A Longitudinal Examination of Suicidal Behaviours Among Individuals with Mental Disorders in the Canadian Armed Forces

by

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Abstract

A high percentage of Canadian Armed Forces (CAF) members and veterans will be diagnosed with a mental disorder, and many also experience suicidal behaviours. This study examined demographic characteristics, potentially protective factors, and distal and proximal risk factors that may be related to suicidal behaviour (ideation, plans and attempts) over a 16-year period among CAF members and veterans who met criteria for a mental disorder at baseline. This study utilized data from the 2018 CAF Members and Veterans Mental Health Follow-up Survey (n = 2,941) with respondents from the 2002 Canadian Community Health Survey: Canadian Forces Supplement. Logistic regression analyses were conducted using subsamples with a lifetime diagnosis of a) major depressive episode, b) posttraumatic stress disorder, and c) any anxiety disorder (generalized, social phobia, panic) assessed with a structured diagnostic interview in 2002. Demographic characteristics at baseline associated with suicidal behaviour among most subsamples included age, environmental command, and rank. Risk factors at baseline and/or between 2002 and 2018 included prior suicidal behaviour, comorbid mental disorder, child maltreatment, self-medication and avoidance coping, work stress, number of and exposure to traumatic experiences, persistence/recurrence of mental disorder, current comorbid disorder, alcohol use disorder, having released from service, and number of deployment-associated experiences were associated with suicidal behaviour among most subsamples. Protective factors against suicidal behaviour at baseline and/or between 2002 and 2018 included problem-solving coping and social support. Findings identify characteristics of those with mental disorders who may be at greatest risk for developing suicidal behaviour and who need further interventions.

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Chapter I: Introduction and Review of the Literature

Statement of the Problem

Suicide is a significant public health concern worldwide and is currently the twelfth leading cause of death in Canada (Statistics Canada, 2022). Prior to 2020, suicide was one of the top ten leading causes of death for two decades. Each day approximately 11 people die by suicide in Canada alone (Government of Canada, 2020). From 2000-2020 the average number of annual deaths by suicide was approximately 4,000 (Government of Canada, 2020). Despite the large body of literature aimed at identifying those at risk of suicide, prior to 2020 there had not been a substantial decrease in the suicide rate in the past decade (McIntyre et al., 2021; Varin et al., 2021).

Suicide impacts individuals of all ages and ethnicities, and certain populations are at higher risk of suicide, including men, Indigenous people, and middle-aged adults (Government of Canada, 2020). Suicide impacts not only the decedent, but research shows that there are at least 10 individuals affected by a suicide death (i.e., in a state of loss and grief) such as friends, family, schoolteachers, as well as the first responders called to the scene (Government of Canada, 2020). Further, intentional self-harm/suicide is associated with 623.42 disability-adjusted life year (DALY; one DALY reflects the loss of one healthy life year due to premature death or a health condition causing disability) per 100,000 population (World Health Organization, 2022). Hence, suicide intervention strategies must be empirically supported and well-designed to address this persisting public health concern.

Suicidal behaviour is a term that encompasses suicidal ideation and suicide plans and attempts (Silverman et al., 2007). Suicidal ideation denotes thoughts about suicide, which can vary in length and severity from indeterminate wishes to more detailed urges (Harmer et al., 2022). Suicide plans refers to thoughts of suicide and the details of a plan are considered to some degree (Thompson et al., 2013). Suicide

attempts refers to a non-fatal act an individual makes to end their own life (Padmanathan et al., 2019). These three categories of suicidal behaviour (i.e., suicidal ideation, suicide plans and attempts) remain important to consider in suicide research for a number of reasons. First, among the general population, suicidal ideation, plans and attempts are common (Nock et al., 2008a; Nock et al., 2013). Approximately 12% of the Canadian general population will have suicidal thoughts during their lifetime, about 4% will make a plan for suicide, and 3% will attempt suicide (Statistics Canada, 2020). Second, suicidal ideation, suicide plans and attempts are significant risk factors for death by suicide (Nock et al., 2013). Of those with a history of suicidal ideation, the likelihood of a suicide attempt is approximately 30% (Nock et al., 2008a). Third, individuals experiencing suicidal ideation and/or suicide attempts often contact healthcare providers in primary care or emergency settings, thus making these individuals easily flagged for further interventions (Stene-Larsen & Reneflot, 2019). Lastly, the Centers for Disease Control and Prevention and the World Health Organization have prioritized a more comprehensive plan to monitor and understand suicide, which aims to develop a strategic health policy that will reduce suicidal behaviours and death by suicide particularly amongst highly susceptible populations (Centers for Disease Control and Prevention, 2021; World Health Organization, 2018). Importantly, understanding risk factors associated with suicide and thereby identifying intervening factors that can be addressed could potentially reduce suicide risk.

Why Military Personnel? A Population Susceptible to Experience a High Level of Intense Stressors.

Prior work has shown that a high percentage (~58%) of CAF members and veterans are diagnosed with a mental disorder at some point in their lifetime (Sareen et al., 2021). Past-year prevalence of mental disorders is higher in Canadian Armed Forces (CAF) serving members and veterans compared with the Canadian general population (28% and 20%, respectively; Government of Canada, 2021; Sareen et al., 2021). This may be due to several factors that are specific to those in the military, including prior histories of trauma and service-related duties including combat exposure and deployment history (i.e., being deployed outside of Canada at some point in their

lifetime; Blosnich et al., 2014; Bryan et al., 2015; Cohen et al., 2015; Nichter et al., 2020).

However, findings are more mixed as it relates to suicide risk in the military. Some studies have shown an increased risk of suicide among military personnel compared to the general population, whereas other research suggest that the risk is comparable across the two population groups (Belik et al., 2010; Rusu et al., 2016; Shen et al., 2016). Data from the 2021 Report on Suicide Mortality in the CAF found that males in the Regular Force Army had a statistically significant higher suicide rate compared to Regular Force males in other environmental commands (Boulos, 2021). A majority of Regular Force members who died by suicide reported experiencing a work/life stressor (including death of a partner, family or friend by suicide; death of family or friend [other than suicide]; chronic illness in a partner or family member; legal issues such as litigation; bankruptcy or excessive debt; physical health concern; job, supervisor, or work performance issue; failed or failing partner relationship), with about half reporting two or more stressors (Boulos, 2021). Additionally, that same report indicated that many CAF Regular Force males (90.9%) who died by suicide had at least one indicator of a mental health concern (i.e., traumatic brain injury in their lifetime, substance use disorder, personality disorder, anxiety disorder, depressive disorder or trauma and stress related disorder) (Boulos, 2021). Further, 91% of those who died by suicide had a record that indicated suicidal ideation and/or attempts prior to their death (Boulos, 2021).

Why Veterans? Transitioning to Civilian Life can be a Time Marked by Significant Stress.

When we look at the veteran population, similar trends to the serving population have been noted. The 2019 Veteran Suicide Mortality Study showed that risk of death by suicide was higher for both male and female CAF veterans compared to the Canadian general population, at 1.4- and 1.9-times higher risk, respectively (Simkus et al., 2019). Additionally, when compared to males in the general population in Canada, male veterans who were younger in age had a higher risk of death by suicide (Simkus et al., 2019).

Transitional periods are often a stressful experience for many, and veterans are especially vulnerable. A veteran's transition to post-service life can be fraught with several challenges, such as adjusting to a new job and detaching from one's identity associated with being a serving member (Doyle & Peterson, 2005; Elnitsky et al., 2017; Mitchell et al., 2020; Praharso et al., 2016; Romaniuk & Kidd, 2018; Thompson et al., 2017). This is just one example of a potential intervening factor that can impact the risk of suicidality among military personnel who meet criteria for a mental disorder in their lifetime. Studies have determined that veterans transitioning to post-service life are at a higher risk for developing both mental disorders and suicidal behaviour compared to the general population, with much of this work focused mainly on American samples (Shen et al., 2016).

Importantly, the "healthy soldier effect" is a concept applied to the military to describe a trend whereby it is typical to observe lower rates of poor health in those who are in the military compared to the general population (Bruce, 2010). This effect can be critical to consider in research, as key characteristics that differ between military personnel and the general population, may relate to observed differences in health outcomes. Further, these factors that make for a "healthy soldier" can be associated with characteristics that protect them from increased suicide risk. However, prior work has shown that among veterans who had shown the "healthy soldier effect" (i.e., they had a reduced risk of mortality from a variety of causes), who served in the Operation Enduring Freedom and Operation Iraqi Freedom and were diagnosed with a mental disorder diagnosis had a 77% increased risk of suicide (Bruce, 2010). Thus, there is some evidence to suggest that the protective selection effect of those who enroll in the military may not be necessarily applicable in the context of suicide risk.

Why Focus on Individuals with a Mental Disorder Diagnosis? A Sample at Risk for Developing Suicidal Behaviour

There is a strong and consistent association between mental disorders and suicide; roughly 90% of individuals who die by suicide meet criteria for a mental disorder in the year prior to their death (Arsenault-Lapierre et al., 2004; Bertolote & Fleischmann, 2002). However, the large majority of individuals with a mental disorder do not die by

suicide. The lifetime risk of suicide death among individuals with a mental disorder range between 5% and 8% (Nordentoft et al., 2011). When looking at suicidal behaviours, similar trends have been noted, such that many individuals with suicidal behaviour also meet criteria for a mental disorder (Bachmann, 2018; Belik et al., 2010; Kessler et al., 2005; Nock et al., 2013), while a large percentage of those with mental disorders do not experience suicidal behaviour (Cai et al., 2021; Nordentoft et al., 2011).

Individuals with a mental disorder diagnosis represent a specific group with distinct characteristics and risk factors for developing suicidal behaviour. When looking at trends among individuals with specific mental disorders, research shows that depression and posttraumatic stress disorder (PTSD) diagnoses can be significant predictors of suicidal behaviour in both the general population and in the military (Handley et al., 2018; Nock et al., 2013; Ursano et al., 2020). Additionally, numerous studies have shown associations between mental disorders and suicidal behaviour (Belik et al., 2010; Kessler et al., 2005). Since it is known that mental disorders are prevalent among those who experience suicidal behaviour, it is important to identify who, among all those with a mental disorder, are most at risk of suicidal behaviour. There is a lack of research examining how predictive and proximal factors can impact likelihood of suicidal ideation, plans, and attempts among those with a mental disorder. It is also unclear whether these factors are consistent across a range of mental disorder presentations and across suicidal behaviours.

Conceptual Frameworks of Suicide

Numerous conceptual models of suicide exist. These models have described suicide from various perspectives including psychological, epidemiological, environmental, cultural, and biological. Despite the range of models available, several common factors are identified that highlight individuals who may be at an increased risk for suicidal behaviour. These factors have included presence of a mental disorder, presence of a medical illness, poor family relationships and traumatic life events (e.g., child maltreatment). Other factors, including demographic characteristics such as sex and educational attainment, and individual factors such as lower levels of social

support, coping mechanisms, and greater presence of life stressors have been identified as potential risk factors for suicidal behaviour (Bachmann, 2018; Boyd et al., 2014; Holman & Williams, 2022).

In Mann's stress-diathesis model, stress factors are described as either external (e.g., difficulty finding work) or internal (e.g., major depressive episode; Mann et al., 1999 2002, 2003, 2005). Diathesis is understood as individual risk factors including demographic characteristics (e.g., sex, age) that predispose an individual and are associated with suicide risk when responding to stress factors (Mann et al., 1999, 2002, 2003, 2005). This model of suicidal behaviour assumes a component of additive effects, where the diathesis (e.g., individual factor) is combined with a stressor (e.g., mental disorder or physical health condition). The additivity of these factors can lead to the experience of suicidal ideation. From suicidal ideation, factors including substance use and access to lethal means may lead to a suicide attempt. This attempt can be either fatal or non-fatal. Internal and/or external stressors and stressful life events may occur at any stage along the pathway of suicidal behaviour. A limitation of this model is that stress factors are not further conceptualized according to distal and proximal risk factors, which aids in the understanding of suicidal behaviour and has clinical utility in suicide risk assessment (Hawton & van Heeringen, 2009)

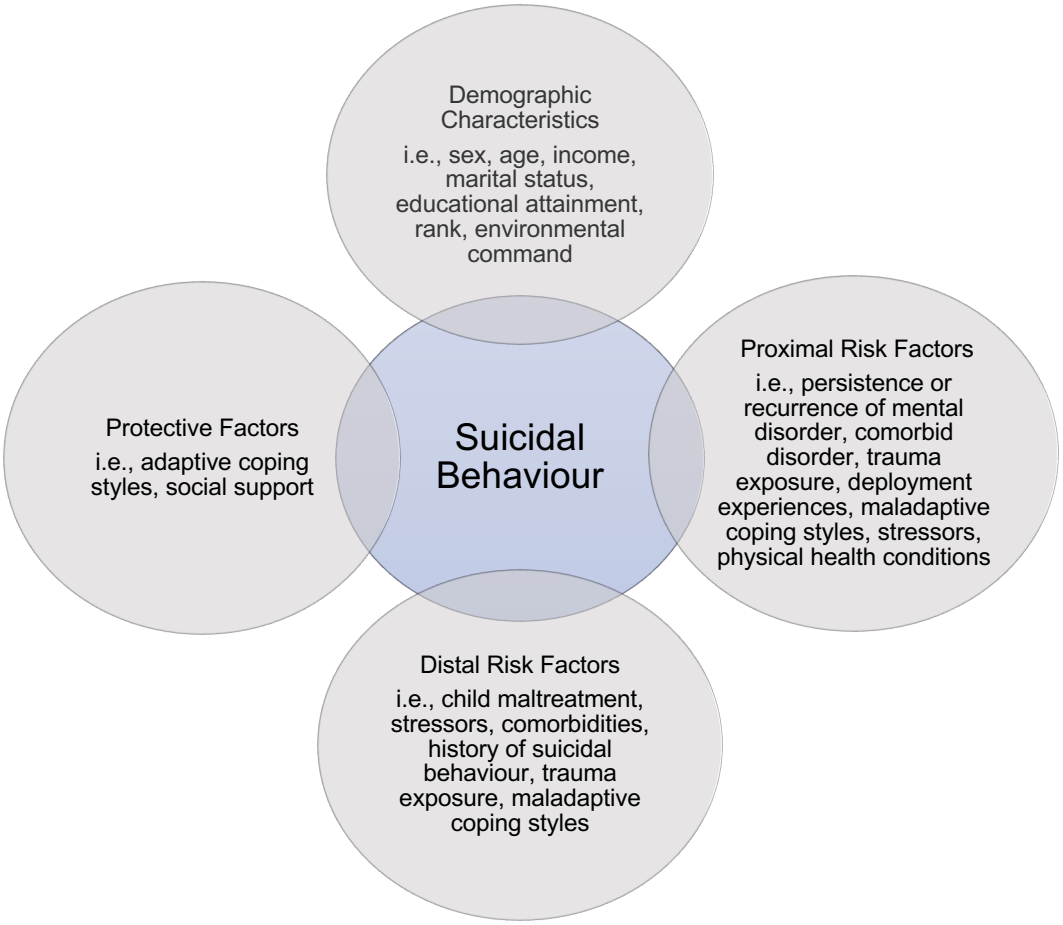
Current models of suicidal behaviour note demographic characteristics (e.g., sex, marital status) as well as the distinction of risk factors into distal (e.g., child maltreatment) and proximal factors (e.g., stressful life events, traumatic events) that may lead the way to suicidality among individuals who are susceptible (Ingram & Luxton, 2005; Moscicki, 2001). According to the model for suicidal behaviour by Moscicki (2001), distal risk factors can be individual factors (e.g., prior suicidal behaviour) or environmental factors (e.g., early life traumas). Proximal risk factors of suicidal behaviour are factors that have occurred more recently in time, and again can be at the individual (e.g., physical health condition) or the environmental level (e.g., recent traumatic exposure; Moscicki, 2001). Additionally, protective factors are considered as a separate factor since these factors buffer the impact of risk factors and protect against suicidal behaviour. According to this model, it is the presence of demographic characteristics along with the accumulation of distal and proximal factors

that make an individual susceptible to experience suicidal behaviour. Some of the factors are potentially modifiable (e.g., coping behaviour), and can be a target for clinical intervention whereas other risk factors (e.g., experience of child maltreatment) are useful in terms of screening for targeted interventions. The benefit of this model is its ability to add an epidemiological perspective to understanding suicidal behaviour risk factors, which is important when developing a comprehensive strategy for suicide risk assessment.

