al., 2017). Might exposure site also predict medical outcome? Using this statistical method, I intended to test if the independent variables *Age, Gender*, *ExposureSite* and *Rurality* have any influence on medical outcome (dependent variable). This can be represented by the formula: y =

$b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + c$ where y=*MedicalOutcomeEffect*, x_1=*Age*, x_2=*Gender*, x_3=*ExposureSite*, x_4=*Rurality*, c is a constant, and the various b values are the regression coefficients associated with each independent variable.

In order to help ensure validity with the statistical technique of binomial logistic regression, the *MedicalOutcome* variable was first examined as a five-level variable in order to determine a cut point for making it into a dichotomous (two outcomes) measure. As mentioned in the recoding section, *MedicalOutcome* was ultimately grouped into two outcome groups: No effect=0 and Effect=1. With recoding, the predictors in the model are all categorical (*Age*, *Gender, ExposureSite,* and *Rurality*) and bivariate logistical regression is therefore an appropriate statistical modeling approach. My null hypothesis was that *Age, Gender, ExposureSite, and Rurality* do not influence medical outcome.

Chi-Squared Analysis. Each potential predictor variable was first tested for association with medical outcome using a Chi-Squared analysis. In total, four chi-squared analyses were performed to refine the test for research question 1E: Rurality and Medical Effect; Gender and Medical Effect; ExposureSite and Medical Effect; and Age and Medical Effect. These tests enabled me to build and refine my final logistic regression model.

Phase 2: Focus Group Procedures

Phase 2 of the study used the results from Phase 1 to recruit an appropriate semi-structured focus group in order to answer research question 2: Upon reviewing findings from research question 1, what are the perceptions of practicing pediatricians about

effective clinical or educational interventions that could be implemented in primary care settings in Vermont?

Semi-structured focus groups use pre-determined questions yet allow the conversation to proceed informally with room for unscripted follow-up and probes. The focus group format was developed by best practices on writing focus group protocols and conducting applied research (Krueger & Casey, 2015) and lasted approximately one hour. The semi-structured protocol was informed by the results of the quantitative data analysis but also incorporated information specific to the informant's role and experience with primary care practice and experience with intentional self-poisonings.

Sample. Based on the results of the NNEPCC data analysis, focus group participants were purposefully selected to include four Vermont primary care providers (PCPs) with extensive experience practicing in both rural and urban Vermont settings, who see both males and females under the age of 20, and have experience with Vermont systems of care for intentional self-poisonings. The focus group was not testing actual interventions. Instead, they brought their clinical and practical experience in primary care to enhance my understanding of what is needed to successfully implement and support effective suicide prevention in Vermont primary care settings given the profile developed in the quantitative phase.

Format. Due to concerns about COVID-19, the group was conducted virtually via a University of Vermont Larner College of Medicine secure Zoom link, and recorded and transcribed to help ensure accuracy. Results from the NNEPCC analysis and the

questions used to guide the focus group were shared during the focus group via a pre-prepared PowerPoint presentation built from the results of the data analysis in Phase 1.

Focus group analysis. The focus group transcript was analyzed using qualitative techniques for coding and themes analysis to expand the richness and understanding of possible intentional self-poisoning interventions in their practices. Specifically, the coding and thematic analysis includes within-case and across-case theme development as well as cross-thematic analysis. A second coder was utilized to ensure coding validity and discrepancies in coding between these two individuals were resolved. In the discussion section, I will interpret the results in order to prioritize supports for primary care interventions that might help decrease Vermont's intentional self-poisoning rate and ultimately improve a significant risk factor for later death by suicide.

Assessing Reliability and Validity

Reliability

Cresswell & Plano Clark (2018) address the importance of reliability in interpretation of results. Potential sources of error, and therefore threats to reliability, are researcher error and participant changes (p. 217.) These threats can be minimized by the use of procedures throughout the study to ensure the data received is consistent, replicable, and stable over time. Specifically, this study uses NNEPCC data from 2005-2019 on intentional self poisonings in Vermont adolescents. This data is entered by trained poison center professionals with clear and consistent protocols. The focus group was recorded and transcribed to minimize recollection errors and a secondary coder

helped ensure consistent interpretation. Standardized software programs, data cleaning and analytical procedures were used to analyze both the qualitative and quantitative data.

Validity

Cresswell & Plano Clark (2018) detail several common validity threats inherent in a mixed methods explanatory sequential design, namely:

- Failing to identify which quantitative results are important to explain
- Not explaining surprising, contradictory quantitative results with qualitative data
- Not connecting the initial quantitative results with the qualitative follow-up (p. 252)

This study uses several strategies to minimize these threats. The focus group participants were selected through their relation to Vermont's intentional self-poisoning profile. This clearly articulated the rationale for each participant's inclusion in the study and enabled a more robust grasp of the primary care environment in Vermont. The qualitative data collection questions were designed to explore any quantitative results that seemed surprising. Finally, results from the quantitative and qualitative were integrated at several stages of the study beyond the selection of participants, including the development of the focus group protocol and questions, and the final discussion that informed the proposed intervention recommendations.

Dissemination Plan

The expected audience for this study is Vermont pediatric primary care providers. A secondary audience for this report includes key stakeholders in Vermont's suicide prevention efforts including state policy makers and public health groups.

Although outside the scope of this dissertation, the primary venue for dissemination of this study will be at a Pediatric Grand Rounds at the University of Vermont Larner College of Medicine in May 2021. Grand Rounds are part of the methodology of medical education and usually consist of the presentation of medical problems and new treatment modalities to an audience consisting of doctors, residents, and medical students associated with a particular teaching hospital.

The secondary venue for dissemination of this study (dependent upon COVID-19 pandemic protocols in place) will be at the Vermont Suicide Prevention Symposium in 2021. Attendance at this symposium is primarily professionals working within public health, mental health, medical, education, social service, government, veteran affairs, corrections, and the National Guard. Sponsored through the Vermont Suicide Prevention Center (VSPC), this symposium acts as a resource for disparate groups working through the state on suicide prevention including educators and school health professionals, first responders, social services, health care and mental health services, faith communities, community coalitions, legislators, special interest groups, youth and young adults, and organizations serving the elderly in Vermont.

Chapter 4: Results

NNEPCC Data

Profile of Vermont Adolescents Engaged in ISP with SI

Analysis of the Vermont-specific NNEPCC data involving children and adolescents under the age of 20 who intentionally self-poison with suicidal intent from 2005 through 2019 provides a broad outline of this population. As Table 3 shows below, the population is overwhelmingly female. This predominance of female cases is consistent over time. While the average age for all cases is 16.12 years, the average age for females appears to be younger (M=16.00, SD=1.99) than the average age for males (M=16.55, SD=1.99). The mean age in years of cases also appears relatively consistent over time, with only three years (2013, 2014, and 2015) having a mean age below 16 years old. The standard deviation in the mean age is also fairly consistent over time.

Over ninety percent of the time, the exposure site was their own residence (91.3%) with only school (2.4%), and other residence (1.7%) above one percent. Exposure at health care facilities, public areas, and workplaces were relatively rare, with a combined total of less than one percent of cases happening at those locations. Exposure sites were unknown (1.9%) or classed as other (1.6%) in 3.5% of cases.

Table 3

Number, Average Age, and Percent Female from NNEPCC data, 2005-2019

Year	Number ISP with Suicidal Intent	Percent Change from Previous Year	Average Age (Std. Dev.)	Percent Female
2005	120	-	16.07 (1.99)	82.50
2006	122	1.67	16.15 (1.86)	77.05
2007	105	-13.93	16.42 (2.01)	80.00
2008	111	5.71	16.58 (1.79)	77.48
2009	87	-21.62	16.32 (1.61)	77.01
2010	102	17.24	16.42 (2.10)	78.43
2011	89	-12.75	16.36 (1.87)	79.40
2012	109	22.47	16.17 (2.06)	76.15
2013	135	23.85	15.63 (2.29)	86.67
2014	143	5.93	15.67 (1.87)	71.33
2015	155	8.39	15.66 (2.03)	76.62
2016	175	12.90	16.15 (2.21)	79.43
2017	196	12.00	16.00 (1.92)	82.14
2018	199	1.53	16.27 (2.02)	79.90
2019	155	-22.11	16.30 (1.95)	79.35
Total	2003	-	16.12 (2.01)	78.92

Substances Used by Vermont Youth Engaged in ISP with SI

In most cases, one (70.3% of episodes), two (17.8%) or three (6.7%) substances were identified as potential poisoning agents, but slightly more than 5% use four or more. Table 4 below shows the most common poisoning agents used in ISP with SI by Vermonters under the age of 20 from 2005-2019.

Table 4

Ten Most Common Poisoning Agents Used

AAPCC Substance Category	Frequency	Percent (n=2003)
1. Analgesics	855	42.7
2. Antidepressants	642	32.1
3. Sedative/hypnotics/antipsychotics	296	14.8
4. Antihistamines	170	8.5
5. Anticonvulsants	110	5.5
6. Cold and cough preparations	99	4.9
7. Stimulants and street drugs	96	4.8
8. Cardiovascular drugs	96	4.8
9. Dietary supplements/herbals/homeopathic	69	3.4
10. Alcohols	65	3.2

Note: This table shows the most common substances used for intentional self-poisoning with suicidal intent by Vermont Youth <20, NNEPCC 2005-2019. Since the percentages can include secondary or tertiary poisoning agents used as well as the primary agent, the percentages exceed 100%.

In terms of type of exposure, the NNEPCC data from 2005-2019 shows that 67% of the exposures are acute (meaning a single, repeated or continuous exposure occurring over a period of eight hours or less); and 29% are acute on chronic (meaning a single exposure that was preceded by a continuous, repeated, or intermittent exposure occurring over a period exceeding eight hours). According to the NNEPCC, acute on chronic exposure is most frequently a result of patients taking a large dose of their own medication. Less than one percent of exposures are chronic (a continuous, repeated, or intermittent exposure to the same substance lasting longer than eight hours) and 4% are unknown. There are differences of less than one percent in the exposure types when the data is broken out by earlier (2005-2012) and later (2013-2019) years.

NNEPCC Contacts

Calls to the poison control center for the age range studied have increased from 120 in 2005 to 155 in 2019 but show a lot of variability with a high of 199 in 2018 and a low of 87 in 2009. However, each of the last seven years (2013-2019) have been between 10% and 63% higher than the highest year in the previous eight (2005-2012). Calls typically originate from a health care facility (70.5%) or the patient's own residence (16.2%). Within those broad categories, calls most frequently originate from an acute care hospital (69.7%) or an Ambulance/EMT/Hazmat group (5.8%). Calls were typically made by a medical professional, specifically a registered nurse (28.9%), a medical doctor (26.9%), or "other health professional" (9.3%). Family members are the next highest group contacting the PCC, including mothers (8.5%), fathers (2.6%), grandparents (<1%) and other relatives (<1%). A broad category of "others" are much more likely to call on behalf of the patient (16.7%) than the patient is themselves (1.8%).

As shown in Table 5 below, the county location of the caller shows Chittenden and Windham as the highest, with Franklin, Washington, Rutland, Bennington, Windsor, and Orleans also above five percent. Calculating ISP with SI prevalence rates by county is problematic because the NNEPCC data is reported as originating from the county where the caller is located, not necessarily from the county of residence. Additionally, the data is not by individual, but instead by episode, and likely under-reported due to the voluntary nature of the poison control center's services. However, even with these limitations, it is worth noting that the largest discrepancy between the percent of NNEPCC calls and the percent of Vermont 10-19 year olds resident in the county is in

Windham, as shown below. These results replicate Vermont data from other sources and suggest that Windham might be a high priority location in which to pilot an intervention.

Table 5

Comparison of caller location, NNEPCC data 2005-2019 and 2019 VT population estimates ages 10-19 by counties with highest number of calls

Caller location	Percent NNEPCC calls, 2005-2019	Percent 2019 VT population, ages 10-19, census data
Chittenden	22.8	28.8
Windham	11.1	6.0
Franklin	9.0	8.0
Washington	8.8	9.6
Rutland	8.6	8.8
Bennington	7.9	5.7
Windsor	7.5	7.7
Orleans	5.9	4.0

Finally, the data shows that there are fewer calls to the NNEPCC center during the summer months of June, July and particularly August (accounting for 7.1%, 7.1% and 6.5% of calls respectively) with the highest volume of calls in May, October, and November (9.9%, 9.1%, and 9.0% respectively). When only including the most recent years (2013-2019), this monthly variability is even more pronounced with June, July, and August the lowest at 6.6%, 7.1% and 6.4%, and May, September and October the highest at 10.2%, 9.1% and 9.8%, respectively.

Medical Outcomes and Disposition of Cases

The medical outcome is death or a major effect in a small percent of the cases (1.7%), with an additional 23.1% having a moderate effect, 35.4% having a minor effect, and 26.6% having no effect. Using the recoded binary medical outcome variable (0=no

effect and 1=effect) shows that there has been some change in the percent of cases each year that exhibit some medical effects. Table 6 shows that the percent of cases showing some medical effect ranged from a low of 62.96% in 2013 to a high of 80.00% in 2019. There does not however appear to be a pattern based on earlier versus later year groupings.

Table 6

Comparison of medical outcome by year, 0=no effect, 1=effect

Year	Mean	N	Std. Deviation
2005	.70	120	.46
2006	.76	122	.43
2007	.68	105	.47
2008	.72	111	.45
2009	.64	87	.48
2010	.78	102	.41
2011	.71	89	.46
2012	.72	109	.45
2013	.63	135	.48
2014	.66	143	.48
2015	.74	155	.44
2016	.70	175	.46
2017	.76	196	.43
2018	.77	199	.42
2019	.80	155	.40
Total	.72	2003	.45

Over 12% of the cases were not or unable to be followed but judged as unlikely to have any or only minor clinical effects (5.2%) or judged as potentially toxic (6.8%) based on the initial report. Slightly less than half were treated/evaluated and released (45.4%), with others admitted to a critical care unit (18.8%), a psychiatric facility (17.3%), or a

non-critical care unit (7.5%). Almost seven percent refused a referral/didn't arrive at a health care facility (3.5%), or were lost to follow-up (3.4%).