As many factors and events precede suicidal behaviour, not one single model is comprehensive enough to fully describe who experiences suicidal behaviour and explain why suicidal behaviour occurs. Additionally, the extent to which suicidal behaviour can be explained by a linear progression from ideation, to plans, and to attempts has been questioned (Díaz-Oliván et al., 2021; Galynker et al., 2017). The progression from suicidal ideation to suicidal action can occur, but this is not always the case (Bloch-Elkouby et al., 2020; Galynker et al., 2017). In comparing the models by Mann (1999, 2002, 2003, 2005) and Moscicki (2001), both have demonstrated utility in research (De Santiago-Diaz et al., 2021; Herzog et al., 2021; Lin et al., 2021; Scheer et al., 2021; Suzuki et al., 2021; Wei et al., 2022). The distinction of factors into two categories (i.e., distal and proximal) is both relevant to research and is useful when applied to clinical practice (Figure 1). Considering all these factors and the concept of non-linearity as it relates to suicidal behaviour, the present study considered demographic characteristics, protective factors, as well as distal and proximal factors in a theoretical model for suicidal behaviour. This framework is clinically useful and relevant to research in terms of developing an evidence-based comprehensive strategy to describe the type of individual (i.e., demographic characteristics) and the types of factors (i.e., distal and proximal factors) which can lead to suicidal behaviour, as well as the protective factors that can act as a buffer against suicidal behaviour.

Figure 1

Conceptual Model for Suicidal Behaviour



Note. This figure portrays an integrated model adapted from Mann and colleagues (1999, 2002, 2003, 2005), Moscicki (2001) and based on the assumption of non-linearity of suicidal behaviour from Díaz-Oliván and associates (2021). In this model, there are four key factors of suicidal behaviour (i.e., demographic characteristics, protective factors, distal risk factors and proximal risk factors).

Demographic Characteristics

Individual risk factors are characteristics that have been shown to be associated with a particular outcome. Further, in the general population, demographic characteristics including younger age, female sex, unpartnered marital status, lower

education and lower income have been associated with suicidal behaviour (Nock et al., 2013). Further risk factors for suicidal behaviour include interpersonal issues, such as familial or relationship problems or conflict with co-workers (Nock et al., 2013). In military personnel, demographic characteristics such as male sex, younger age, unpartnered marital status, lower education, lower income, army environmental command have been associated with suicidality (Haney, 2012; Nichter et al., 2021; Nock et al., 2013; Nock et al., 2013; Ravindran et al., 2020). In veterans, younger age is associated with suicide (Nichter et al., 2021; Ravindran et al., 2020). This may be due in part to the notion that young veterans transitioning to civilian life may experience challenges in the adjustment period, such as difficulties with finances and a lack of social support (Elnitsky et al., 2017; Mitchell et al., 2020; Nichter et al., 2021; Praharso et al., 2016; Ravindran et al., 2020; Romaniuk & Kidd, 2018; Thompson et al., 2017).

Distal Risk Factors

Prior Suicidal Behaviour. Prior suicidal behaviour is the strongest risk factor for future suicidal behaviour (Christiansen & Jensen, 2007; Nock et al., 2008a: Nock et al., 2013). This factor is important from a clinical perspective, to be able to identify who is most at risk for suicidal behaviour. Individuals who have reported prior suicidal behaviour are more likely to die by suicide, and this risk may be greater among older adults compared to younger adults (Hawton & van Heeringen, 2009; Moscicki, 2001). Further, the relationship between prior suicidal behaviour and later suicidal behaviour is still strong even after adjusting for significant demographic characteristics (Joiner et al., 2005).

Presence of a Mental Disorder and Comorbidity. Suicide is related to several mental disorder diagnoses including major depression, anxiety disorders, substance abuse and PTSD (Bertolote & Fleischmann, 2002; Haney, 2012; Nichter et al., 2020; Nock et al., 2013; Norman et al., 2018). Individuals who meet criteria for a mental disorder have an increased risk for suicidal behaviour, wherein those with a mental disorder have a 7- to 12-fold greater risk of suicide compared to those without a disorder (Li et al., 2011). Notably, while the relationship between suicidality and mental disorders is strong, most individuals with a mental disorder do not experience suicidal behaviours (Nock et al., 2008a; Nock et al., 2008b; Nock et al., 2009; Nock et al., 2010).

Further, certain comorbid mental disorders have been associated with a shift from suicidal ideation to attempt, including PTSD and alcohol use disorders (Haney, 2012; Nock et al., 2013). Of those who die by suicide many have comorbid disorders, with the most common being alcohol abuse and depression (Haney, 2012; Hawton et al., 2013).

Stressors, Stressful Experiences, and Traumatic Events. Stressors are subjective experiences that affect individuals differently. Stressors are important to consider in the context of suicide research as they are linked to the occurrence of suicidal behaviour (Nock et al., 2013). Additionally, the accumulation of a number of stressors is highly associated with an increased risk for suicidal behaviour (Aberg et al., 2022; Ahlin et al., 2019; LaMontagne et al., 2021; Nock et al., 2013). There are several well-established stressors that have been linked to suicidal behaviours. One common focus is work-related stressors, which includes shift work or working in physically challenging careers (Aberg et al., 2022; Ahlin et al., 2019; LaMontagne et al., 2021; Baumert et al., 2014). Military personnel experience various stressors related to both their military work (e.g., physical injury, lack of support from their colleagues) and related to their personal lives (e.g., conflict with their intimate partner, illness in the family), which may make them particularly vulnerable.

'Stressful experience' is a term that encompasses various events that may have immediate and/or long-lasting impacts. Distal stressful experiences, such as childhood adversities (e.g., parental unemployment) or child maltreatment (e.g., physical abuse as a child), have been associated with suicide (Afifi et al., 2016; Angelakis et al., 2002; Sachs-Ericsson et al., 2017; Salokangas et al., 2019; Sareen et al., 2013). Research indicates that child maltreatment (e.g., emotional abuse, physical and sexual abuse, physical and emotional neglect) are also highly linked to suicidal behaviour (Nock et al., 2013). Even after accounting for comorbid mental disorders, child maltreatment remain associated with a statistically significant increased risk of suicidal behaviours (Salokangas et al., 2019). There is evidence to suggest that child maltreatment is linked to changes in how an individual responds to stress (e.g., issues with decision-making and emotional regulation; Nock et al., 2013. These changes to stress responses may increase an individuals' susceptibility to suicidal behaviour (Turecki et al., 2012). The relationship between stressful life events and stressors and likelihood of suicidal

behaviour exhibits a dose-response relationship, wherein a greater number of life events and stressors is associated with higher risk of suicidal behaviour (Nock et al., 2013).

Proximal Risk Factors

Persistence or Recurrence of Mental Disorders. As it is well-known that presence of a mental disorder is highly linked to suicidal behaviour, it is important to evaluate whether a mental disorder is persistent or recurring in nature (Bertolote & Fleischmann, 2002; Haney, 2012; Nichter et al., 2020; Nock et al., 2013; Norman et al., 2018). Persistence/recurrence of mental disorders highlights the need to evaluate its impact on the individual across a longer span of time, and leads to the consideration of proximal disorders which can present as a risk factor for suicidal behaviour (Moscicki, 2001; Nock et al., 2013). Research shows that persistence or recurrence of a mental disorder may be more predictive of suicidal behaviour when compared to the severity of mental disorder symptoms (Moscicki, 2001).

Stressors, Stressful Experiences and Traumatic Events. Exposure to recent stressors is associated with increased risk for suicidal behaviour (Clapperton et al., 2019). Stressors can vary in the level of impact they have on the individual experiencing the stressor based on their perception of the stressor (Nock et al., 2013). Additionally, the type of stressor that an individual is experiencing can also vary depending on their stage of life. Military personnel and veterans may encounter a unique set of stressors related to their career, such as military-related stressors (e.g., work role strain), as well as stressors related to their personal lives (e.g., financial constraints, conflict with family and friends; Arenson et al., 2018; Boulos & Zamorski, 2013; Bryan et al., 2015; Haney, 2012; Nichter et al., 2021; Nock et al., 2013; Nock et al., 2014; Ravindran et al., 2020; Stein et al., 2018; Zamorski, 2011). Stressful life events (e.g., transitioning to civilian life, traumatic experiences) are also proximal factors that often precede suicidal behaviour (Nichter et al., 2021). Transitioning to civilian life can be a difficult time for some military personnel. There are a number of adjustments made once a military personnel releases from service, such as detaching from one's identity associated with being a serving member (Doyle & Peterson, 2005; Elnitsky et al., 2017; Mitchell et al., 2020; Praharso et al., 2016; Romaniuk & Kidd, 2018; Thompson et al., 2017).

Several proximal traumatic experiences have been found to be associated with suicidal behaviour, and research indicates that a greater number of traumatic experiences may be more important as opposed to the type of experience (Nock et al., 2013). Traumatic events, such as deployment-associated experiences (e.g., witnessing death), military sexual trauma, and other interpersonal traumas, are related to increased suicidal risk in military personnel (Belik et al., 2009; Blosnich et al., 2021; Bryan et al., 2015; Haney, 2012; Livingston et al., 2022; Nichter et al., 2021; Nock et al., 2013; Pompili et al., 2013). The available evidence on combat exposure and suicidal risk is mixed, where some studies have found an association and others have not (Anglemyer et al., 2016; Bryan et al., 2015). Overall, evidence suggests that a higher number of stressors, stressful life events, and traumatic exposures is indicative of greater suicidal risk (McFeeters et al., 2014; Blosnich et al., 2021; Monteith et al., 2018; Zimmerman et al., 2015).

Physical Health and Chronic Pain Conditions. Suicidal behaviours are linked to physical health conditions in adults (Scott et al., 2010). In the general population there are several specific physical conditions associated with suicidal behaviours, including cancer, asthma, HIV/AIDS, Huntington's disease, multiple sclerosis, epilepsy, peptic ulcer, renal disease, congestive heart failure, chronic obstructive pulmonary disorder (COPD), and migraine headaches (Ahmedani et al., 2017; Amiri & Behnezhad, 2019; Hawton & van Heeringen, 2009; Moscicki, 2001; Sampaio et al., 2019; Singhal et al., 2014). Additionally, research shows that comorbidity of physical health conditions and mental disorders is associated with increased risk of suicidal behaviour (Kavalidou et al., 2017). Chronic pain also displays an increased risk for suicidal behaviour (Racine, 2018). Notably, type, duration and severity of pain has not been shown to be significantly related to increased risk of suicidal behaviours among those with a chronic pain condition (Racine, 2018), highlighting the strong independent association between presence of a chronic pain condition and suicidality. Among veterans, number of physical health conditions, as well as type, has been associated with increased suicidal behaviour (Scott et al., 2010; Thompson et al., 2014).

Alcohol Use Disorder. Aside from the presence of a mood or personality disorder, alcohol use disorder is the most frequent disorder among those who have died

by suicide (Conner & Bagge, 2019; Cavanagh et al., 2003). Proximal alcohol use was found to be related to increased risk of suicidal behaviour, particularly when among those with a mental disorder (Glenn & Nock, 2014). There is a three times greater risk for suicidal behaviour among those with alcohol use disorder compared to those without alcohol use disorder (Conner & Bagge, 2019). Research suggests that comorbid alcohol use disorder with another mental disorder is more predictive of suicidal behaviour than alcohol use disorder alone (Moscicki, 2001). Alcohol consumption may increase suicidal risk by negatively impacting decision-making and increasing impulsivity (Cavanagh et al., 2003). Individuals with alcohol use disorder may have an increased risk for suicidal behaviour due to the challenging experiences often associated with the disorder, including increased stressors such as financial hardship and deterioration of social support (Pompili et al., 2010). Individuals experiencing suicidal ideation are seven times more likely to attempt suicide when consuming heavy amounts of alcohol (i.e., for men: five or more drinks, for women: four or more drinks, on one occasion; Richards et al., 2020). According to research in military personnel and veterans, alcohol use has been suggested to be a form of coping (Inoue et al., 2022).

Coping Mechanisms/Styles. Coping mechanisms are ways in which individuals use their skills and resources in order to manage stress in their lives. Coping mechanisms can be described as either adaptive or maladaptive. Maladaptive coping styles include using substances (e.g., illicit substances, alcohol), behavioural and emotional avoidance, and self-blame (Hofmann & Hay, 2018). These maladaptive coping styles have been associated with increased risk for suicidal behaviour (Marty et al., 2010; Svensson et al., 2014; Werbart Tornblom et al., 2021; Woodhead et al., 2014). Factors including reduced inhibition and increased impulsivity are associated with self-medication forms of maladaptive coping (Marty et al., 2010). Coping styles have also been linked to various life experiences including adverse events in childhood, whereby individuals who have experienced child maltreatment are more likely to use maladaptive coping compared to those who have not experienced child maltreatment (McLafferty et al., 2019). Further, individuals with a mental disorder diagnosis who utilize a maladaptive coping style, particularly avoidant coping, are at a greater risk for

suicidal behaviour when compared to those with maladaptive coping without a mental disorder (Ambrus et al., 2020).

Protective Factors

Social Support. Social support is often described as a protective factor for suicidal behaviour. Protective factors are those which provide a buffer and tend to reduce the likelihood of a given outcome— in this case, suicidal behaviour. There is limited research related to protective factors in the context of suicidal behaviour, especially when compared to the amount of research on suicidal risk factors (Nock et al., 2013). According to the extant research, social support and connectedness play an important role in the relationship between mental disorders and suicidal behaviour in the general population (Holman & Williams, 2022; Nock et al., 2013; Oquendo et al., 2005). The role of social support is relevant in the context of the military as well. Sources of social support for those in the military include family, friends, and colleagues/unit. In the military, social support can be a critical protective factor in decreasing suicidal risk (Bush et al., 2011; Elbogen et al., 2020; Nock et al., 2013; Smith et al., 2016).

Coping Mechanisms/Styles. The ways in which an individual copes with stress can also play a role in buffering negative outcomes. There is limited research in the area of adaptive coping mechanisms and suicidal behaviour, and even less focused on this relationship among military personnel. In the limited available evidence, a few studies have noted that the presence of adaptive coping mechanisms have been found to be protective factors for suicidal behaviour in the general population (Holman & Williams, 2022; Liang et al., 2020; Nock et al., 2013). Adaptive coping styles including problem-focused coping are associated with a decreased risk of suicidal behaviour (Liang et al., 2020; Marty et al., 2010; Werbart Tonblom et al., 2021). Additionally, there is evidence to suggest that there is a link between protective factors such as strong social support coupled with an adaptive coping style may be important to consider in relation to suicidality (McLafferty et al., 2019). Applied to a military context, there is some evidence to suggest that adaptive coping mechanisms can be critical protective factors in decreasing suicidal risk (Bush et al., 2011; Elbogen et al., 2020; Nock et al., 2013; Smith et al., 2016).

Theoretical Frameworks for Suicidal Behaviour and Mental Disorders

Suicidal behaviour is complex and is often challenging to predict. Both distal and proximal vulnerability factors are important to understand. However, research indicates that to gain a better understanding of suicidal behaviour it is important to acknowledge that the relationship with mental disorders is multifaceted (Bachmann, 2018). One theory that can be used to understand this relationship between suicidality and mental disorders among military personnel is Joiner's Interpersonal-Psychological Theory of Suicide (IPTS). This theory predicts that individuals die by suicide because they feel as though they are a burden or inconveniencing others in some way, they are unafraid of harming themselves in a fatal way, and they experience a loss of belonging and a subsequent loss of connection with others (Joiner, 2005). Notably, factors that could be described as protective, such as a strong connection and sense of belonging while serving, may change and turn into risk factors once becoming a veteran. Further, veterans may feel a loss of connection as they are no longer in service with other military members.