Regression Model Development

Chi-squared analysis helped build a model to test if age, gender, and/or rurality predict severity of medical outcome in Vermont as they have been hypothesized to do in other studies (Rhodes et al., 2008; Pringle et al., 2017). I also used chi-squared analysis to test if exposure site might also predict severity of medical outcome. Four chi-squared analyses were performed: Rurality and Medical Effect; Gender and Medical Effect; Exposure Site and Medical Effect; and Age and Medical Effect.

Rurality and Medical Outcome. The first analysis used the RC_Rurality variable where 0=contacts originating from urban counties and 1=contacts originating from rural counties. Of the 1953 cases with data on county of call origin and medical effect, 32.92% were from urban counties (n=643) and 67.08% were from rural counties (n=1310). RC_Rurality was first compared to the RC_MedicalOutcomeEffect and then to the RC_ MedicalOutcomeNoMinMod to check if there was an association between rurality and medical effect. The first analysis (urban/rural and no effect/effect) showed a significant Pearson chi-squared association between rurality and medical outcome $\chi^2(1, N = 1953) = 5.774$, $p = .016$. The second analysis (urban/rural and no effect/minor effect/at least moderate effect) also showed a significant association of $\chi^2(2, N = 1953) = 16.790$, $p < .001$. These findings suggest that rurality should be included in the binomial regression model.

Gender and Medical Outcome. The second construct used was a recoded gender variable where 0=male and 1=female. Of the 2002 cases with data on gender and medical effect, 21.08% were male (n=422) and 78.92% were female (n=1580). RC_GenderBinary was first compared to the RC_MedicalOutcomeEffect and then to the RC_ MedicalOutcomeNoMinMod to check if there was an association between gender and medical outcome. The first analysis (male/female and no effect/effect) showed a significant Pearson chi-squared association between gender and medical outcome of $\chi^2(1, N = 2002) = 6.601$, $p = .010$. The second analysis (male/female and no effect/minor effect/at least moderate effect) also showed a significant association of $\chi^2(2, N = 2002) = 11.892$, $p = .003$. These findings suggest that gender should also be included in the binomial regression model.

Age and Medical Outcome. The third construct tested was a recoded age variable where 0=17 years old and older and 1=16 years old and under. This cut point was chosen because approximately half the cases fall below 16 and half above (54.5% of the cases are 16 and below, the mean is 16.117 years, and the median is 16.000 years). As with the others explored above, RC_PatAgeDich was first compared to the RC_MedicalOutcomeEffect and then to the RC_ MedicalOutcomeNoMinMod to check if there was an association between age and medical outcome. The first analysis (less than or equal to 16 years old/equal or greater than 17 years old and no effect/effect) showed a significant Pearson chi-squared association between age and medical outcome of $\chi^2(1, N = 1991) = 6.053$, $p = .014$. The second analysis (less than or equal to 16 years old/equal or greater than 17 years old and no effect/minor effect/at least moderate effect) also

showed a significant association of $\chi^2(2, N = 1991) = 12.890$, $p = .002$. These findings suggest that age should also be included in the binomial regression model.

Exposure Site and Medical Outcome. The fourth construct tested was a recoded exposure site variable where 0=all other exposure sites and 1=exposure at own residence. This variable was divided this way because over 93% of ISP with SI of Vermont youth take place at their own residence. Of the 2003 cases with data on exposure site and medical effect, 8.74% of the sites were other (n=175) and 91.26% were at own residence (n=1828). As with the others explored above, RC_ExposureResidence was first compared to the RC_MedicalOutcomeEffect and then to the RC_ MedicalOutcomeNoMinMod to check if there was an association between exposure site and medical outcome. The first analysis (other site/own residence and no effect/effect) showed a non-significant Pearson chi-squared association between exposure site and medical outcome of $\chi^2(1, N = 2003) = .630$, $p = .427$. The second analysis (other site/own residence and no effect/minor effect/at least moderate effect) also showed a non-significant association of $\chi^2(2, N = 2003) = .705$, $p = .703$. These findings suggest that exposure site should not be included in the binomial regression model.

Regression Analysis

The results of the chi-squared analysis changed the independent variables I included in my binomial regression analysis. I had intended to test if the independent variables *Age, Gender*, *ExposureSite* and *Rurality* have any influence on *MedicalOutcomeEffect* of outcome (dependent variable). The Chi-squared analysis above suggests however, that I should not include exposure site. This means that my research

question 1E is now refined to test the influence of only age, gender, and rurality on medical outcome.

As Table 7 shows, the independent variables *Age, Gender*, and *Rurality* are associated with *MedicalOutcomeEffect* of outcome (dependent variable). All independent variables show significance as predicted via the earlier Chi-squared analysis. The regression coefficients can be interpreted as the odds ratios. That is, younger ages have an approximately 24% higher likelihood of having a medical effect than older ages, females have a 36% higher odds of an effect than males, and someone calling from a rural county has a 31% higher odds of having a medical effect than someone calling from an urban county. The Cox and Snell R square is 0.009 and the Nagelkerke R Square is 0.013. This implies that age, gender, and rurality account for approximately 1% of the likelihood of having a medical effect.

Table 7

Binomial regression results showing the association of age, gender, and rurality on medical outcome for Vermont youth who ISP with SI.

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	0=ages 17-19, 1=16 and under(1)	-.219	.103	4.483	1	.034	1.245
	0=male, 1=female(1)	.305	.132	5.382	1	.020	1.357
	0=Urban County, 1=Rural County(1)	.273	.111	6.108	1	.013	1.314
	Constant	.700	.078	79.960	1	.000	2.013

a. Variable(s) entered on step 1: 0=ages 17-19, 1=16 and under, 0=male, 1=female, 0=Urban County, 1=Rural County.

Implications for Phase 2

Focus Group Recruitment. With the data analysis for Phase 1 complete, I was able to use the results to design the Phase 2 focus group protocol. Recruitment was purposeful to ensure a comprehensive representation of the primary care landscape in Vermont as it related to the descriptive and statistical results of the NNEPCC data analysis. Since age, gender, and rurality were shown to have an association with medical effect, I recruited focus group participants from both urban and rural practices serving both male and female adolescents. Further, since some medications clearly prescribed for adults (in particular cardiovascular drugs), were on the most commonly used poisoning agents list, I also recruited a family medicine doctor who sees both children and adults in her practice. As a result, the final focus group included four primary care providers with deep clinical experience treating the population revealed in Phase 1.

Focus Group Questions. The data analysis from Phase 1 also informed the development of the focus group questions. The participants were asked a series of questions created to help understand their experience treating adolescents in Vermont, what they thought of the NNEPCC data analysis results, what strategies they currently use to identify and follow-up with at-risk adolescents, and what additional practices they think might hold promise to improve care for our target population. Specifically, the questions were:

1. Can you describe your experience treating adolescents in your practice*?*

   (Probe: How long have you been there? What is your background?)

2. Here is the data I've collected from the Northern New England Poison Control Center about the particular risk profile of Vermont adolescents around intentional self-poisoning with suicidal intent. What are things about these findings that surprise you? That don't surprise you? *(Probe: Do you see any trends in your office that are different than the trends I'm describing?)*

3. What practices have you come into contact with in your offices that seem to offer promise for identifying and treating adolescents at risk for intentional self-poisoning and suicide? *(Probe: What cultural or environmental factors in your practice present the most challenges to addressing this issue? What factors or systems present some opportunities?)*

4. Here are some promising practices in use in primary care to help improve the outcomes associated with intentional self-poisoning in adolescents. How do you think they would translate to your clinical practice?

5. What supports would you need to implement these interventions in your clinical practice? (*Probe: How could these supports best be provided?)*

6. What advice would you have for other Primary Care Providers in Vermont as they face similar challenges in the area of intentional self-poisonings?

Focus Group Data

Profile of Focus Group Participants

A semi-structured focus group consisting of four primary care providers who currently see Vermont adolescents was held remotely on December 18, 2020 via a secure

Zoom link. The results of the NNEPCC data analysis and the focus group questions were shared with the participants via a prepared PowerPoint presentation. Participants had a combined 74 years of experience providing primary care services. As informed by the Phase 1 data results, the participants consisted of one male pediatrician with extensive behavioral health experience providing primary care services to a predominately rural population including (mostly male) adolescents. The other three participants were female providers; two of them are currently pediatricians in a large urban practice and the third was a family medicine doctor in a large urban practice who runs an adolescent clinic weekly. The family medicine doctor also has extensive experience in providing both behavioral and medical primary care services to adolescents in non-primary care settings. One of the other pediatricians is currently also responsible for resident education at a large urban medical school, and another of the pediatricians currently in an urban practice has spent the majority of her career engaged in rural medicine.

The expertise of the focus group participants is summarized in Table 8 below. (Note that as one participant joined the call late, I solicited their practice and experience details after the focus group via email.) This mix met my intended goals of having a broad array of both experienced and relatively new Vermont primary care providers representing care to a wide range of adolescents in both urban and rural settings. In addition, all participants have been the primary care provider for Vermont adolescents who have intentionally self-poisoned.

Table 8

Experience of focus group participants

Clinical Experience	Participant "A"	Participant "B"	Participant "C"	Participant "D"
# Years (Y)	23	20	6.5	25
Pediatric/Family Medicine (P/FM)	P	P	P	FM
Urban Setting (current=U/past=u)	u	U	U	U
Rural Setting (current=R/past=r)	R	-	r	r
Adolescent Panel-Male (M)	M	-	-	-
Adolescent Panel-Female (F)	-	-	-	-
Adolescent Panel-Mixed (X)	-	X	X	X
Behavioral Health (BH)	BH	-	-	-
Substance Abuse (S)	S	-	-	-
Adolescent Medicine (A)	-	-	-	A
Social/Medical Complexity (C)	-	C	C	-
Medical Education (E)	-	E	-	-

Coding

After transcribing and reviewing the focus group recording, and after discussion with the second independent coder to resolve discrepancies, I created a coding matrix with the following primary and secondary themes:

Table 9

Categorical Coding Matrix with Primary and Secondary Themes

Primary Themes	*Secondary Themes*
NNEPCC data	*Reactions to ISP with SI data; Role of social media*
Current Practices	*Screening, Communication/Follow-up; In-office counseling*
Needed Supports for Improving Care	*More time; Increased behavioral health; Potential promising practices; Communication/Follow-up*
Requested Education	*No handouts; Education for patients; Education for parents; Education for providers*
Gaps/Barriers	*Lack of access to behavioral health; Strategies for increasing access*

Interpretive Findings

As shown in Table 9 above, my five primary themes were NNEPCC Data, Current Practices, Needed Supports for Improving Care, Requested Education, and Gaps/Barriers. In the sections below, I detail the results of each concept as developed chronologically through the focus group process.

NNEPCC Data. The theme NNEPCC Data arose from presenting the analysis of the Northern New England Poison Control Center secondary data analysis to the primary care focus group. After presenting the data verbally and via a shared PowerPoint slide deck, I asked the participants to comment on the data through a primary care lens. Several of the initial responses asked for clarifications on the data, for example: "Are opioids considered analgesics," "Can you explain what counts as an effect," and "Is marijuana listed as a drug?"

Two participants commented on the list of most commonly used substances. Both participants agreed that kids are likely using substances that are readily available to them in their houses or social circles including their own or a family member's medications and alcohol. They commented:

> "What's most accessible to kids is alcohol….I mean probably, well, obviously a lot of what gets used depends on what you know, what prescription medications parents have, and my guess is that there are a lot of parents out there who have anti-hypertensive medications. That's

> probably one of the most commonly prescribed medications, so that's not a surprise that it's one of the more commonly used in overdose attempts."
>
> "No, I feel like again like if you have someone, whether it's preplanned or it's impulsive, they are going for what they have access to, like and they likely may not even know what the medication does, but it's there, and so you know. It doesn't surprise me."

The importance of this message, and restricting access to all medications in the household given this information was discussed as a promising strategy later in the focus group.

The participants were also not surprised that calls originating from a rural county had higher odds of having a medical effect than calls originating from an urban county. As became clear later on in the focus group, the participants see a lack of equity between the social, care management, and mental health resources available in urban versus rural counties in Vermont as a source of major health disparities.

An additional secondary theme that emerged revolved around social media. The providers spoke for several minutes about possible sources of information used by young people, and the role media/ social media might play in suicide attempts. This was not a part of the NNEPCC data analysis, but emerged spontaneously during the time we were discussing the results. One provider noted, "There's actually a book that was going around that, of different ways to kill yourself when my kids were in middle school." Another wondered, "What's on social media in terms of, you know sites that might be giving kids advice on how to hurt themselves?"

Current Practices. The next theme, Current Practices, was also relatively informational/didactic in nature. Participants all agreed that they use screening in their offices to decide which patients are engaging in risky behaviors and need further follow-up. All adolescents are screened at well-visits in all the practices. The most common screening tool used is the PHQ-9 modified for teens. Several practices also use the CRAFFT specifically for gauging risky behaviors and the GAD 7 for understanding patient anxiety. Of note, all these screening tools are evidenced based and considered best practice when working with adolescents. One participant noted they provide information on "[r]isky behaviors in general. It opens a conversation." Another participant agreed and elaborated:

> Yeah, and some of the questions on the CRAFFT, in the secondary area of the CRAFFT, when they ask about like are you doing it alone or are you doing it to relax? It does often help identify kids that aren't just . . . you know, a lot of kids are using occasional, you know, experimentation with marijuana or alcohol, but there are then those other kids that they're using it to try to self-medicate. So I mean, I love that we use the PHQ-9 modified for teens with the CRAFFT at all of our adolescent visits and I personally use the PHQ-9 and the GAD 7 for anxiety for most of my . . . mood follow-ups. So just kind of something to follow.