Considering Joiner's IPTS model and how it is particularly relevant in this area of research, this next section will describe how it can be mapped well on to Veterans Affairs Canada (VAC) framework of measures of Veteran Wellbeing (Thompson et al., 2016). VAC is invested in research that can be used to understand and improve the health and wellbeing of their members. As such, VAC has documented seven domains of wellbeing relevant to the veteran population through literature search and feedback from the target population (i.e., veterans). The seven domains are: 1) housing and physical environment, 2) life skills, 3) culture and social environment, 4) purpose, 5) social integration, 6) health, and 7) finances (Thompson et al., 2016).

To further delineate these domains, housing and physical environment refers to the structures, facilities, and all natural components surrounding those in which the individual works and resides. Life skills details an individuals' ability to adapt and cope, their education level and lifestyle choices including eating and exercise routines. Culture and social environment refer to the individual's personal beliefs about values held by general society, which in turn can impact their own view of themselves (e.g., general population opinions of military personnel). Purpose involves how an individual applies

meaning tied to an activity (e.g., job satisfaction). Social integration relates to how much an individual is involved with others and their sense of belonging from these relationships. Health is defined within a biopsychosocial context wherein the mental, physical, spiritual, and social state of an individual is encompassed. Lastly, finances refer to one's perception of their own financial literacy and contentment.

This wellbeing framework provides a means to identify certain factors that may apply to an individual may have and can also be understood in terms of the IPTS. For example, within the social integration domain, if an individual is not well supported and they no longer feel a sense of belonging (e.g., loss of role associated with a transition to civilian life), also a factor also in the IPTS model, this person may be at an increased risk for suicidal behaviour. These domains of wellbeing can also be applied to CAF serving members. For example, if an individual's self-rated physical health (Veteran Wellbeing Health Domain) is low because they have a physical health condition that limits their capabilities and they feel as though they are a burden to their family and/or other military personnel (IPTS model), then they may also be at an increased risk for suicide. Certain factors within each of these domains may impact the veteran and serving member's level of wellbeing, and as a result, their risk and protective factors. To determine whether these factors lead to positive or negative health outcomes, it is important to gain an understanding of how these factors change over time.

Suicide Intervention Framework

There is a need for a comprehensive and coordinated approach to reduce suicide risk, and ultimately death by suicide. Thus, it is important to have a conceptual framework for organizing levels of suicide interventions to guide and inform suicide prevention programming. From a public health perspective, one approach involves operationalizing the definitions of primary, secondary, and tertiary prevention as it relates to suicidal behaviour (Caldwell, 2008). The first level being primary prevention which is centered on enhancing protective factors in military personnel to promote health and reduce risk of suicidal behaviour (Caldwell, 2008). Examples of primary prevention include programs and services that promote mental and physical health, as well as programs that build or strengthen coping mechanisms. In this way, the focus can shift to known modifiable risk factors. Secondary prevention focuses on screening and

early intervention when risk factors for suicidal behaviour have been identified (Caldwell, 2008). Secondary preventions include developing screening tools to identify and intervene with those at risk of suicide. This may include training for military leaders and health professionals to better detect those at increased risk for suicidal behaviour. And finally, tertiary prevention involves providing interventions for military personnel who have experienced suicidal behaviours (Caldwell, 2008). Examples of tertiary prevention include evidence-based interventions for suicidal behaviour including mental health treatment once the individual is identified as having active suicidal ideation. For the purposes and scope of this study, further examination of suicide intervention levels will focus on primary and secondary prevention.

As previously mentioned, there is limited research on protective factors of suicidal behaviour especially in comparison to the amount of research on risk factors. Therefore, more research is needed to examine which protective factors are associated with reduced suicidal risk. This information is useful in the context of primary prevention planning. To illustrate with an applied example, since it is known that individuals who are not in partnered relationships are at increased risk for suicide, one strategy for primary prevention of suicidal behaviour could involve increasing social support networks (Nock et al., 2013).

According to the literature, the most significant and consistent risk factor for suicidal behaviour is presence of a mental disorder, with depression, posttraumatic stress disorder and anxiety disorders representing the highest risk (Nock et al., 2013). Additionally, about 58% of military personnel meet criteria for a mental disorder in their lifetime (Sareen et al., 2021). Therefore, given the high prevalence of mental disorders in the military and the association with suicidal behaviours, it is important to closely examine those with a mental disorder as they are at high risk of suicidal behaviour. In line with secondary prevention, CAF members and veterans with a mental disorder are a specific group to screen for, and it is especially important to identify particular characteristics that can place them at greatest risk.

To date, a large amount of research on suicidal behaviour has focused on identifying risk factors associated with suicidal behaviour, while there is limited research that has investigated which risk factors in a longitudinal and predictive way (Franklin et

al., 2017). There are numerous benefits related to strong prediction models in health care including cost reductions, improved quality of care, more efficient use of resources due to better targeted care, and enhanced health outcomes in the individuals being treated (Wang et al., 2018). Research shows that suicidal behaviours are often more attributable to proximal factors (e.g., recent depressive symptoms, current physical health conditions) when compared to distal factors (e.g., child maltreatment; Bruffaerts et al., 2015; McLean et al., 2017). Further, distal factors have been found to be more important in those with prior histories of suicidal behaviour (Bruffaerts et al., 2015).

While prior history of suicidal ideation is relatively predictive of death by suicide (i.e., moderate positive predictive value among those with a mental disorder), prior work has found that disclosure of suicidal thoughts can be problematic in adults wherein individuals who are suicidal do not disclose this information. Prior work has noted that approximately 48% of individuals who were suicidal did not report suicidal ideation (McHugh et al., 2019; Mérelle et al., 2018). This finding is supported by other studies which suggest that nondisclosure of suicidality and refusal to answer to suicide-related questions is strongly associated with increased suicidal risk (Nock et al., 2018). Therefore, it is important to focus secondary prevention efforts of screening not solely on disclosure of suicidal behaviour, but also of characteristics and proximal factors that are highly predictive of suicidal behaviour (Mérelle et al., 2018).

A gap remains in the literature as to which demographic characteristics, protective factors, and distal and proximal risk factors may impact risk of suicidal behaviour among military personnel who meet criteria for a mental disorder in their lifetime. Further, little is known with respect to the effectiveness of each factor in predicting suicidal behaviour. As few studies have considered the prevalence of various demographic characteristics, as well as distal and proximal factors in determining how much they contribute to predicting suicidal behaviour. A better understanding of these factors (i.e., demographics, distal and proximal risk, protective) for veterans and serving members is needed to provide clarity on risk of suicidal behaviour.

Study Objectives

The aims of the current study are to examine a) demographic characteristics, b) distal and proximal risk factors and, c) protective factors that predict

increased/decreased risk for suicidal behaviour (i.e., ideation, plans and attempts between 2002 and 2018) over a 16-year follow-up period among CAF serving members and veterans who met criteria for a mental disorder at baseline. This study used data from the Canadian Armed Forces Members and Veterans Mental Health Follow-up Survey (CAFVMHS). This longitudinal dataset collected data at two time points over a 16-year period (2002 and 2018), which allowed for the novel opportunity to examine individual demographic characteristics, protective factors and distal risk factors at the first wave of data collection, as well as various proximal risk factors closer in time to the most recent suicidal behaviour.

Quantitative Research Questions and Hypotheses

The research questions and hypotheses of the current study are as follows:

1) What are the baseline demographic and military-related characteristics that increase risk of suicidal behaviour among CAF serving members and veterans who have been diagnosed with a mental disorder at baseline (i.e., major depressive episode, PTSD, any anxiety disorder) in unadjusted models? It is hypothesized that younger age, male sex, unpartnered marital status, lower household income level, lower education, army environmental command, lower military rank, and having ever been deployed will be associated with a higher risk for suicidal behaviour between 2002 and 2018.
2) What are the distal risk factors (i.e., child maltreatment, 2002 work stress, 2002 trauma exposure, 2002 comorbid mental disorders, 2002 lifetime history of suicidal behaviour, 2002 self-medication coping style, 2002 avoidant coping style) that are associated with increased risk of suicidal behaviour between 2002 and 2018 among CAF members and veterans who have been diagnosed with a mental disorder at baseline (i.e., major depressive episode, PTSD, any anxiety disorder)? It is hypothesized that a history of suicidal behaviour (i.e., lifetime suicidal behaviour in 2002), greater work stress, comorbid mental disorder, greater use of an avoidant coping style, greater use of a self-medication coping style, exposure to and greater number of traumatic experiences, and a history of child maltreatment will be associated with an increased risk of suicidal behaviour between 2002 and 2018.

3) Among those with a mental disorder at baseline (i.e., major depressive episode, PTSD, any anxiety disorder), which proximal risk factors measured in 2018 (i.e., persistence/recurrence of disorder, current comorbid mental disorder, trauma exposure type, deployment-related experiences (DEX), self-medication coping style, avoidant coping style, alcohol use disorder, chronic physical health conditions, chronic pain conditions, released from service, work stress) are associated with increased odds of suicidal behaviour between 2002 and 2018? It is hypothesized that persistence or recurrence of mental disorder (i.e., continued to meet criteria for same disorder between 2002 and 2018), greater number of deployment-related experiences (DEX), exposure to and greater number of traumatic experiences in 2018, alcohol use disorder, greater use of avoidance and self-medication coping styles in 2018, current chronic physical health conditions, current chronic pain conditions, greater work stress, and having been released from service (i.e., veteran status) will be associated with higher odds of suicidal behaviour.
4) What are the protective factors measured in 2002 and 2018 (i.e., problem solving coping style, social support) that are associated with decreased odds of suicidal behaviour between 2002 and 2018 among those with a mental disorder at baseline (i.e., major depressive episode, PTSD, and any anxiety disorder)? It is hypothesized that a problem-solving coping style (in 2002 and 2018) and greater level of social support (in 2002 and 2018) will be associated with decreased odds of suicidal behaviour.
5) What is the contribution of each demographic characteristic, as well as distal and proximal factors (i.e., that were found to be significantly related to suicidal behaviour), in predicting any suicidal behaviour between 2002 and 2018 among those with baseline mental disorders (i.e., major depressive episode, PTSD, and any anxiety disorder)? It is hypothesized that proximal risk factors (i.e., 2018 proximal independent variables) will have a greater PPV compared to demographic characteristics and distal risk factors.

Chapter II: Method

Research Design

The current study was a secondary data analysis of a longitudinal survey with two waves of data. This study used data from the Canadian Armed Forces Members and Veterans Mental Health Follow-up Survey (CAFVMHS). This longitudinal survey collected data at two time points across a 16-year period (2002 and 2018), allowing the novel opportunity to measure both distal risk factors and proximal risk factors, as well as potential protective factors for suicidal behaviour and, for some, across the transition from service to civilian life.

Data and Sample

The Canadian Armed Forces Members and Veterans Mental Health Follow-up Survey (CAFVMHS) was collected between January and May of 2018 in a collaboration between Statistics Canada and the Department of National Defense. The CAFVMHS is a follow-up of a representative sample of 5,155 active-duty Canadian Armed Forces personnel from the 2002 Canadian Community Health Survey–Canadian Forces Supplement (CCHS-CFS; Statistics Canada, 2004). Statistics Canada conducted two surveys in 2016, the CAF Transition and Well-Being Survey and the Life After Service Survey (Afifi et al., 2020). These surveys included some respondents who participated in the 2002 CCHS-CFS; as such they were not considered eligible for reinterview in 2018 (Afifi et al., 2020). Of the 4,299 participants who were eligible for reinterview in 2018, 2,941 participated in the follow-up survey (Afifi et al., 2020). The CAFVMHS had a response rate of 68% among those eligible for reinterview (Bolton et al., 2021). As of 2018, 87.8% of the sample was male, 65.5% were veterans, 60% were over 50 years old, and 82.7% were married (Sareen et al., 2021). Further information pertaining to the survey methods and sample characteristics have been previously published (Afifi et al., 2020; Bolton et al., 2021).

Subsample Selection

The reliable and valid World Health Organization – Composite International Diagnostic Interview (WHO-CIDI) is a fully structured diagnostic interview that was used

to assess mental disorders according to the Diagnostic and Statistical Manual of Mental Disorders-4th Edition criteria (DSM-IV) criteria by trained lay interviewers at both timepoints (Kessler et al., 2004; Kessler & Ustun, 2004). In 2002, the following lifetime diagnoses were assessed—major depressive episode (MDE), posttraumatic stress disorder (PTSD), generalized anxiety disorder (GAD), panic disorder, and social phobia. A nominal variable of 'any anxiety disorder' was created based on endorsement of any one of the following anxiety disorders: GAD, panic disorder and social phobia; this approach has been used in prior work with this dataset (Pankratz et al., 2022).

All analyses were conducted in the following three subsamples of participants: A) those who had met criteria for MDE in their lifetime at baseline (i.e., 2002), B) those who had met criteria for PTSD in their lifetime at baseline (i.e., 2002), and C) those who met criteria for one or more anxiety disorders (i.e., generalized anxiety disorder (GAD), panic disorder, social phobia) in their lifetime at baseline (i.e., 2002). Note that it is possible for a participant to be included in more than one subsample if they had more than one lifetime mental disorder at baseline (e.g., both 2002 lifetime MDE and 2002 lifetime PTSD).

Data Access

The 2002 CCHS-CFS and the linked 2018 CAFVMHS dataset was available to researchers through the Manitoba Research Data Centre. Researchers are able to access the dataset with the appropriate clearance qualifications as classified by Statistics Canada and study project approval from the Manitoba Research Data Centre.

Measures

Dependent Variable

Any Suicidal Behaviour. In 2018, assessment of suicidal behaviours in the CAFVMHS included separate questions on suicidal ideation, plans and attempts since 2002 (since last interview; dichotomous nominal variables, yes/no). Suicidal ideation was assessed with the following question: 'Since 2002, did you seriously think about attempting suicide or taking your own life?'. Suicide plans were assessed by asking respondents the question: 'Did you make a plan for attempting suicide?' Suicide

attempts were assessed using the question: ‘Did you attempt suicide or try to take your own life?’ An integrated variable of ‘any suicidal behaviour’ since last interview (i.e., ideation, plans or attempts between 2002 and 2018) was created and used. Suicidal ideation, plans and attempts was collapsed into one variable due to sample size restrictions (i.e., too few individuals in each cell of ideation, plans and attempts).

Independent Variables

Demographic Characteristics. Demographic variables assessed at baseline (i.e., 2002) included age in years (as a continuous variable), sex (male/female; nominal variable), marital status (partnered: married or common law, or unpartnered: separated, divorced, or widowed, never married; nominal variable), level of educational attainment (secondary school diploma or higher vs. less than high school; ordinal variable), and total past-year household income in 2002 (median split: $0-$49,999, $50,000+; ratio variable). Military characteristics that were examined included environmental command (i.e., land/army, air, sea; nominal variable), and military rank (i.e., junior non-commissioned member and senior non-commissioned member, commissioned officer; ordinal variable). Also, lifetime deployment status in 2002 was examined (i.e., deployed at least once vs. never deployed; nominal variable).

Traumatic Experiences. In 2002, respondents were asked about lifetime exposure to 28 potentially traumatic events (e.g., involvement in combat and peacekeeping operations, sexual assault, motor vehicle accident, natural disaster, other unexpected events, etc.) using the World Health Organization Composite International Diagnostic Interview (WHO-CIDI) PTSD module (Belik et al., 2009; Kessler et al., 2004; Kessler & Ustun, 2004). Lifetime events that were related to having been deployed formed a ‘deployment-associated traumatic events’ variable (12 items were included, e.g., have you ever participated in combat either as a member of a military or as a member of an organized non-military group; Enns et al., 2021). Remaining lifetime events were collapsed into ‘sexual trauma’ based on face validity (2 items included, e.g., been sexually touched against your will) or an ‘other trauma’ category (12 items included, e.g., ‘were you ever a refugee that is did you ever flee from your own home to a foreign country or place to escape danger or persecution, being stalked, have you ever had a life-threatening illness;). In 2018, respondents were asked the same

traumatic event questions and those variables were similarly categorized. Additionally, a count of the total number of lifetime traumatic events was created and examined in 2002 and 2018 (numeric variable).