One participant highlighted another reason to use these screening tools beyond identifying at-risk behaviors, namely that they are "sort of the common language now between psychology, psychiatry and the medical home" that enables more effective

communication and coordination between the various providers working with each patient. This insight straddled the secondary themes of screening and communication and provides a path to further improvement. Specifically, all providers noted that while they do get much appreciated notifications from hospital emergency rooms (ER) when a patient of theirs is seen, this communication is usually only a fax or automatic notification in the medical record (in the case of practices affiliated with the hospital). One provider mentioned that an ER doctor called once when they were particularly worried about an admission being a suicide attempt, but that was the only time they had been directly contacted. Another noted:

> I do get notifications from the ER via fax. I rarely get a call. Sometimes that notification includes a copy of the note. But frequently it's just a notification that the patient was seen, and there's no diagnosis, so there's some problems sometimes with the EMR [Electronic Medical Record].

Several participants expressed the desire for more communication with the ER and had some ideas about what additional support would be helpful. These ideas will be discussed in the "Needed Supports for Improving Care" section below.

The PCPs noted that they never get follow-up calls from the poison control center unless they called in the episode in the first place. Several noted that they do routinely get follow-up calls from "First Call", a 24 hour crisis hotline staffed by specialists from Vermont's largest designated mental health agency, if the patient goes to the ER. (Although not mentioned by the focus group participants, Vermont's other counties have

similar crisis hotlines as well and everyone in the state has access to a Vermont-wide crisis text line.)

Needed Supports for Improving Care. The next theme captured which additional interventions the participants could envision piloting in Vermont. Interestingly, most of this discussion centered around potential supports or interventions in primary care, but much of it also involved interventions outside primary care, such as specialty (i.e. behavioral health) or acute care (i.e. emergency rooms) settings.

More Time. As mentioned earlier, all the providers screen adolescents during their preventative well-care visits. Anyone identified as "at-risk" receives enhanced screening referral and personalized care management. The participants said many times during the focus group that they could not visualize offering enhanced screening to their entire adolescent panel because there simply wasn't enough time or resources to do that. Even one of the better resourced participants summarized this by saying: "I mean to do that with every single adolescent if there's no concerns, I don't feel like that's feasible 'cause there's already so much I can't cover….that's why we do those screening tools is so we can identify what things need to be addressed during the visit."

Increased Behavioral Health. One participant noted they would like more information on treatment modalities like Dialectical Behavior Therapy or similar evidenced-based therapies which could be used in the office with at-risk patients: "if there were something about DBT or . . . strategies you could use in the office to talk about that approach? I would, I would be interested in that. I've had to self educate on that front, but never know what's truly helpful and what's not . . . " Three providers

mentioned the critical support offered by co-located behavioral health and care coordinators such as social workers and psychologists. They also noted that access to these resource varied widely between large or urban and smaller or rural practices. Two of the providers in the focus group had access to co-located social workers and two did not.

Communication/Follow-up. All the doctors in the focus group thought that some of the evidenced-based active follow-up techniques discussed in the literature, such as Postcards from the EDge, were not suited to adoption in adolescent primary care in Vermont. One stated, "I think we are so small that a postcard seems actually impersonal." Another noted, "Yeah, when I do active follow up, I call, I get on the phone and call the patient myself." A third explained that a follow-up phone call was a good opportunity to reach the parents of an at-risk teen:

> and I think it's actually more effective that way. So and maybe obviously because I came from private practice first I think . . . that's not even something I would have my triage nurses to do. That's something I would do personally. You know and call the family and chat with them and you know I do, I do the counseling and the risk reduction for families of kids that flag on either the, you know, a PHQ-9 for major depression or the PHQ-9 that on the bottom has the suicide attempts or has seriously considered harming themselves or ending their life.

Potential Promising Practices. Promising Practices captured some ideas that the primary care providers thought would improve care to Vermont kids at-risk for suicide attempts. The providers mentioned that many of these were "pie in the sky" ideas. One proactive outreach strategy that was specifically suggested involved a visiting nurse model currently used in rural areas for both younger children as well as senior citizens. One provider stated:

> One of my dreams would be to have a like a VNA, a visiting nurse, go out to the house when there's a report of a situation like this and go out and sit with them and like actually help them go through their cabinets and identify things and talk to them like actually in the house in the setting. One of the most lethal overdoses I had have known about was with Benadryl, and I don't think, I mean, just an example of how a lot of families wouldn't expect that that was such a problem. A lot of people know about Tylenol but might not know about other things.

Another provider concurred:

> That's a great idea, and though I don't have any population with it or any sense of the aging population, but I know that there are some programs that do that for old folks will go in and say, you know, you know, here's a mat you're more likely to slip and fall on that, and you know just looking at safety things in their homes if they could do something similar with families that have adolescents.

Another idea involved increased screening and communication with the emergency rooms when patients are seen for a suspected suicide attempt. One provider said that in suspected suicide attempts, often the emergency attending doctor will get a consult with a psychiatric service. They added, “It would be great to get a call from, I know the ED doc’s not gonna call me, they're busy, I get that. But if the consultant could call, that would be really helpful. I would find things out a couple of days earlier that way.” Another participant added:

> Wouldn't it be nice, if, well, wouldn't it be nice if in the ED that they could establish who the psychologist is, if that kid has one, and include that in their communication? Like maybe be like ‘let's ask this family about their mental health supports currently?’ Some sort of screening tool, it says like they have this, they have this, they don't have this. And if they don't have it, insert . . . a referral to [a treatment center] or a number for a therapist. Something that begins instead of just jumping to the conclusion that they need to go to the medical home would be nice to have . . . Yeah, some support from the ED.

The participants also expressed a desire for increased communication and coordination with school health. In response to noticing inequity across the state concerning who had access to high quality school health programs, one provider mentioned that a standardized health curriculum for high school students across the different Supervisory Unions would be helpful. Another provider agreed, saying “I was just gonna say the connection with school, school nurses, school health.”

Requested Education. Several types of education for patients, providers and parents emerged as another theme during the focus group. These ideas included the patient, parent, and provider information as well as improved materials for primary care offices.