Work Stress. Respondents were asked about their work stress in 2002 and 2018 using a 12-item measure based on items from the Job Content Questionnaire (Karasek et al., 1998). Items assessed six dimensions of work stress (i.e., decision authority/control, job insecurity, psychological demand, physical exertion, social support from colleagues/supervisors, and skill discretion/demand) on a 5-point Likert scale (strongly agree to strongly disagree). This measure has demonstrated moderate reliability (Karasek et al., 1998). Respondents were asked about their work stress if they were considered actively serving CAF members or were currently employed. A continuous total work stress score, ranging from 0 to 40, was created and examined at both waves of data collection (i.e., 2002 and 2018).

Deployment-Related Experiences (DEX). Eight dichotomous items (yes/no) were used to assess lifetime exposures that occurred during a CAF deployment as of 2018 (e.g., ever seen ill or injured women or children who you were unable to help, ever felt responsible for the death of a Canadian or ally personnel, ever had difficulty distinguishing between combatants and non-combatants; Boulos & Fikretoglu, 2018). These items were derived from the Combat Experiences Scale developed by Walter Reed Army Institute for Research (Sudom et al., 2016). Respondents who were never deployed were coded as ‘no’ on all items. Number of lifetime deployment-related experiences was created and examined based on whether the respondent reported exposure to one or more of any of the 8 DEX items assessed in the survey (numeric variable).

Chronic Physical Health Conditions. The CAFVMHS assessed a list of 19 physical health conditions, identified as having been diagnosed by a health professional that has ‘already lasted or is expected to last 6 months or more’. Physical conditions included were asthma, chronic obstructive pulmonary disease, arthritis, back problems, high cholesterol, high blood pressure, heart disease, suffers effect from stroke, diabetes, chronic fatigue, intestinal/stomach ulcers, irritable bowel syndrome, inflammatory bowel diseases, migraines, traumatic brain injury effects, cancer, epilepsy,

multiple sclerosis, and chronic liver disease. An ‘any physical health condition’ nominal variable was created based on whether respondents reported ‘yes’ to any one of the number of physical health conditions. Also, a single nominal variable (yes/no) of any condition known to be associated with chronic pain was created based on endorsement of any one of the following: arthritis, back problems, migraine headaches, and gastrointestinal conditions, including irritable bowel syndrome (IBS), inflammatory bowel disease (IBD; Crohn’s disease and ulcerative colitis), and intestinal and stomach ulcers, based on prior work with this dataset (Perera et al., 2021).

Child Maltreatment. In 2018, child maltreatment was assessed and included the following items that occurred prior to 16 years of age (except for a neglect item which asked the respondent if there was a time before the age of 10 years where they were left alone or unsupervised): sexual abuse (2 items, e.g., ‘attempted or forced into unwanted sexual activity by being held down, hurt or threatened, in some way’), physical abuse (3 items, e.g., ‘was bit, kicked, punched, burned, choked, or physically attacked’ at least once), emotional abuse (1 item, e.g., ‘a parent or other adult said mean or hurtful things that made you upset or feel really bad about yourself’ at least six times), exposure to intimate partner violence (1 item, ‘heard or saw guardians, stepparents, or parents hitting each other or another adult in the home’ at least three times), and neglect (2 items, e.g., ‘did you ever have to go without things you needed, like food, shoes, clothes, or materials for school’; categorizations based on prior work by Afifi et al., 2021).

Released from Service. In 2018, respondents were asked if they were actively serving as a CAF member or if they released from service (i.e., became a veteran). A nominal (yes/no) variable was created to indicate those in the sample who became a veteran by the time of re-interview in 2018 (i.e., the second wave of data collection).

Social Support. Social support (ordinal variable) was assessed in 2002 and 2018 using the Medical Outcomes Study Social Support Survey (Sherbourne & Stewart, 1991). This measure contained 19 items which assesses various types of social support including perceptible, active social interaction, affection, and emotion and information based. This measure provides a continuous measure of social support with total scores that ranged from 0 to 76, where lower scores represent lower social support (Mota et

al., 2021; Sherbourne & Stewart, 1991). For example, respondents were asked, ‘how often is each of the following kinds of support available to you if you need it: [someone to help you if you were confined to bed? Someone you can count on to listen to when you need to talk?’]. Level of current social support was used as a continuous variable at both waves of data collection (i.e., 2002 and 2018).

Coping with Stress. In 2002 and 2018, respondents were asked 14 questions about how frequently they used various strategies for dealing with stress (nominal variables) which were derived from the Ways of Coping Questionnaire, the COPE Scale, and the Coping Strategy Indicator (Amirkhan, 1990; Carver et al., 1989; Folkman & Lazarus, 1985). These coping measures (i.e., Ways of Coping Questionnaire, COPE Scale, Coping Strategy Indicator) have shown moderate to high reliability (Amirkhan, 1990; Carver et al., 1989; Folkman & Lazarus, 1985). Items were assessed on a Likert Scale from 1 to 4 (often to never, respectively). For example, they were asked, ‘People have different ways of dealing with stress. Thinking about the ways you deal with stress, please tell me how often you do each of the following: How often do you… ‘try to solve the problem?, avoid being with people?, try to feel better by smoking more cigarettes than usual?, try to feel better by drinking alcohol?, try to feel better by using drugs or medication?, wish the situation would go away or somehow be finished?’. Coping strategies were assessed with the same questions in 2018. Factor analysis of these items resulted in three factors: avoidance coping (5 items, e.g., ‘wish the situation would go away or somehow be finished’), problem-focused coping (4 items, e.g., ‘try to solve the problem’), and self-medication coping (3 items, e.g., ‘try to feel better by smoking more cigarettes than usual’; Mota et al., 2013). Each coping style was examined separately at both waves of data collection (i.e., in 2002 and in 2018), using a continuous variable for the degree to which each of the three coping styles were used.

Alcohol Use Disorder. Alcohol dependence was assessed in 2018 based on the WHO-CIDI according to DSM-IV criteria by trained lay interviewers (American Psychiatric Association, 2013; Kessler & Ustün, 2004; Nelson, 1999). 16-year incidence and recurrence (2002-2018) of alcohol abuse and dependence was measured in 2018 (nominal variables). Respondents were asked about their alcohol use (e.g., frequency of alcohol use that including more than one drink, number of beverages consumed),

attempts to reduce their alcohol use, and whether their alcohol use interfered with their daily life or caused interpersonal issues in 2002 and since 2002. A nominal variable (yes/no) indicating alcohol use disorder in 2018 was created and examined.

Comorbidity of Mental Disorders. A nominal variable was created based on the endorsement of 'yes' to any other DSM-IV mental disorder, other than the one that was examined as part of the subgroup stratification variable in 2002 (American Psychiatric Association, 2013). For example, if data were stratified by those who met criteria for MDE at baseline, then a lifetime diagnosis of any one of the other disorders (i.e., PTSD or any anxiety disorder) would be used to indicate comorbidity at baseline.

Persistence or Recurrence of a Mental Disorder. As previously mentioned, lifetime mental disorder diagnoses were assessed in 2002 at baseline. In 2018, recurrence of each mental disorder (i.e., MDE, PTSD, and any anxiety disorder – GAD, panic disorder, and social phobia) was assessed. Persistence or recurrence was indicated when the individual met criteria for a lifetime mental disorder diagnosis as assessed in 2002 and again met criteria for the identical mental disorder diagnosis between 2002 and 2018. For each mental disorder, a persistence or recurrence variable was created and examined in regression modelling. For example, for the subsample of individuals with baseline lifetime MDE, a variable called persistence or recurrence of MDE was created to indicate those who presented with a lifetime MDE in 2002 and also between 2002 and 2018.

Current Comorbid Mental Disorders. In 2018, 16-year incidence/recurrence of each mental disorder (i.e., MDE, PTSD, and any anxiety disorder – GAD, panic disorder, and social phobia) was assessed. A nominal variable was created based on the endorsement of 'yes' to any other mental disorder between 2002 and 2018, other than the one that was examined as part of the baseline 2002 lifetime mental disorder stratification variable. For example, for the subsample of individuals with lifetime MDE at baseline, then a since last interview diagnosis of any one of the other disorders (i.e., PTSD and any anxiety disorder) was used to indicate current mental disorder comorbidity at the second wave of data collection (i.e., in 2018).

Prior History of Suicidal Behaviour. Lifetime suicidal behaviour was assessed in 2002 with separate questions on suicidal ideation, plans and attempts. A nominal

variable was created based on the response of 'yes' to any suicidal behaviour (i.e., plans, attempts and ideation) at baseline (i.e., 2002).

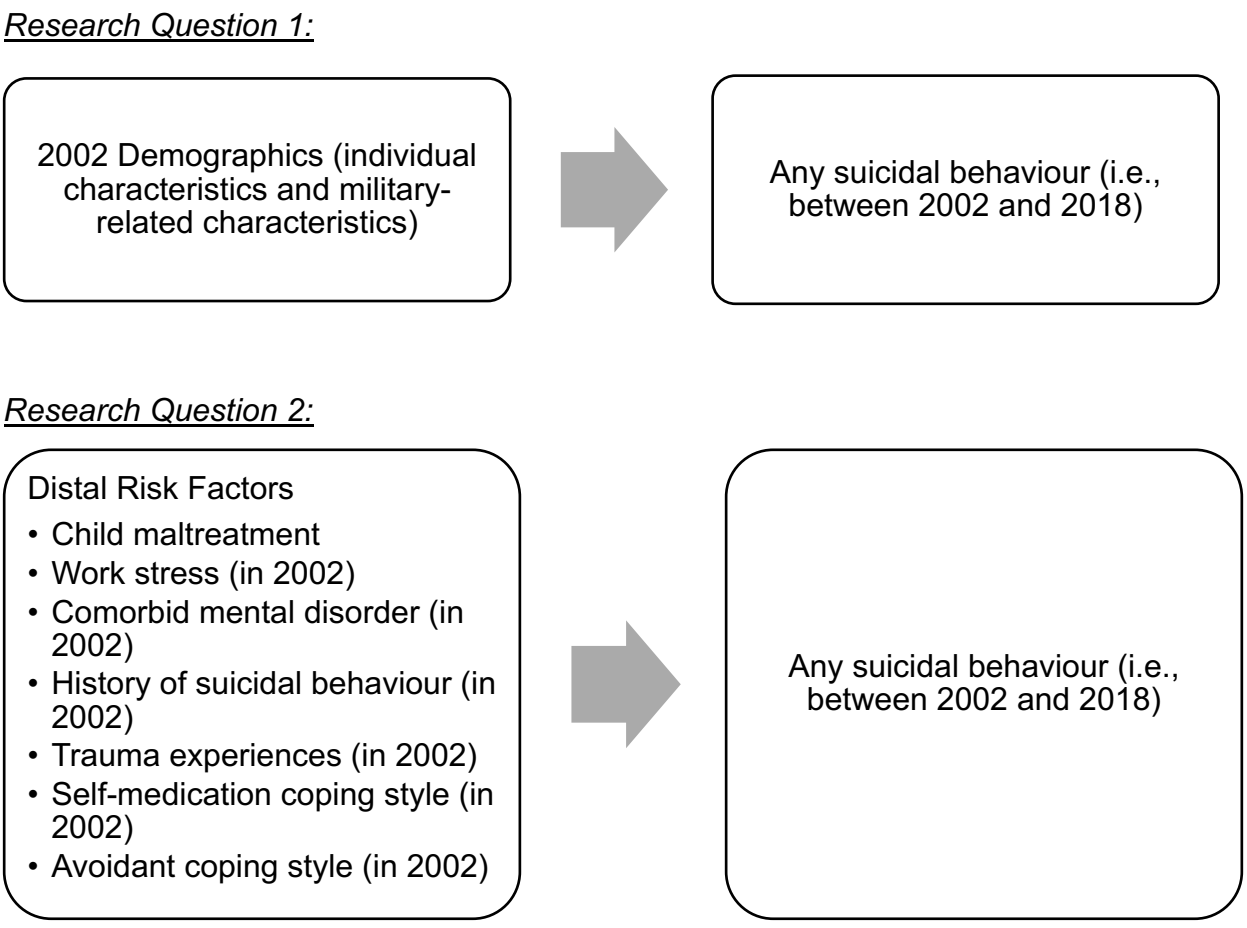
Data Analysis

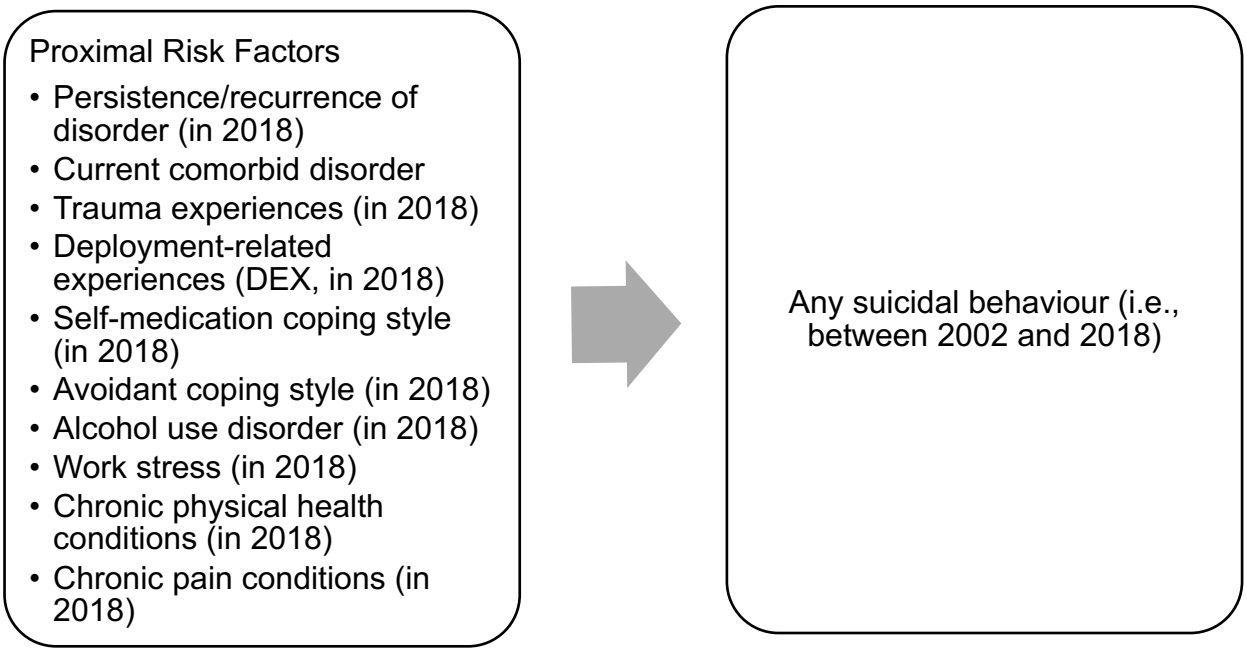
Sampling and bootstrapping weights created by Statistics Canada were used to ensure representativeness of the 2018 sample to the target population in 2002 and to account for nonresponse. Quantitative methods, specifically, logistic regression analysis was used as it is the most appropriate test for the study design (i.e., secondary data analysis), the level of measurement of the variables (as indicated in the measures section above, and with the main outcome being dichotomous), and the number of variables of the proposed work. For all logistic regression analyses and positive predictive values, 95% confidence intervals were used. Additionally, for all analyses in this study, an alpha of $p < .05$ was used as the present study was exploratory. This alpha level is consistent with prior work which indicates that exploratory studies do not require *p*-value adjustments (Martínez-Camblor et al., 2020).

The assumptions of logistic regressions are as follows: 1) linearity in the logit for continuous independent variables; 2) no multicollinearity; 3) independence of observations (i.e., no duplicate responses or repeated measures for each timepoint), and 4) limited number of outliers (Stoltzfus, 2011). To verify whether these assumptions are met within the context of the dataset, statistical evaluations were conducted. To check assumption one, this was done by plotting the log-odds of the outcome (2018 any suicidal behaviour "since last interview") compared to the explanatory variable (e.g., presence of deployment-associated traumatic events at baseline) to ensure there was a linear relationship. To verify that assumption two was met, this was done by verifying that the independent variables were not correlated. Self-checking verified that assumption three was met, as there were no duplicate responses in the dataset for each timepoint independently. To check assumption four, the plots from assumption one was analyzed again to ensure that there were few extreme outliers. To conclude, the assumptions of logistic regression were met and data analysis progressed to the next step. Data were analyzed in STATA (16.1, StataCorp LLC, College Station, TX).