Patient Education. Three participants mentioned that they have magnets or other resources with crisis phone and text numbers and one specifically said they have their patients put those numbers in their phones during the office visit. Another said they do not hand out the crisis materials, but having the magnets or posters in their offices helps them remember the numbers themselves to give to patients. One mentioned that perhaps having the Poison Control number on the same card would be helpful. Most participants thought that additional handouts would not be useful. They said that they already hand out a lot of anticipatory guidance and fear it gets recycled on the way out of the office, isn't read, or never makes it home to the parent. Instead, they thought that having signage in the exam rooms with the national suicide textline would be helpful. All agreed their office signage was outdated and presents an opportunity for improvement:

> Like right now, I think [participant] and I can attest there are some safe driving in teenagers posters in our exam rooms that appear to be 25 plus years old that probably could be replaced with something a little bit more important . . . 'cause people are often hanging out in the rooms looking at their phone like . . . national suicide textline is there. Are there already good things that are have been developed that we can laminate to be in

> compliance and stick on the wall? I guess I feel like the handouts are gonna go in the trash.

Several of the providers mentioned that part of adolescent medicine involves empowering teens to make their own decisions about risk and safety. Parents are often not present at the visit, nor are they managing the teen's medication at home. In addition, there are both legal (HIPAA and FERPA) and individual patient privacy concerns when communicating with adolescents and their parents. This makes it more challenging for providers to counsel parents of at-risk teens about safe storage or available crisis resources than it would be, for example, to counsel parents on safe storage of a grandparent's heart medication when they have a toddler. Two participants said that they provide counseling on means restriction with patients they have concerns about but, again, that this isn't feasible to do with every patient. One doctor summarized this as:

> I talked to families really intentionally about it and kids that have shown any risk. But I have also started talking to any of my older adolescents that are on particularly things like Adderall that are going off with their own 30 day supply of it. Their families aren't helping manage it anymore. And so, I often talk to them about like just being careful with it and considering keeping, you know, keeping it locked or still keeping it where their family can keep an eye on it because other people might want it and just kind of also just saying like, this can be dangerous with too much. And you know, I have my college kids, I talked to them about getting a medication lock box just because , you know, again, like, I'm hoping that it's one more step

> and also that it's again there are, it just kind of brings up a conversation of this is an abuse-able and mis-usable medication and I'm sure it's, you know, not trying to say like you will, but other people may and so I do bring that up.

Parent Education. As already discussed, the participants noted that for both logistical and privacy reasons, parent education is challenging with this patient population. One of the doctors noted:

> But I'm thinking about this as far as this idea of, I think age makes a really big difference 'cause I'm mostly I'm seeing the older adolescents who you know like actually are, you know, with the transition out of the pediatric and so they're not having that parent involved as much …. [A] 13 year old, that is going to be a different follow up then with the 18-19 year old to some degree. I'd be, you know, if there was a kid that young, you know we would have this, you know, full wrap around, and with the older kids they're a little bit more isolated.

None of the focus group participants were surprised to see medications typically prescribed to parents and grandparents on the list of most commonly used poisoning agents. However, the pediatricians rarely spoke to parents of adolescents about safe medicine storage despite routinely having safe storage conversations with parents of their toddler patients. The one family medicine doctor, who sees all ages as patients, noted:

> As a family physician who's prescribing to adults, to parents, I know if it was opioids, and I know they have teenagers, I'm, like, am likely to caution them about keeping them locked up, but if it was a blood pressure medication . . . I wouldn't think to warn them.

Gaps/Barriers. The coding category Gaps and Barriers captured what the focus group felt were two big challenges for addressing adolescent self-poisoning with suicidal intent in Vermont. The first centered around issues of resource equity between Vermont Counties. This was typically seen by the participants as a rural/urban divide where larger urban practices and school districts have greater access to high quality support such as social services, care managers, and mental health providers. One provider stated:

> I mean, I think honestly . . . the other thing that I just find so disconcerting is that there isn't, there isn't equal access and equal resources in the rural areas. And I saw this horrible thing . . . where I was before and it was notoriously horrible with like six month waits and nobody would go to see the kids in crisis. And it was just, it was just horrifying, you know. And it's like everybody talks about the [designated agency in the largely urban Chittenden County] and makes this assumption that that's what every, you know, area the state has access to and it's just not what they have.

Another agreed, saying:

> I know I was at a conference about . . . where the folks at [a treatment center in Chittenden County] were presenting their program and how it's a fabulous program, but it was very clear that it was only at this one part of the state that that was available, and if you were anywhere else, there's nothing like [this treatment center] anywhere else that really focuses on adolescents.

Another said that some schools also have high quality health classes where kids tell him "they have a great class that talks about all sorts of things" but that not all high schools do. One provider mentioned this was of particular concern right now during the COVID-19 pandemic as schools that were typically a source of support for families were remote and less able to fill in the gaps in some historically under-resourced rural areas.

The second area identified as a barrier was lack of communication between the various providers serving at-risk adolescents in general in Vermont. One provider summarized how critical it was to strengthen the resources and connections between schools, primary care offices, and behavioral health providers in Vermont:

> you know your suicides are happening in areas where it's more rural and they don't have access to services, you know like, then can we strengthen the services? And at the same time, obviously yes, can we strengthen the education in the, in those school districts? And can we strengthen the partnerships to their primary care providers?

Chapter 5: Discussion

Implications for Practice

Mertens (2015) states that mixed method approaches are particularly good for so-called "wicked problems" because they allow participants to be part of the process through solution identification and the sharing of their expertise. This explanatory sequential mixed methods study included both quantitative and qualitative analysis to provide a rich understanding of the opportunities and challenges in identifying and treating Vermonters under the age of 20 who intentional self-poison with suicidal intent. My ultimate goal was to support the development of primary care interventions that would be informed by and adapted to the particular clinical and geographic realities of the (predominately rural) state of Vermont. The discussion below is organized around possible interventions which address the primary and secondary themes identified from the focus group and presented in Table 9, page 61. The discussion concludes with a sample implementation plan utilizing the Damschroder et al. (2009) Consolidated Framework for Implementation Research (CFIR).

Current Practices

Identifying youth at risk is critical. The providers appreciated the timely information gleaned from the NNEPCC dataset and thought it would potentially help identify at risk kids and behaviors. Every primary care provider interviewed in the focus group reported screening all adolescents for depression, suicidal thoughts, and previous suicide attempts during their well-care visits with validated screening tools. Their experience certainly has implications for the education of other Vermont PCPs who may

not already be screening their adolescent panels with validated tools. Training on use and interpretation of the PHQ-9 modified for teens, the GAD 7, and the CRAFFT screening tools state-wide would seem particularity appropriate based upon the experience of the focus group. The PHQ-9 modified for teens contains a specific question on suicidal ideation already, and the findings from this study could be used in combination with that question to make screening for self-harm attempts in primary care even more explicit.

However, according to the Vermont Department of Health's 2016 *Adolescent Well Visit* brief, only around 50-80% of Vermont adolescents are thought to have an annual well-care visit. Increasing adolescent well-care visit rates has been a priority of the Vermont Department of Health and the primary care community in Vermont for many years. The Centers for Medicare and Medicaid Services (2014) released a report on strategies for increasing adolescent well-care visits (Centers for Medicare and Medicaid Services, 2014) that was used to develop a list of high priority policy level, community and systems level, and practice level improvement strategies by the Oregon Pediatric Improvement Partnership (2015). A suggestion for future activities is to meet with the Vermont-based primary care providers again to see which of these strategies they perceive as critical additions to efforts already underway in Vermont.