Figure 2

Analytic Plan for the Current Study





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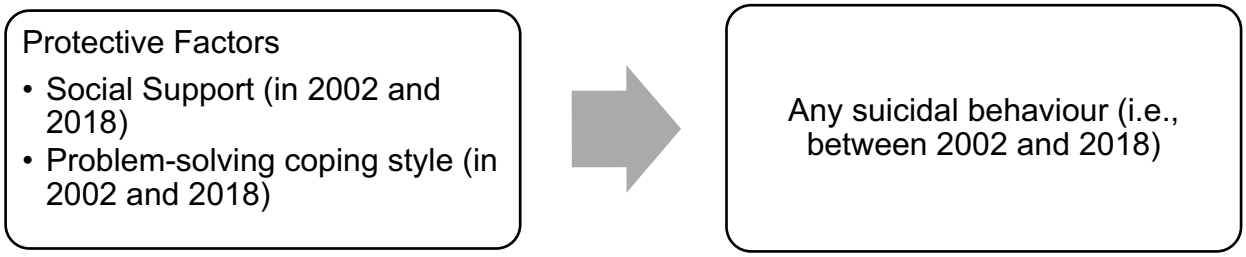

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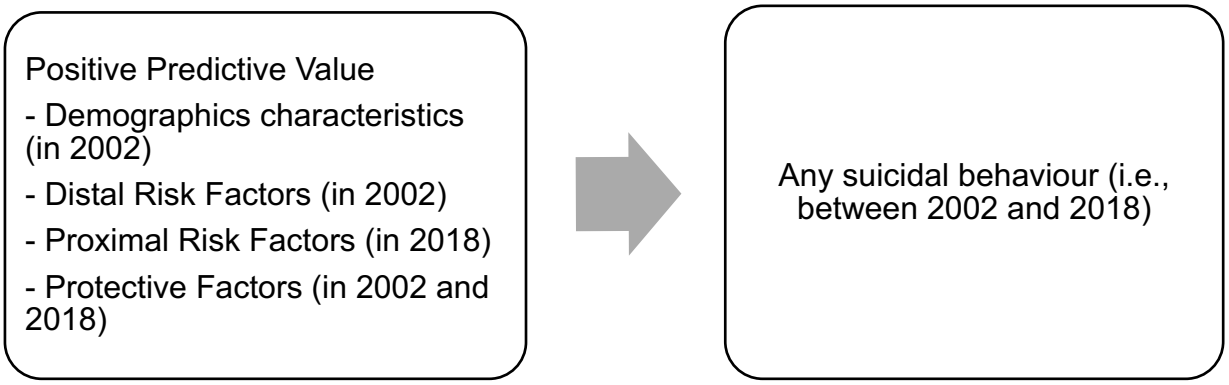


Examination of these relationships occurred among the following subgroups:

1. *Individuals with MDE at baseline (i.e., 2002)*
2. *Individuals with PTSD at baseline (i.e., 2002)*

3. *Individuals with any anxiety disorder at baseline (i.e., in 2002, one of: GAD, panic disorder, social phobia)*

Note. This figure demonstrates the analytic plan of the thesis. To address the first research question, the plan included identifying demographic characteristics (e.g., 2002 demographics and military characteristics) of suicidal behaviours among individuals with a mental disorder. For the second research question, the plan was to identify the distal risk factors in 2002 that were associated with increased odds of any suicidal behaviour, among individuals with a mental disorder. For the third research question the plan included identifying proximal risk factors in 2018 that were associated with increased odds of any suicidal behaviour, among individuals with a mental disorder. For the fourth research question the plan was to identify protective factors in 2002 and 2018 that are associated with decreased odds of suicidal behaviour, among those with a mental disorder. And for the fifth research question the plan included identifying the contribution of demographic characteristics, as well as the distal and proximal risk factors on predicting any suicidal behaviour (measured between 2002 and 2018).

Among individuals with baseline lifetime MDE, descriptive statistics were computed to examine the prevalence of any suicidal behaviour between 2002-2018. Parallel analyses were conducted with a subsample of individuals with lifetime PTSD in 2002 and among individuals with any anxiety disorder in 2002. To address research question 1, bivariate analyses (logistic regressions) were used to identify demographic characteristics (i.e., baseline demographic characteristics, baseline military-related characteristics) of any suicidal behaviour (i.e., ideation, plans and attempts between 2002 and 2018) among individuals with presence of lifetime MDE at baseline. Parallel analyses were conducted with a subsample of individuals with lifetime PTSD in 2002 and of individuals with any anxiety disorder in 2002.

To address research question 2, logistic regression was used to identify which distal risk factors measured in 2002, with the exception of child maltreatment which were measured in 2018 (i.e., child maltreatment, work stress, trauma experiences,

comorbid mental disorders, history of suicidal behaviour prior to 2002, self-medication coping style, avoidant coping style) were associated with increased odds of any suicidal behaviour (i.e., ideation, plans and attempts between 2002 and 2018) among individuals with lifetime MDE at baseline (i.e., 2002). Parallel analyses were conducted within a subsample of those with lifetime PTSD at baseline and among those with any anxiety disorder at baseline.

To address research question 3, logistic regression was used to identify which proximal risk factors measured in 2018 (i.e., persistence/recurrence of a mental disorder, current comorbid mental disorder, traumatic experiences, deployment-related experiences (DEX), self-medication coping style, avoidant coping style, alcohol use disorder, chronic physical health conditions, chronic pain conditions) were associated with increased odds of any suicidal behaviour (i.e., ideation, plans and attempts between 2002 and 2018) among individuals with lifetime MDE at baseline (i.e., 2002). Parallel analyses were conducted with a subsample of those with lifetime PTSD at baseline and among those with any anxiety disorder at baseline.

To address research question 4, logistic regression was used to identify which protective factors measured in 2002 and 2018 (i.e., problem-solving coping style, social support) were associated with decreased odds of any suicidal behaviour among individuals with lifetime MDE at baseline (i.e., 2002). Parallel analyses were conducted with a subsample of individuals with lifetime PTSD at baseline and among individuals with any anxiety disorder at baseline.

Additionally, to address research question 5, if a significant relationship was found between the independent variable (i.e., demographic characteristic or risk factor) and any suicidal behaviour, then the positive predictive value (PPV) was calculated to evaluate the contribution of each independent variable on predicting any suicidal behaviour (i.e., between 2002 and 2018) among individuals with lifetime MDE at baseline (i.e., 2002). To put it in another way, the PPV was calculated only for demographic characteristics and risk factors that were found to have a statistically significant association with any suicidal behaviour. This approach of utilizing risk factors with significant associations in PPV calculations have been supported in prior work (Busch, 2021; Habibzadeh et al., 2016; Tustumi, 2022). Parallel analyses were

conducted with a subsample of individuals with lifetime PTSD at baseline and among individuals with any anxiety disorder at baseline.

The PPV calculation is based on the probability that an individual will have suicidal behaviour—the disease—given the presence of each independent variable—the positive test. The mathematical expression is as follows:

PPV = a / (a + b)

= true positive / (true positive + false positive)

In the case of this analysis, the true positive indicated the presence of the independent variable along with the presence of any suicidal behaviour. And the false positive refers to the presence of the independent variable with no suicidal behaviour (see expression below).

PPV = independent variable + SB / [(independent variable + SB) + (independent variable + no SB)]

Numerous variables analysed in this study are represented by continuous values. In research and clinical practice, applying cut-points for continuous variables are often used for ease of interpretation of findings and to identify individuals most at risk of a particular outcome (Tustumi, 2022). As it relates to the present study, for the PPV to be calculated, all variables analyzed must be dichotomous. Therefore, since not all the characteristics and risk factors analyzed in the dataset were binary in nature, the next step involved selecting an appropriate cut-point for the continuous variables (i.e., 2002 age, 2002 and 2018 self-medication and avoidance coping, 2002 and 2018 work stress, 2002 and 2018 number of traumatic experiences and number of DEX between 2002 and 2018). In order to select the appropriate method for the cut-point, the distributions of all continuous variables were analyzed (Busch, 2021; Habibzadeh et al., 2016; Tustumi, 2022). After analyzing the skewness and kurtosis normality tests for all continuous variables it was determined that there were a number of variables that were not normally distributed therefore a reasonable approach involved utilizing a non-parametric method to select an appropriate cut-point (Busch, 2021; Habibzadeh et al., 2016). As such, for the purposes of this calculation only, a median split (i.e., non-parametric method) was applied to all continuous variables (Busch, 2021; Habibzadeh et al., 2016). Median split variables were only used in the calculation of PPV and not for

any other analyses (i.e., logistic regression analyses of associations) to minimize the substantial loss of variance. A dichotomous, categorical variable was created based on the median (i.e., 50th percentile), where responses at or below the median were in one level of the variable, and all those above the median were in the other level. This method of splitting continuous variables is a data dependent method of selecting a cut-off value, and thereby introduces bias into the study findings (Busch, 2021; Habibzadeh et al., 2016; Tustumi, 2022). However, this method ensures that the variable is divided into equally representative groups (Tustumi, 2022).

Ethical Considerations

Data from the CAFVMHS were collected according to the Statistics Act that provides Statistics Canada with the ability to collect data while safeguarding the confidentiality of respondents. Participant consent was acquired by Statistics Canada at the time of the survey. The consent process explained that secondary use of the data would occur, and participants were asked for their willingness to have their data used in this way.

This study received ethical approval from the University of Manitoba Bannatyne Research Ethics Board and data access approval from Statistics Canada. All data are anonymized, protecting the identity of the participant. No unique identifiers nor directly identifying data are provided, nor were they used in the data analysis. Participants were not identified in any way. All analyses required a minimum of 5 individuals or higher in each cell of data. Indirectly, age was collected in the CAFVMHS, and was used in the data analysis as an independent variable in the relationship between mental disorders and risk for any suicidal behaviour.

Student and advisors had access to the data at the Manitoba Research Data Centre. These are the only individuals that had direct access to the data files. Records were kept and maintained by the Manitoba Research Data Centre analyst as to who was allowed to access the Manitoba Research Data Centre and the files being used for this study. Data were stored at the Manitoba Research Data Centre using secure servers in affiliation with Statistics Canada. Only data tables and analyses, not participant level data, was authorized to leave the secure facility.

Statistics Canada has rigorous standards to avoid identification of any individual or subgroup. There is a vetting process at the Research Data Centre prior to removing analyses from the facility that ensures that confidentiality is not broken, and that participant information is not compromised.

Chapter III: Results

Prevalence of Any Suicidal Behaviour by Baseline Lifetime Mental Disorders

The prevalence of any suicidal behaviour (i.e., between 2002 and 2018) among individuals with baseline MDE, baseline PTSD, and baseline any anxiety disorder was 38.2%, 40.2% and 38.2%, respectively.

Demographic Characteristics Among Those with Baseline Lifetime Mental Disorders in Risk for Any Suicidal Behaviour between 2002 and 2018

Table 1 demonstrates demographics and military-related characteristics of individuals with a mental disorder who reported any suicidal behaviour between 2002 and 2018. Demographic characteristics associated with any suicidal behaviour between 2002 and 2018 included age, environmental command, and rank. Associations between demographics and risk of any suicidal behaviour varied by mental disorder subsamples.

Subsample A: Baseline Lifetime MDE

Among individuals with baseline MDE, older age was significantly associated with decreased odds of any suicidal behaviour between 2002 and 2018 (significant odds ratio [OR]= 0.97; 95% confidence interval [CI]: 0.94-1.00). In other words, younger age was associated with increased likelihood of suicidal behaviour. Military personnel in the land environmental command were more likely than individuals wearing air uniforms to report any suicidal behaviour between 2002 and 2018. As well, commissioned officers were at significantly lower odds than junior and senior non-commissioned members to have any suicidal behaviour between 2002 and 2018 (OR= 0.60; 95% CI: 0.36-0.98). To frame this finding in another way, CAF members in a lower rank were at increased risk for any suicidal behaviour.

Subsample B: Baseline Lifetime PTSD

Among individuals with baseline PTSD, none of the demographic characteristics examined were significantly associated with increased odds of any suicidal behaviour between 2002 and 2018.

Subsample C: Baseline Lifetime Any Anxiety Disorder

Among individuals with baseline any anxiety disorder, similar to finding among individuals with baseline MDE, those in the land environment were more likely than those wearing air uniforms to report any suicidal behaviour between 2002 and 2018. Similarly, commissioned officers were at significantly lower odds than junior and senior non-commissioned members to have any suicidal behaviour between 2002 and 2018, (OR= 0.23; 95% CI: 0.13-0.42).

Distal Risk Factors Among Those with Baseline Lifetime Mental Disorders in Risk for Any Suicidal Behaviour between 2002 and 2018

Table 2 provides distal risk factors of any suicidal behaviour between 2002 and 2018 by mental disorder subsamples. Across all three subsamples, distal risk factors associated with any suicidal behaviour between 2002 and 2018 included prior history of any suicidal behaviour, comorbid mental disorder, deployment trauma, work stressors, self-medication coping, avoidance coping, number of traumatic experiences as well as child maltreatment including exposure to intimate partner violence, neglect, emotional abuse, sexual abuse, and physical abuse. Associations between various distal risk factors and any suicidal behaviour differed among the three subsamples (i.e., of those with baseline MDE, of those with baseline PTSD, and of those with baseline any anxiety disorder).

Subsample A: Baseline Lifetime MDE

Among individuals with baseline MDE, those with a prior history of suicidal behaviour were associated with increased odds of suicidal behaviour between 2002 and 2018 (OR = 2.74; 95% CI: 1.79-4.19). Comorbidity of mental disorders, including 2002 lifetime PTSD and 2002 any anxiety disorder, was linked to increased likelihood of any suicidal behaviour (OR = 1.86; 95% CI: 1.21-2.85). Additionally, all child abuse history types were significantly linked to increased odds of suicidal behaviour, including exposure to intimate partner violence [OR= 2.27; 95% CI: 1.27-4.03], neglect [OR= 1.82; 95% CI: 1.18-2.79], emotional abuse [OR= 2.46; 95% CI: 1.57-3.83], sexual abuse [OR= 1.79; 95% CI: 1.04-3.08], and physical abuse [OR= 2.40; 95% CI: 1.53-3.77]). As well, a self-medication coping style was related to suicidal behaviour (OR = 1.19; 95% CI: 1.05-1.35). Stressors and stressful life experiences were related to increased odds

of suicidal behaviour, with unadjusted odds ratios of 1.07 for work stress (95% CI: 1.02-1.12) to 1.15 for number of traumatic experiences (95% CI: 1.07-1.24).

Subsample B: Baseline Lifetime PTSD

Among individuals with 2002 lifetime PTSD, those who had a history of any suicidal behaviour were highly linked to suicidal behaviour between 2002 and 2018 (OR = 2.22; 95% CI: 1.13-4.38). Similar to the finding within the MDE subsample (subsample A), those with baseline PTSD who reported using more maladaptive coping such as self-medication coping (OR = 1.23; 95% CI: 1.02-1.49), and avoidance coping (OR = 1.14; 95% CI: 1.00-1.30) were also at increased odds of any suicidal behaviour. Again, stressors and stressful life experiences including work stress (OR = 1.08; 95% CI: 1.01-1.15), and number of traumatic experiences (OR = 1.13; 95% CI: 1.02-1.25) were linked to increased odds of any suicidal behaviour between 2002 and 2018.

Subsample C: Baseline Lifetime Any Anxiety

Among individuals with baseline any anxiety disorder, those who had a prior history of any suicidal behaviour (OR = 5.22; 95% CI: 3.14-8.68) had a greater likelihood of any suicidal behaviour (as seen in the findings in subsamples A and B). Similar to results found among other subsamples, individuals with any anxiety disorder who also used maladaptive coping styles, including self-medication coping (OR = 1.19; 95% CI: 1.04-1.37) and avoidance coping (OR = 1.11; 95% CI: 1.02-1.21), were more likely to experience suicidal behaviour. As well, stressors and stressful life experiences were found to be associated with any suicidal behaviour, such as work stress (OR = 1.08; 95% CI: 1.03-1.14) and number of traumatic experiences (OR = 1.09; 95% CI: 1.02-1.17). All child abuse history types were linked with suicidal behaviour (i.e., exposure to intimate partner violence [OR= 2.54; 95% CI: 1.39-4.63], neglect [OR= 2.10; 95% CI: 1.28-3.42], emotional abuse [OR= 1.98; 95% CI: 1.18-3.33], sexual abuse [OR= 2.08; 95% CI: 1.17-3.71], and physical abuse [OR= 1.75; 95% CI: 1.08-2.82]).

Proximal Risk Factors Among Those with Baseline Lifetime Mental Disorders in Risk for Any Suicidal Behaviour between 2002 and 2018

Table 3 provides proximal risk factors of any suicidal behaviour between 2002 and 2018 by subsample (i.e., mental disorder type). Proximal risk factors associated with any suicidal behaviour between 2002 and 2018 across the subsamples included

persistence or recurrence of a mental disorder, current comorbid mental disorder, alcohol use disorder, traumatic experiences, having been released from service in 2018, avoidance coping, self-medication coping, number of traumatic experiences and number of deployment-related experiences. There were also a few differences noted between the three subsamples and in their links between proximal risk factors and any suicidal behaviour.

Subsample A: Baseline Lifetime MDE

Among individuals with 2002 lifetime MDE, the highest magnitude association was found in the following two proximal risk factors: i) persistent or recurring MDE; ii) current comorbid mental disorder of PTSD (i.e., between 2002 and 2018), and/or any anxiety disorder (i.e., between 2002 and 2018). Among individuals with 2002 lifetime MDE, those who had persistent or recurring MDE were at an increased likelihood of any suicidal behaviour between 2002 and 2018 (OR = 9.40; 95% CI: 5.52-16.02). Additionally, the presence of a current comorbid mental disorder (i.e., PTSD or any anxiety disorder between 2002 and 2018) was linked to suicidal behaviour (OR = 8.09; 95% CI: 4.98-13.14). Stressful life events such as being a refugee, being stalked, or having ever had a life-threatening illness, known as ‘other traumatic experiences’ was significantly related to increase odds of suicidal behaviour, where individuals with these traumatic experiences were nearly twice as likely to experience suicidal behaviour between 2002 and 2018 compared to individuals who did not have these types of traumatic experiences (OR = 1.99; 95% CI: 1.24-3.19). Of individuals with 2002 lifetime MDE, those who also had an alcohol use disorder were more likely to experience suicidal behaviour between 2002 and 2018 (OR = 2.04; 95% CI: 1.17-3.55).

The following odds ratios, for example those for avoidance coping and number of traumatic experiences, appear relatively small in magnitude; however, it is important to note that these are continuous variables and therefore in considering this, the odds ratios are quite substantial. One of the maladaptive coping styles was found to be linked to suicidal behaviour, wherein those with avoidance coping were more likely to experience suicidal behaviour (OR = 1.32; 95% CI: 1.22-1.43). As well, number of stressful life experiences including number of traumatic experiences (OR = 1.15; 95% CI: 1.07-1.23) and number of deployment related experiences (OR = 1.16; 95% CI:

1.03-1.30), were linked to increased odds of any suicidal behaviour between 2002 and 2018.

Subsample B: Baseline Lifetime PTSD

Among individuals with baseline PTSD, those with persistence or recurrence of mental disorder at the second wave of data collection were more likely to experience any suicidal behaviour between 2002 and 2018 (OR = 7.48; 95% CI: 3.61-15.52). Individuals with PTSD at baseline who also had an alcohol use disorder in 2018 were at increased odds of any suicidal behaviour (OR = 2.99; 95% CI: 1.28-6.98). Again, as demonstrated in the findings with the MDE subsample, individuals with baseline PTSD who reported the experience of 'other' traumatic experiences were at increased likelihood of any suicidal behaviour (OR = 2.61; 95% CI: 1.26-5.41). Similar to findings among individuals in the MDE subsample, the PTSD subsample demonstrated a significant relationship between the maladaptive coping style of avoidance coping (OR = 1.28; 95% CI: 1.13-1.45) and suicidal behaviour between 2002 and 2018. As well, a greater number of traumatic experiences (OR = 1.14; 95% CI: 1.03-1.27) was associated with increased odds of any suicidal behaviour between 2002 and 2018.

Subsample C: Baseline Lifetime Any Anxiety

Among individuals with baseline any anxiety disorder, those with presence of persistence or recurrence of anxiety disorder were at increased odds of suicidal behaviour (OR = 7.67; 95% CI: 4.39-13.39). As well, current comorbid mental disorder (i.e., MDE and/or PTSD between 2002 and 2018) was associated with increased likelihood to have any suicidal behaviour between 2002 and 2018 (OR = 7.59; 95% CI: 4.23-13.64). Individuals with 2002 lifetime any anxiety disorder with a current alcohol use disorder were more likely to have recent suicidal behaviour (OR = 2.12; 95% CI: 1.15-3.92). Stressful life experiences, including 'other' traumatic experiences (OR = 1.78; 95% CI: 1.08-2.94) and having been released from service in 2018 (OR = 1.84; 95% CI: 1.01-3.38), were linked with any suicidal behaviour. Similar to subsamples A and B, individuals with baseline any anxiety who reported the use of maladaptive avoidance coping were at increased likelihood of any suicidal behaviour (OR = 1.43; 95% CI: 1.28-1.59). As well, number of stressful life experiences, such as the number of traumatic experiences (OR = 1.14; 95% CI: 1.04-1.24) and the number of deployment-

related experiences (DEX; OR = 1.17; 95% CI: 1.01-1.34), were linked to increased odds of any suicidal behaviour between 2002 and 2018.

Protective Factors Among Those with Baseline Lifetime Mental Disorders Against Any Suicidal Behaviour between 2002 and 2018

Table 4 displays potential protective factors for any suicidal behaviour between 2002 and 2018 by mental disorder type. Baseline protective factors for any suicidal behaviour (i.e., between 2002 and 2018) included problem solving coping and social support. Protective factors varied by mental disorder subsamples.

Among individuals with baseline MDE, 2018 problem-solving coping (OR = 0.74; 95% CI: 0.67-0.83) and 2018 social support (OR = 0.97; 95% CI: 0.95-0.99) were linked to decreased odds of any suicidal behaviour between 2002 and 2018. Among those with 2002 lifetime PTSD, only 2018 problem-solving coping (OR = 0.73; 95% CI: 0.62-0.85) was associated with decreased odds of any suicidal behaviour between 2002 and 2018. Among individuals with 2002 lifetime any anxiety disorder, 2002 problem-solving coping (OR = 0.78; 95% CI = 0.69-0.88), 2018 problem-solving coping (OR = 0.68; 95% CI: 0.60-0.77), and 2018 social support (OR = 0.96; 95% CI: 0.93-0.98) were all associated with decreased odds of suicidal behaviour.

Positive Predictive Value (PPV) of Demographic Characteristics and Risk Factors

Table 5 illustrates the PPV for each independent variable (i.e., demographic characteristics and risk factors) significantly associated with any suicidal behaviour between 2002 and 2018.

Subsample A: Baseline Lifetime MDE

Among the characteristics significantly associated with any suicidal behaviour, the greatest PPV in terms of demographic characteristics among those with baseline lifetime MDE was 2002 median age, with younger age at 43.3% (95% CI: 36.3%-50.6%). Of the distal risk factors significantly associated with any suicidal behaviour, the PPVs ranged from 40.4% (95% CI: 34.9%-46.1%) for deployment-associated traumatic exposure to 55.0% (95% CI: 42.2%-67.2%) for exposure to intimate partner violence. As for proximal risk factors significantly associated with any suicidal behaviour, the highest

PPV among those with baseline lifetime MDE was 60.2% (95% CI: 53.4%-66.5%) for current comorbid PTSD and/or any anxiety disorder.

Subsample B: Baseline Lifetime PTSD

Since there were no demographic characteristics significantly associated with any suicidal behaviour, there are no PPV calculations for demographic characteristics among those with baseline lifetime PTSD. As for the distal risk factors significantly associated with any suicidal behaviour, the greatest PPV among those with baseline lifetime PTSD was 51.1% (95% CI: 38.8%-63.2%) for any prior history of suicidal behaviour. Of the proximal risk factors significantly associated with any suicidal behaviour, the greatest PPV among those with baseline lifetime PTSD was 66.3% (95% CI: 53.6%-77.1%) representing persistence or recurrence of disorder.

Subsample C: Baseline Lifetime Any Anxiety

The greatest PPV in terms of demographic characteristics among those with baseline lifetime any anxiety disorder was the environmental command variable with land environment contributing to a PPV of 47.2% (95% CI: 38.8%-55.8%). Of the distal risk factors significantly associated with any suicidal behaviour, the greatest PPV among those with baseline lifetime any anxiety disorder was 59.6% (95% CI: 50.7%-68.0%) for any prior history of suicidal behaviour. As for the proximal risk factors significantly associated with any suicidal behaviour, the PPVs among those with baseline lifetime any anxiety disorder ranged from 41.8% (95% CI: 35.1%-48.7%) for having been released from service to 60.5% (95% CI: 52.3%-68.2%) for persistence or recurrence of disorder.

Chapter IV: Discussion

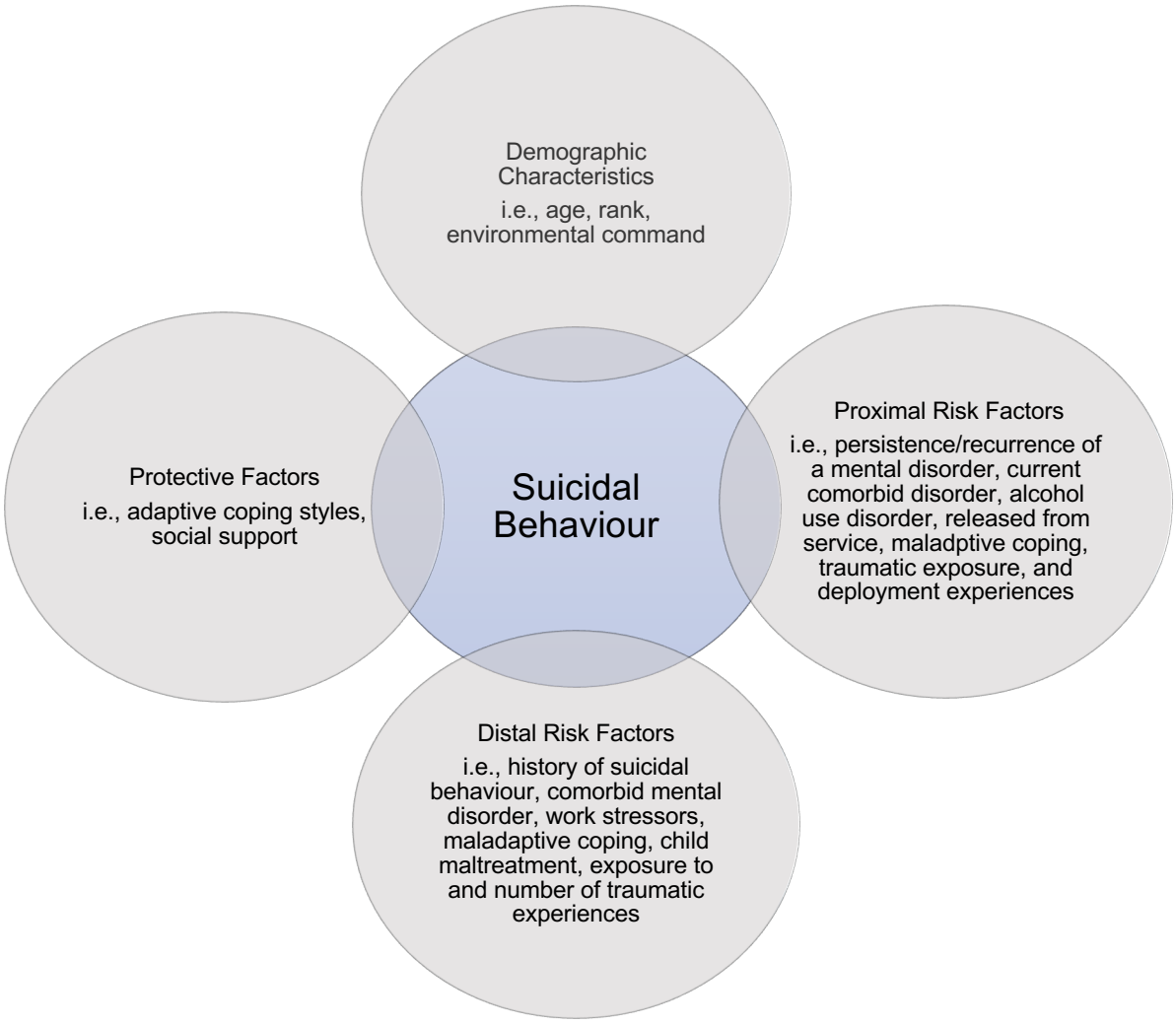
This is the first Canadian study to examine demographic characteristics, distal and proximal risk factors, as well as protective factors for suicidal behaviour among military personnel and veterans with MDE, PTSD and any anxiety disorder over the span of 16 years. Results from this study are consistent with the main components of the integrated theory outlined by Mann and colleagues (1999; 2002; 2003; 2005), Moscicki (2001) and Díaz-Oliván and associates (2021). Figure 3 incorporates the results from the current study into the four key factors of suicidal behaviour (i.e., demographic characteristics, distal and proximal risk factors, and protective factors) based on the integrated theoretical model of suicidal behaviour (Mann et al., 1999; 2002; 2003; 2005; Moscicki, 2001; Díaz-Oliván et al., 2021).

The present study found that 38.2% of those with 2002 lifetime MDE, 40.2% of those with 2002 lifetime PTSD, and 38.2% of those with 2002 lifetime any anxiety disorder experienced suicidal behaviour between 2002 and 2018. The prevalence of suicidal behaviour among those with a mental disorder was higher than those found in previous research (Cai et al., 2021; Nordentoft et al., 2011). Further, the findings of the current work highlight that certain baseline demographic characteristics (i.e., 2002) of individuals with baseline MDE and any anxiety disorder were associated with an increased risk of any suicidal behaviour between 2002 and 2018, including younger age, land environmental command, as well as junior and senior non-commissioned status. Further distal risk factors across all subsamples included prior history of any suicidal behaviour, greater work stressors, a self-medication coping style, greater number of traumatic experiences. Child maltreatment including exposure to intimate partner violence, neglect, emotional abuse, sexual abuse, and physical abuse, were predictive of any suicidal behaviour only among individuals with baseline lifetime MDE and baseline lifetime any anxiety disorder. Proximal risk factors that were significant across all subsamples included persistence or recurrence of the baseline mental disorder, an alcohol use disorder, ‘other’ traumatic experiences, greater use of avoidance coping, and greater number of traumatic experiences. Finally, a current problem-solving coping style was protective against suicidal behaviour amongst all subsamples. Social support in 2018 was protective only for individuals with baseline

MDE and baseline anxiety disorder. Furthermore, the examination of PPVs in this study helped to identify characteristics and risk factors that were predictive of suicidal behaviour. These findings help to further characterize those with mental disorders at greatest risk of suicidal behaviour.

Figure 3

Conceptual Model for Suicidal Behaviour with Findings from the Current Study



Note. This figure portrays the present study's findings of demographic characteristics and factors associated with suicidal behaviour among those with a mental disorder which are incorporated into the integrated model adapted from Mann and colleagues

(1999; 2002; 2003; 2005;), Moscicki (2001) and based on the assumption of non-linearity in suicidal behaviour from Díaz-Oliván and associates (2021). In this model, there are four key factors of suicidal behaviour (i.e., demographic characteristics, protective factors as well as distal and proximal risk factors).