The PCPs participating in the focus group likewise emphasized the importance of timely communication among the various providers whenever at-risk children and youth are identified. Like adolescent well-care visits, parts of this system are already in place. However, schools, behavioral health specialists and acute care settings like the emergency room could benefit from bi-directional communication mechanisms with

primary care providers. A promising first step would be to work with the State of Vermont's only tertiary care hospital, the University of Vermont Medical Center, to develop a protocol for screening all adolescents seen in the emergency room for suicide risk. As suggested by the focus group, this screening could also include questions on the supports currently in place for the adolescent and their families, timely communication with the primary care doctor, and personalized follow-up. Once developed, this protocol could be rolled out to the other Vermont community hospitals along with training and support for their staff.

Requested Education and Needed Supports for Improving Care

It was clear during the focus group that communicating the profile of youth engaging in intentional self-poisoning with suicidal intent to PCPs would be critical, especially around the potential issues of missing at-risk males, prevalence of use of adult medications, and impact of rural geography. Although the initial profile developed through this study was broad, in the future more specific profiles could be developed depending on what type of information might prove most useful to providers. The NNEPCC data also has tremendous potential to be used for better surveillance, with regular, timely reporting on specific areas of interest. However, the focus group was also clear that translating that research knowledge into successful clinical encounters will require additional training and education. Therefore, these two themes are inextricably tied together when moving into implementation strategies.

Specifically, the clinicians thought that any provider or patient/caregiver education would need to take into account one of the challenges inherent in adolescent

medicine: the transition from simultaneously working with the caregiver/child dyad to encounters primarily with the adolescent. They categorically rejected the use of additional handouts for adolescent patients under the well-observed phenomena that these usually ended up in the recycling or garbage on the way out of the office. Instead, they wanted updated materials for display in the exam rooms with messages around risk factors and resources including that death by suicide is preventable, safe storage of means is effective, and support like crisis phone and text lines are available 24/7. They stated these materials give the provider something to point to when speaking with the teen, and an opportunity to encourage them to put the resources into their phone during the visit.

It is notable that the primary care providers in the focus group inquired about the role of social media in intentional self-poisonings with suicidal intent despite it having no representation in the NNEPCC data analysis. As was clear from the transcript, they would like more information on where youth are getting information on ISP and what role social media might play in their mental health and decision making. Much research is exploring the parallel increases in widespread social media use, depressive symptoms, and suicidality, particularly among females (Kelly et al., 2018; Luby & Kertz, 2019; Twenge et al., 2018). Data from these studies could be used to supplement the NNEPCC data to provide more specific information to the primary care providers in the future.

A second body of research is beginning to explore the ways in which social media can help with suicide prevention efforts, with Robinson et al. (2016) publishing a review of these studies. The Suicide Prevention Resource Center also has a recently released toolkit on Mental Health and Suicide Prevention with particular focus on supporting at-

risk people during the COVID-19 pandemic (*National Response Action Plan Promotional Toolkit | National Action Alliance for Suicide Prevention*, n.d.). It features ready-to-use infographics, and key talking points as well as videos and sample social media posts. One provider's stated technique of framing discussions around safe storage of medication in terms of protecting other people (friends, roommates, or siblings) would also seem to be an important learning opportunity. That technique could be used to encourage learning and behavior change precisely because it capitalizes on the social changes in adolescence that shift the focus away from parents and towards friend groups, including in social media usage.

The clinicians also requested additional training on brief interventions they could use in the office setting for increasing the efficacy of their discussions with adolescents. The Suicide Prevention Resource Center (*Resources and Programs | Suicide Prevention Resource Center*, n.d.) has a searchable listing of resources and programs. Three that appear particularly appropriate for increasing providers' comfort and skill with these types of discussions in adolescent primary care settings include: Problem-Solving Therapy, Motivational Interviewing, and the Counseling on Access to Lethal Means module. Training for primary care providers in these modalities and resources could be offered through either a professional organization like the Vermont Chapter of the American Academy of Pediatrics, or in a quality improvement learning session format. The NNEPCC data analysis also reveals an opportunity to work with adult primary care providers since the list of common poisoning agents includes medications prescribed primarily to adults.

Gaps/Barriers

Many of the gaps and barriers identified in this research center around health disparities, including lack of access, in rural Vermont communities. The NNEPCC data suggests an association between a higher likelihood of a medical effect and residence in a rural county. The focus group participants, many of whom had practiced primary care in rural Vermont communities, reiterated the differences between the behavioral resources available in urban versus rural Vermont counties. Although the nature of the NNEPCC data makes calculating exact prevalence rates impossible (see limitations section below), the NNEPCC data aligns with other Vermont data sources (*Intentional Self-Harm and Death by Suicide, 2019 | Vermont Suicide Prevention Center*, 2019) in suggesting that one rural county in particular, Windham, would be a meaningful place to pilot any intervention due to its relatively high number of calls to the NNEPPC.

Finally, the focus group expressed concern that these disparities are being exacerbated by the COVID-19 pandemic because the shift to remote learning has removed the prominent safety net traditionally provided by schools in rural communities. Although outside the scope of this research, this suggests that keeping rural schools open, and expanding telehealth options in rural communities, should be of primary importance during the pandemic.

Implementation Considerations

The use of a structured implementation framework such as the Consolidated Framework for Implementation Research (Damschroder et al., 2009) can help guide implementation decisions when attempting to move from theory to practice (Keith et al.,

2017). The Consolidated Framework for Implementation Research (CFIR) is increasingly being used in health care settings and incorporates many decades of research in implementation science. It has five broad constructs that have been shown to influence the success or failure of implementation efforts. These constructs are 1) the intervention characteristics, 2) the outer setting in which the intervention takes place, 3) the inner setting in which the intervention takes place, 4) the characteristics of individuals involved, and 5) the actual process of implementation (Damschroder et al., 2009).

The remainder of this discussion will provide an example of using this research and the CFIR to develop an implementation strategy for one of the interventions identified above - means restriction. Means restriction has a strong evidence base. It is also something that many primary care providers have heard about or do in certain contexts (like counseling for parents of toddlers) but have perhaps not received formal training on in the context of intentional self-poisonings with suicidal intent. In this example, the CFIR will be used for formative evaluation – that is, to identify potential barriers and facilitators to practice change prior to undertaking the proposed policy implementation in order to increase its chances of success.

CFIR Construct 1: Intervention Characteristics

The sub-constructs in the CFIR relate to the source of the intervention, the strength of evidence behind it, the ability to trial the intervention and adapt it to local conditions, and its cost. For my proposed scenario, the intervention source will be the Vermont Chapter of the American Academy of Pediatrics (VT-AAP), and the Vermont American Academy of Family Physicians (VT-AAFP). They are the best-practices

resources for the pediatric and family medicine primary care providers in the state and have impeccable legitimacy in the medical community. They can also provide trusted information on the pressing need for and evidence base behind the policy intervention.

Further, these two professional organizations, the Vermont Department of Health, and the Vermont Department of Mental Health also regularly work with a quality improvement program at the University of Vermont, the Vermont Child Health Improvement Program (VCHIP). VCHIP runs annual collaborative projects to improve child and young adult health with almost all the family medicine and pediatric practices in Vermont. VCHIP has a high degree of legitimacy as well because they use a quality improvement coaching model to make sure the intervention can be adapted and trialed to meet the particular office flow and system at each individual practice.

The complexity and cost of implementing this policy in the medical home are also low. Although means restriction is a complex social and political issue, it becomes a more straightforward safety issue when presented in the medical setting. There are numerous grants available that allow practices to provide firearm safety locks and medication storage options for little to no cost to the practice. There is also a free on-line evidenced-based protocol called "Counseling on Access to Lethal Means" (CALM) specifically for training medical professionals in the office setting. This protocol "covers how to: (1) identify people who could benefit from lethal means counseling, (2) ask about their access to lethal methods, and (3) work with them—and their families—to reduce access" (*Counseling on Access to Lethal Means | Zero Suicide*, n.d.) Development of a

shorter module, focused specifically on the issue of young people and intentional self-poisoning, might be even more appropriate for educating busy primary care providers.

One possible barrier to implementation is the time counseling will take if it is added to the already busy format of the adolescent well-care visit. This could be mitigated by adding CALM questions into the routine but brief screening for depression, self-harm, and substance abuse. This would quickly screen for people who could benefit from the comprehensive lethal means counseling while not extending the office visit unnecessarily for those for whom it might not be applicable. In addition, doctors are already reimbursed for this brief screening and voiced support during the focus group for screenings which helped them better structure discussions during the appointment.

Another barrier is that parents often don't accompany their older teens to well-care visits, and that older teens are less likely to schedule and attend well-care visits in the first place. Because of this, it is recommended that this intervention be initially rolled out at well-care visits for younger patients, possibly under the age of 16. Parents are more likely to be in attendance, and this research study shows that these younger ages are more likely to have a medical effect after intentional self poisoning. Since adult medications appear on the top ten list of poisoning agents used by youth in Vermont, this should be of particular concern to caregivers. Older adolescents could then be part of a second intervention, perhaps introduced strategically as an intervention to make sure their younger siblings and friends are in safe environments.

CFIR Construct 2: Outer Setting

Analysis of the outer setting construct reveals a real source of strength for this intervention as it focuses on the larger community to which the individual practices belong. Are they part of a network that provides collaborative support? Is there competitive peer pressure to implement best practices, and are there external forces that will support or hinder the implementation? As a consequence of prior work with the AAP, the AAFP, and VCHIP, Vermont has a highly engaged and connected medical community where this type of approach is well recognized and supported at virtually all levels.

CFIR Construct 3: Inner Setting

The inner setting subconstructs relate to the specific organizational setting itself. They include the structural characteristics, the culture, the implementation climate, the relative priority of the policy change vis-à-vis other issues, the learning climate, the leadership engagement, and the resources and information available to the staff. This area is critical to the success or failure of a change in practice. It is important that enough time be spent with each practice to identify specific challenges and opportunities, as well as practice champions, that can ensure the practice self-generates the tools and techniques that will work in their unique circumstances. Another way to strengthen this area would be to undertake a pilot study in the medical community to explore and refine exactly how to translate this into a clinical setting in Vermont. These “first adopters” could serve as bridges to other practices and validate the educational initiative.

CFIR Construct 4: Characteristics of Individuals

This construct includes the level of knowledge about the change, feelings of ability to undertake the change, and commitment to the organization. As mentioned above, the medical community serving children and families in Vermont has a high level of efficacy with improvement programs and practice change. Doctors have a high level of self-efficacy in general and many practices are owned by the providers–who as a result have a large stake in the well-being of their communities and patients. Moreover, medical professionals occupy a unique position of trust with their patients. As in previous years, a 2020 Gallup poll finds nurses and doctors at the top of the list of most trusted professions (Reinhart, 2020). Education about the intervention, and the data behind it, will be critical for engaging the primary care community.

CFIR Construct 5: Process

The CFIR identifies the importance of opinion leaders and champions in any implementation process. As mentioned above, these policies and education initiatives could be initially championed by the professional medical organizations in Vermont, the AAP and the AAFP. These two organizations have annual meetings, and regularly present recommendations to their members through a listserve and by highlighting the continuing medical education (CME) credit opportunities that are required for doctors to maintain their licensure.

Study Limitations

The types of data used in this research study have many advantages and act as a timely and consistent addition to other data sources on intentional self-poisoning with

suicidal intent among young Vermonters. However, it has several very important limitations, the first set of which center around the characteristics of the Northern New England Poison Control Center data itself. Many of the data variables were used as proxies for important concepts for which I had no direct information. The example of this that had the most implications for the research questions was that caller location was used as a proxy for the geographic area of residence of the patient (and therefore whether the patient lived in a rural or urban county). Further, each ISP episode was associated with a unique event, not with a unique person, and only reflect those exposures reported to the poison control center. As a result, I was unable to calculate meaningful prevalence rates compared to the Vermont population. All case and contact information is from self-reports and the NNEPCC may not be able to independently verify the accuracy of all information. Finally, the NNEPCC dataset also lacks certain data elements such as race/ethnicity and gender designations outside of the dichotomous grouping of male and female. This limits the usefulness of this particular dataset in helping to identify populations often at higher risk for intentional self-harm and suicide. Overall, this research relies heavily on the professional judgment and clinical expertise of the NNEPCC clinical toxicologists and the primary care physicians who participated in the focus group.

Further Research

Although this dissertation focused on intentional self-poisoning with suicidal intent for Vermont children and youth under the age of 20, the NNEPCC database is a rich source of information on intentional poisonings for all ages and all reasons. Further

research could examine whether Vermont males are under-represented in some categories (suicidal intent) and over-represented in others (abuse/misuse.) The characteristics of adults intentionally self-poisoning with suicidal intent in the NNEPCC dataset could also be examined, with adult primary care likewise engaged.

Conclusion

This research suggests many additional secondary interventions that might be appropriate to pilot test in primary care settings in Vermont using an implementation framework such as the CFIR. Particularly appropriate interventions include: educating primary care providers to increase their confidence in identifying and addressing risk factors for suicide with their patients and their families; providing tools and resources to help providers counsel patients and their families on the importance of means restriction and other risk reduction techniques; and enhanced bi-directional communication, referral, and personalized care management between the various providers treating children and adolescents for depression and previous intentional self-harm attempts. Primary care providers are trusted professionals who often engage whole families in education and treatment, potentially reaching multiple generations of family members that might be at risk for suicide simultaneously. Initiatives backed by professional medical organizations, undertaken in a highly trusted medical setting, with support from the state public health community, and implemented by an experienced quality improvement entity would have a high probability of successfully moving these research findings from theory into practice.

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