Results by Study Hypotheses

Hypothesis One

The first hypothesis was that among CAF member and veterans with a mental disorder, younger age, male sex, unpartnered marital status, lower household income level, lower education, land/army environmental command, lower military rank, and having been deployed would be associated with a higher risk for suicidal behaviour between 2002 and 2018. In line with part of the hypothesis, findings from this work showed that among individuals with a mental disorder the following characteristics were associated with increased risk for suicidal behaviour between 2002 and 2018: younger age, land/army environmental command, and lower military rank. Importantly, there were differences across the three subsamples, which indicates that there were differences in demographic characteristics in their risk for suicidal behaviour based on the type of mental disorder (i.e., baseline lifetime: MDE, PTSD, and any anxiety disorder).

Among individuals with baseline MDE, younger age was significantly related to increased odds of any suicidal behaviour. This may be due in part to the notion that younger military personnel are adjusting to their role in their military career and could be experiencing a number of additional life stressors (Haney, 2012; Nichter et al., 2021; Nock et al., 2013; Nock et al., 2014). Studies in the general population have noted similar differences by age, with suicidal behaviour being linked to younger age (Nock et al., 2013).

Individuals with MDE or anxiety disorder, who were working on land compared to those who were in air or sea environmental command, were significantly more likely to experience suicidal behaviour between 2002 and 2018. This result related to environmental command is consistent with previous findings (Boulos, 2020). One possible explanation for this finding may be that individuals who are in the land

environmental command may be exposed to more traumatic experiences (e.g., combat operations). Junior and senior non-commissioned members with MDE or any anxiety were more likely to experience any suicidal behaviour between 2002 and 2018. Similar to environmental command, this finding may be partly explained by the job responsibilities of individuals in these ranks. This finding is in line with other research wherein lower military rank was associated with increased exposures to traumatic events which may be related to their work-related duties in their role (Mota et al., 2021).

Notably, among those with baseline PTSD, none of the demographic characteristics examined were predictive of any suicidal behaviour between 2002 and 2018. This lack of relationship among those with baseline PTSD, but found in those with baseline MDE and anxiety disorder, may be reflective of the particular disorder and its related symptoms. As previous research has shown, there is a strong link between PTSD and suicidal behaviour, especially among military samples (Handley et al., 2018; Nock et al., 2013; Ursano et al., 2020). Further, it could be that military members and veterans with PTSD may be re-experiencing traumatic experiences and distressing symptoms and it is these experiences and reactions that place an individual at increased risk of suicidal behaviour, despite their particular demographic characteristics.

The data are insufficient to support the hypothesis that sex, income level, educational attainment level, and marital status are significantly associated with any suicidal behaviour among those with a mental disorder. The demographic composition of the CAF and of this sample in particular, being young and predominantly male, denotes an increased risk of suicidal behaviour (Nichter et al., 2021; Nock et al., 2013). However, in this study, there is inadequate evidence to suggest that sex is a demographic risk factor among those with mental disorders. Additionally, the data of this study showed that there was no credible evidence to show that deployment status (i.e., being deployed at least once) was related to increased odds of any suicidal behaviour. This finding is supported by previous studies which have found that the experience of deployments was not strongly related to suicidality (Anglemyer et al., 2016; Bryan et al., 2015).

Hypothesis Two

The second hypothesis was that among CAF member and veterans with a mental disorder and the following distal risk factors would be associated with a higher risk for suicidal behaviour between 2002 and 2018, including history of suicidal behaviour (i.e., lifetime suicidal behaviour in 2002), greater work stress in 2002, comorbid mental disorder in 2002, the presence of an avoidant or self-medication coping styles in 2002, the presence and greater number of traumatic experiences in 2002 and the experience of child maltreatment. This hypothesis was partially supported by the results. Among those with a baseline mental disorder, prior history of any suicidal behaviour, any comorbid mental disorder, deployment-associated traumatic exposure, child maltreatment, the use of self-medication and avoidance coping, greater work stress and greater number of traumatic experiences were associated with any suicidal behaviour between 2002 and 2018. Further, although there were differences in which distal factors were significantly related to suicidal behaviour by subsample, any prior history of any suicidal behaviour in 2002, self-medication coping style, greater work stress, and greater number of traumatic experiences were consistently associated with increased suicidal behaviour.

Among all individuals in the three subsamples, two of the three traumatic experiences 'other' trauma, and sexual trauma at baseline, were not predictive of any suicidal behaviour between 2002 and 2018. As well, exposure to deployment trauma was not significantly associated with any suicidal behaviour among individuals with baseline PTSD and baseline anxiety disorder. None of the types of child maltreatment were predictive of suicidal behaviour among individuals with baseline lifetime PTSD. Although the exposure to child maltreatment has typically been noted to be related to increased suicidal behaviour, in this study, child maltreatment was most strongly linked to suicidality among individuals with baseline lifetime MDE and baseline lifetime any anxiety disorder (ORs ranging from 1.75 to 2.54), while the impact of these traumatic experiences were not consistently linked to suicidal behaviour among those with baseline lifetime PTSD (Afifi et al., 2016; Sachs-Ericsson et al., 2017). The lack of relationship between traumatic experiences (i.e., child maltreatment, deployment trauma, sexual trauma and 'other' trauma) and suicidal behaviour among individuals

with baseline PTSD could reflect the strong linkage between trauma exposure with a diagnosis of PTSD. One might hypothesize that the majority of individuals with PTSD experienced child abuse and subsequent traumatic experiences, thus the type of traumatic experience may not be able to distinguish between those with suicidal behaviour versus those without when compared to the accumulated impact of the number of traumatic experiences. This finding is consistent with prior work showing that a greater number of traumatic exposures is associated with increased risk of suicidal behaviour (Nock et al., 2013). In contrast, the relationship between traumatic exposures and child abuse histories among individuals with MDE and anxiety disorder may reflect the effects of certain types of traumatic experiences on individuals with these specific disorders.

Across all three subsamples of those currently employed, greater work stress was associated with a 1.07 to 1.08 increased odds of any suicidal behaviour. This is in line with previous research which suggests that stressors related to the military members' current work can significantly impact the individual and can lead to increased suicidal risk (Bryan et al., 2018; Nichter et al., 2021; Nock et al., 2013; Nock et al., 2014; Ravindran et al., 2020).

As for maladaptive coping styles, greater use of self-medication coping was associated with an increased odds of suicidal behaviour among all three subsamples, with ORs ranging from 1.19 to 1.23. Avoidance coping was related to increased likelihood of suicidal behaviour only among individuals with baseline lifetime PTSD and baseline lifetime any anxiety disorder. Avoidance behaviours are commonly associated with anxiety disorders and PTSD, and the overreliance of these disengaged behaviours over time often deceases the individuals' sense of control (Hofmann & Hay, 2018). Therefore, long-term avoidant coping can be harmful and is often a maladaptive means to escape the threat and emotions related to this threat (Hofmann & Hay, 2018). Further, greater use of avoidance coping over time often leads to persistent mental disorders which may partly explain why the current study found that it was associated with any suicidal behaviour (Hofmann & Hay, 2018).

Hypothesis Three

The third hypothesis was that among CAF member and veterans with a mental disorder, the following proximal risk factors would be associated with higher odds of suicidal behaviour, including persistence/recurrence of a mental disorder (i.e., 2002 lifetime mental disorder and between 2002 and 2018 mental disorder), current comorbid mental disorder, greater number of deployment-related experiences (DEX), exposure and greater number of traumatic experiences in 2018, current alcohol use disorder, greater use of avoidance and self-medication coping styles in 2018, greater work stress and presence of chronic physical health conditions and chronic pain conditions in 2018. This hypothesis was somewhat supported by the findings of this work. Among individuals with a mental disorder, persistence or recurrence of mental disorder, alcohol use disorder, 'other' traumatic experience, having released from service in 2018, greater use of avoidance and self-medication coping styles, greater number of traumatic experiences and greater number of deployment-related experiences were associated with any suicidal behaviour. Although causality between these proximal factors and any suicidal behaviour cannot be proven, the results demonstrate some clear relationships. Although it should be noted that there was a differential relationship in proximal factors as they relate to any suicidal behaviour across each of the three subsamples, persistence or recurrence of mental disorder, current alcohol use disorder, 'other' traumatic experiences, greater use of avoidance coping, and greater number of traumatic experiences in 2018 were consistently associated with suicidal behaviour across subsamples.

A seven- to ninefold increase in odds of any suicidal behaviour was linked to persistence or recurrence of mental disorders, highlighting a significant differential relationship among individuals who did not have persistence or recurrence of amental disorder over the follow-up. The magnitude of this association was the highest among all proximal risk factors examined. This finding of persistence or recurrence of mental disorders being highly associated with suicidal behaviour is consistent with previous research (Moscicki, 2001).

The findings of the present study also showed that current a comorbid mental disorder among those with baseline lifetime MDE or any anxiety disorder was linked to a

seven- to eightfold increase in odds of experiencing any suicidal behaviour between 2002 and 2018, consistent with prior work (Moscicki, 2001). Across the two subsamples, the majority of individuals who had a current comorbid mental disorder also experienced any suicidal behaviour (~58% - 60%), highlighting a significant relationship between mental disorder comorbidity and suicidal behaviour. Although cell sizes prevented examination of the impact of a current comorbid mental disorder among the PTSD subsample, the trend showed an increased likelihood of any suicidal behaviour, consistent with the other subsamples (i.e., baseline lifetime MDE, baseline lifetime any anxiety disorder).

Alcohol use disorder was associated with a two- to nearly three-fold increased likelihood of any suicidal behaviour among all three subsamples (i.e., baseline lifetime: MDE, PTSD and any anxiety disorder). Furthermore, among those with mental disorders this relationship between alcohol use disorder and suicidal behaviour has been noted in previous research (Conner & Bagge, 2019; Glenn & Nock, 2014). It has been speculated in military and veterans samples that those with mental disorders may be experiencing various hardships (i.e., stressors and effects of traumatic experiences) and alcohol use is a maladaptive means for coping with these issues (Inoue et al., 2022).

The findings of this study show that certain types of traumatic events appear to be differentially associated with any suicidal behaviour among individuals with a mental disorder, and these findings are consistent with prior work (Nichter et al., 2021). Particularly, ‘other’ traumatic experience were found to be significantly associated with increased odds of suicidal behaviour with ORs ranging from 1.78 to 2.61. This ‘other’ traumatic experience category is comprised of various events including accidental, interpersonal, and other unexpected events such as being a refugee, being in a motor vehicle accident, having an illness, death of a loved one, having a child with an illness, and being stalked. These findings underscore the importance of secondary prevention efforts in screening for a range of traumatic experiences. Further, consistent with previous research, this study found that a greater number of traumatic experiences was associated with an increased likelihood of suicidal behaviour across all three subsamples (Nock et al., 2013; Nelson et al., 2011).

The association between release from service in 2018 and any suicidal behaviour between 2002 and 2018, was only significant among individuals with baseline lifetime any anxiety disorder, while the impact of release from service was not consistently linked to suicidal behaviour among those with baseline lifetime PTSD or baseline lifetime MDE. The lack of relationship between release from service among individuals with baseline lifetime PTSD and baseline lifetime MDE may reflect that the transitional period to civilian life may contribute to an increased susceptibility among those with anxiety disorders. Further, the challenges associated with this transitional time may be exacerbated by symptoms of anxiety. This result is consistent with the finding from military samples in the United States where mental disorders, including anxiety disorders, were among the most common reasons for medical discharge (Hoge et al., 2005).

This study found that among all subsamples, 2018 work stress between was not significantly related to any suicidal behaviour, which is an inconsistent finding when compared to the extant literature base (Bryan et al., 2018; Nichter et al., 2021; Nock et al., 2013; Nock et al., 2014; Ravindran et al., 2020). This may in part be because, by the second wave of data collection (i.e., 2018), a majority of the sample had released from service (i.e., became a veteran). As such, a likely speculation could be that work stress was not related to increased suicidal behaviour as a large proportion of the sample were currently unemployed.

Contrary to previous research, this study did not find a significant relationship between chronic physical health conditions, chronic pain conditions and suicidal behaviour (Bruffaerts et al., 2015; Kavalidou et al., 2017; Racine, 2018; Scott et al., 2010; Thompson et al., 2014). A speculation for this relationship relates to VAC's Veteran Wellbeing Model and Joiner's IPTS model, whereby if an individual's self-rated physical health (Veteran Wellbeing Health Domain) remains at moderate despite that they have a physical health condition, perhaps their condition is well-managed and does not limit their capabilities. As such, they do not feel as though they are a burden to their family and/or other military personnel (IPTS model), and they may also be at a decreased risk for suicide (Joiner, 2005; Thompson et al., 2016). Another potential speculation for the lack of relationship between physical health conditions and suicidal

behaviour in CAF members and veterans could reflect that a high proportion of the sample may have a condition that led to their release from service, and because of the common nature of physical health conditions, it is not a good distinguishing factor between those with and without suicidal behaviour.

Hypothesis Four

The fourth hypothesis was that among CAF member and veterans with a mental disorder, the following potential protective factors would be associated with decreased odds of suicidal behaviour, including problem-solving coping styles (in 2002 and 2018) and greater social support (in 2002 and 2018). This hypothesis was only partially supported. Baseline problem solving was only protective against any suicidal behaviour among individuals with baseline lifetime any anxiety disorder. And baseline social support was not associated with decreased any suicidal behaviour among any of the subsamples. Across all three subsample, greater use of 2018 problem-solving coping was associated with decreased odds of any suicidal behaviour. As well, 2018 social support was associated with decreased odds of any suicidal behaviour only among individuals with baseline lifetime MDE and baseline lifetime any anxiety disorder. Though these findings do not prove a causal relationship, it can be suggested that approaches to enhance problem-solving coping may be protective against suicidal behaviour among military personnel and veterans. This finding ties into the Veterans Affairs Canada framework of measures of Veteran Wellbeing, wherein the social integration domain suggests that if an individual is well supported and they feel a sense of belonging (i.e., factor in Joiner's Interpersonal-Psychological Theory of Suicide [IPTS] model), then this individual may be at a decreased risk for suicidal behaviour (Joiner, 2005; Thompson et al., 2016).

Hypothesis Five

The fifth hypothesis was that the more proximal risk factors (i.e., 2018 independent variables) will have a greater PPV compared to demographic characteristics and distal risk factors (i.e., 2002 independent variables). This hypothesis was supported by the results of this study. Across all three subsamples the greater PPVs were found among proximal risk factors, which ranged from 43.5% to 66.3%, representing the level of precision in predicting suicidal behaviour from 'other' traumatic

experiences among those with baseline any anxiety disorder and persistence or recurrence of mental disorder among those with PTSD. The range of PPV of distal risk factors follows below that of the proximal factors across all the subsample, which ranged from 40.4% for deployment-associated traumatic exposures among those with baseline MDE to 59.6% for a history of any suicidal behaviour among those with baseline any anxiety disorders in predicting any suicidal behaviour. Finally, baseline demographic characteristics had the lowest range of PPVs, which ranged from 14.8% for officer rank among those with baseline any anxiety to 47.2% for land/army environmental command among those with baseline any anxiety disorder in predicting any suicidal behaviour. These findings are in line with those found in previous research, wherein suicidal behaviours are more attributable to proximal factors (Bruffaerts et al., 2015; McLean et al., 2017). Further in line with past studies, distal factors that are most predictive of future suicidal behaviour include prior histories of suicidal behaviour among those with a mental disorder (Bruffaerts et al., 2015).

It has been postulated that suicidal behaviour is a complex phenomenon; various characteristics are associated with the behaviour and numerous events often precede suicidal behaviour (Bachmann, 2018). Therefore, it is clinically relevant and important to identify which characteristics and risk factors are strongly predictive of suicidal behaviour among those with specific mental disorders (Wang et al., 2018). As such, it is important to consider factors that were assessed prior to 2002 (i.e., demographic characteristics and distal risk factors) by subsample type. First, among those with baseline lifetime MDE, PPV calculations reveal that demographics included younger age and environmental command were most predictive of any suicidal behaviour. When examining the PPVs of distal factors among those with baseline lifetime MDE, child maltreatment, particularly exposure to intimate partner violence, as well as prior history of any suicidal behaviour were most predictive of any suicidal behaviour between 2002 and 2018.

Second, for those with baseline lifetime PTSD, there were no demographic characteristics significantly associated with any suicidal behaviour in regression analyses; as such PPV calculations were not performed for demographics. In terms of the PPV of distal factors among those with baseline lifetime PTSD, those who had a

prior history of any suicidal behaviour was most predictive of any suicidal behaviour between 2002 and 2018. Finally, for those with baseline lifetime any anxiety disorder, land environmental command was the demographic characteristic most predictive of any suicidal behaviour. When examining PPVs of distal factors among those with baseline lifetime any anxiety disorder, prior history of any suicidal behaviour was most predictive of any suicidal behaviour between 2002 and 2018. As such, the overall findings of these prediction calculations highlight that there are differences in demographics characteristics and distal risk factors in their predictive value based on the type of mental disorder.

There were also differences across the subsamples in which proximal risk factors were most associated with any suicidal behaviour between 2002 and 2018. First, the proximal factor most associated with suicidal behaviour among individuals with baseline lifetime MDE was comorbidity. Among those with baseline lifetime PTSD and baseline lifetime anxiety disorder, the proximal factor most associated with suicidal behaviour included persistence or recurrence of disorder. These predictive values highlight the important role of mental disorders, either in persistence of symptoms or comorbidity, in the relationship with future suicidal behaviour.

Strengths of the Current Study

There are a number of strengths of the current study. First, this work used secondary data that included a large representative sample of Regular Force CAF serving members and veterans who were followed longitudinally. Second, this longitudinal dataset had a high response rate. Third, this dataset collected mental disorder diagnoses that were assessed using structured interviews. Fourth, this study was the first Canadian study to examine various risk and protective factors of any suicidal behaviour (ideation, plans and attempts) over a 16-year follow-up period among CAF serving members and veterans who met criteria for a mental disorder at baseline, which allowed for the novel opportunity to assess factors that impact suicidal risk over time and for some, across the transition from service.

Limitations

A number of limitations must be also considered while interpreting the findings of this study. First, mental disorders were obtained through structured clinical interviews by trained lay interviewers, which may be different when compared to clinician-based diagnoses. Second, a limitation of the CAFVMHS is that respondents were not asked to report their gender, therefore this restricts the ability to investigate the first research question in detail by gender. Third, analyses could not be stratified by sex to explore whether there is a differential relationship in risk of suicidal behaviour due to sample size constraints. Fourth, important data regarding suicidal behaviours were not assessed as per the CAFVMHS including severity level of suicidal ideation or intent and method related to suicide attempt. This limited the analyses since this information could not be examined, which could have been useful in further describing the types of suicidal behaviour associated with each mental disorder. Fifth, the CAFVMHS by design did not collect data related to completed suicides. As such, the findings of this study may not be generalizable to individuals who die by suicide. Sixth, the data were only collected at two time points. Multiple waves of data collection with more detailed timelines of suicidal behaviour and mental disorders could further elucidate the relationship between distal and proximal risk factors of any suicidal behaviour. Seventh, due to small sample size within each category of suicidal behaviour (i.e., ideation, plans and attempts), a plan was made to include all three categories as an ‘any suicidal behaviour’ single variable.

Eighth, these analyses could not be stratified by veteran status (i.e., serving member or veteran) as sample size was a limitation. There could be differences between CAF serving members and veterans in risk of suicidal behaviour. Ninth, in terms of the positive predictive value, since these calculations are dependent on the prevalence of suicidal behaviour among those with a mental disorder, the positive predictive values found in the present study may not be generalizable to other military and veteran populations as the prevalence of suicidal behaviour may vary. Tenth, the CAFVMHS data only includes Regular Force CAF members and veterans. Therefore, the demographic characteristics, protective factors as well as distal and proximal risk factors may not generalize to Reservists. Eleventh, due to the cross-sectional nature of

the CAFVMHS, causal inferences cannot be made and the direction of select associations remains uncertain. Data regarding the age at which each traumatic event was experienced or the timing of suicidal behaviour could not be analysed to determine the chronological sequencing of exposure to trauma with onset of suicidal behaviour. However, certain traumatic experiences including those that were assessed in 2002 and those that occurred in childhood (i.e., child maltreatment) could be estimated in terms of their timing based on the timepoint of assessment (i.e., in 2002) and certain phrases that were included which indicated a sequence of events. As such, a degree of temporality can be assumed for the association between 2002 traumatic experiences, child maltreatment and suicidal behaviour. For traumatic experiences assessed in 2018, it is possible that the suicidal behaviour was experienced following the traumatic exposure. Finally, the duration between the two waves of data collection is lengthy. As such, participants' data could be subject to recall bias.

Knowledge Translation

Early in the analysis phase of this study, there was a knowledge translation activity involving the exchange of information with academic researchers and clinicians as this work was accepted for a poster presentation at the 2022 Canadian Academy of Psychiatric Epidemiology (CAPE) Conference in October 2022. At this conference, preliminary findings of this work were presented. The end goal is to submit the final thesis for publication to an open-access journal. During this process, members of the Canadian Institute for Military and Veteran Health Research (CIMVHR) as well as vital knowledge users from Veterans Affairs Canada (VAC) and the Department of National Defence (DND) will be engaged in the write up prior to publication. They will be included as co-authors on the manuscript and will be involved in the interpretation of results and dissemination of findings at relevant conferences and presentations (further details discussed below).

The main goal of this dissemination plan will be to share findings with academic and non-academic audiences to raise awareness of suicidal behaviour and the intervening factors associated with the pathway between mental disorders and suicidal behaviour. Target audiences for this plan are those who will be most affected by the findings of this study, including military partners and policymakers, researchers, and

mental health clinicians who work with military personnel. Particularly, the research team affiliated with the authors of this work have linkages with VAC and the DND, which will allow findings to inform clinical planning for interventions to reduce suicidal risk. Part of this plan will involve meetings with VAC and DND to share the findings and a discussion around how they would like to receive the information. One potential option to share the results of this work would be to provide them with a short report that summarizes key findings of this work in lay language. One possible option to present the findings could be to provide an infographic that summarizes the main and clinically relevant message of this study. The infographic can be created using a website that is freely available online (e.g., Canva) and print copies could be distributed using grant funds.

The dissemination plan also includes presenting the final thesis work at the CIMVHR Forum in 2023, which will engage key partners, policymakers, and people with lived experience outside of academia. Using social marketing techniques, the dissemination plan will also include use of the authors' research group's Twitter account to tweet the date for the upcoming presentation and will provide a link to the published abstract at the CIMVHR Forum. CIMVHR often retweets these posts that highlight their events, therefore they will retweet this work and this will make the presentation and linked research findings more salient to their 1,924 followers.

Additionally, members of the committee who will be co-authors on this work are engaged with Operational Stress Injury (OSI) clinics across Canada (Dr. Murray Enns, and Dr. Natalie Mota). Findings from this research will provide important information that can inform clinical practice at these sites. At the OSI clinic in Manitoba, for example, there are monthly meetings where researchers are invited to present projects with a clinical scope. The final thesis can be presented in this forum with the group of clinicians and feedback can be garnered to see how the findings of this study could be best be shared with a clinical audience in this field across the country.

This dissemination plan will be evaluated by assessing which strategies appeared most effective in conveying the main messages and the reach of the strategy to the appropriate audiences. To determine which strategies appeared most effective, the authors will keep track of the number of attendees at meetings with VAC and DND,

and the number of clinicians who attend the presentations at research round meetings. A total count of how many documents (for VAC and DND) and infographics (for clinicians) are produced will be recorded. Additionally, the number of attendees at the CIMVHR Forum, and the number of retweets/likes on Twitter related to posts from CIMVHR on the presentation in the CIMVHR Forum, will be noted. A detailed summary from this evaluation will be shared and reviewed with the committee.

Chapter V: Conclusion and Implications

Summary of Findings

This section will summarize the results of this study in terms of primary, secondary, and tertiary prevention (Caldwell, 2008). In terms of primary prevention (i.e., enhancing protective factors), the findings of this study showed that there are a few protective factors that can be enhanced which may promote their health and wellbeing as well as help to reduce risk of suicidal behaviour CAF members and veterans. In this way, policymakers and key knowledge users (e.g., clinicians working with CAF members and veterans) can utilize this information and focus on modifiable factors in primary prevention. As supported by findings of this study, one example can include improving the use of problem-solving coping skills among CAF members and veterans with a mental disorder. Another example of primary prevention grounded in the findings of this work involve building or strengthening social support networks among CAF members and veterans.

In terms of secondary prevention (i.e., identifying risk factors), the results of this study showed that there are several demographic characteristics, as well as distal and proximal risk factors that differ based on the presence of a specific mental disorder diagnosis. For example, secondary prevention efforts for individuals with MDE can include developing screening tools for specific demographic characteristics, as well as certain distal and proximal risk factors. As for demographic characteristics, the screening tool should highlight any individuals with MDE who are younger in age, and were in the land/army environmental command, as these characteristics were significantly associated in regression analyses as well as PPV calculations. As for distal risk factors, the tool should identify those with MDE who have experienced any suicidal behaviour in the past, have a comorbid mental disorder, experienced prior deployment-associated trauma, have experienced any type of child maltreatment, utilize self-medication as a coping strategy, have prior work stress and endorse a greater number of past traumatic experiences. PPV calculations showed that exposure to intimate partner violence as a child was strongly predictive of any suicidal behaviour, therefore it is important that clinicians working with military personnel and veterans have a comprehensive understanding the individual's prior traumatic experiences. And for

proximal risk factors, the tool should detect individuals with MDE who have persistence or recurrence of MDE, a current comorbid mental disorder, current alcohol use disorder, 'other' recent traumatic experiences, an avoidant coping style, greater number of recent traumatic experiences and greater number of recent deployment-related experiences.

As well, secondary prevention efforts for individuals with PTSD can include identifying the following distal risk factors: prior history of suicidal behaviour, greater use of self-medication or avoidant coping styles, higher levels of prior of work stress, and greater exposure to traumatic events. In terms of proximal risk factors, the tool should detect individuals with PTSD who have persistence or recurrence of PTSD, current alcohol use disorder, and recent 'other' traumatic experiences (e.g., being a refugee to escape danger or persecution, being stalked, have you ever had a life-threatening illness), the use of avoidant coping, and a greater number of recent traumatic experiences.

And finally, secondary prevention efforts for individuals with anxiety disorders should include screening tools based on identifying individuals who identify as being with the land/army environmental command and are junior or senior non-commissioned ranking. As for distal risk factors, the tool should identify those with any anxiety disorder who have had a history of suicidal behaviour, have a history of child maltreatment, use of self-medication or avoidant coping styles, history of higher levels of work stress and greater number of prior traumatic experiences. In terms of proximal risk factors, the tool should detect individuals who have persistence or recurrence of their anxiety, current comorbid MDE or PTSD, current alcohol use disorder, recent 'other' traumatic experiences, having released from service, the use of self-medication or avoidant coping styles, a greater number of recent traumatic experiences and greater number of recent deployment-related experiences.

Implications

The current study is a novel contribution to the literature as the analytic plan involved the examination of three subsamples based on mental disorder diagnoses at baseline (i.e., 2002 lifetime MDE, 2002 lifetime PTSD, and 2002 lifetime any anxiety disorder, separately), allowing for the investigation of demographic predictors, distal and proximal risk, and protective factors across mental disorders over a 16-year time period.

Additionally, this study addressed a gap in the literature and added important information to the literature base. Limited studies have examined which characteristics and factors that impact risk of suicidal behaviour among a representative samples of military personnel and veterans who meet criteria for a mental disorder in their lifetime. Further, the results of this study help to identify individuals with specific mental disorders (i.e., MDE, PTSD and anxiety disorders) who may be at an increased risk for suicidal behaviour and in need of further interventions. This enhanced knowledge of the variations in characteristics and their predictive value related to suicidal behaviours among individuals with mental disorders serves to inform primary and secondary prevention of suicidal behaviours and best practice strategies in developing supports for serving members and veterans struggling with mental disorders.

Findings from this study serve to better understand trends over time of demographic predictors, distal and proximal risk factors, and protective factors of suicidal behaviour among individuals with presence of mental disorders and for some it captures the transition period from actively serving to veteran status. This information is clinically useful for secondary prevention of suicidal behaviour given that an individual may have already screened positive for a mental disorder (e.g., presents with a major depressive episode) by the time that they are brought to the attention of care providers. These findings identify demographic factors (e.g., age, environmental command, rank), distal risk factors (e.g., prior history of any suicidal behaviour, child maltreatment, use of self-medication coping) and proximal risk factors (e.g., persistence or recurrence of mental disorder, alcohol use disorder, the use of avoidance coping, greater number of traumatic experiences) that may lead to increased suicidal risk. For example, findings of this work showed that CAF members and veterans who had PTSD at baseline and had experienced a greater number of traumatic experiences in 2002 and in 2018, displayed increased odds of suicidal behaviour. Therefore, it is important for clinicians to be aware of this association between trauma load and suicidality among those who are already diagnosed with a mental disorder. Further, this finding supports the need to find new ways to address mental health concerns among individuals with a greater trauma load. Similarly, findings from this work demonstrated that CAF members and veterans with MDE at baseline who also had comorbid PTSD and/or anxiety disorder had increased

likelihood of suicidal behaviour between 2002 and 2018. This finding demonstrates the need to find new techniques to screen for and incorporate treatment of comorbid conditions. As well, since the results of this study indicated that CAF members and veterans with anxiety disorder at baseline who had a greater number of deployment-associated traumatic experiences in 2018 showed increase likelihood of any suicidal behaviour, this finding highlights the need for greater supports and resources following deployment. Additionally, across all three subsamples, prior history of suicidal behaviour in 2002 was found to be highly predictive of suicidal behaviour between 2002 and 2018. Therefore, this finding underscores the importance of screening military personnel and veterans for prior suicidality. In sum, the enhanced knowledge of the characteristics associated with suicidal risk among CAF serving member and veterans who presented with a mental disorder can serve to inform policy, supports and resources for CAF members and veterans.

This information can be used in tertiary prevention efforts to further inform the suicide prevention strategy of the Canadian Armed Forces and Veterans Affairs Canada, highlighting the importance of screening for modifiable risk factors (e.g., greater use of self-medication or avoidance coping). Results from this study demonstrate that select adaptive coping mechanisms (i.e., problem-solving coping styles) and greater levels of social support were associated with lower likelihood of any suicidal behaviour. As such, this information can be used in tertiary prevention efforts wherein targeted interventions are implemented and geared towards increasing adaptive coping strategies and social support networks among military personnel and veterans. This information can also be useful to clinicians who are working with serving members and veterans to help enhance protective factors (e.g., introducing group therapy programs that foster social connection) and reduce risk factors (e.g., screening for those who report greater levels of work stress) to help protect against suicidal behaviours among those with mental disorders.

Future Directions

Future prospective studies are needed to longitudinally investigate the relationship between CAF actively serving members and veterans on various suicidal behaviours to explore whether there are differences in risk based on status of release.

These studies should also investigate completed suicides and include measures of feelings of hopelessness and perceived burdensomeness. Also, future studies with larger samples should examine suicidal behaviours separately to determine if there are differences in demographic characteristics, risk, and protective factors among individuals with a mental disorder. Additionally, future studies should examine clusters of independent variables among those with mental disorders who experience suicidal behaviour to determine whether there are certain sets of characteristics and factors associated with suicidal behaviour. Enhanced knowledge of the set of factors that typically co-occur among individuals with a specific mental disorder who experience any suicidal behaviour will be important to clinicians who work with military personnel and veterans to further improve secondary prevention of suicidal behaviour. This information can also be useful in identifying which military personnel and veterans require further resources and support.

Based on the high prevalence of mental disorders and suicidal behaviours in CAF members and veterans, it is evident that there is work to be done in tertiary prevention of suicidal behaviours. For improvements to occur in our understanding, assessment, and treatment of suicidal behaviours, further work is needed to determine how best to meet the health service needs of military personnel and veterans with mental disorders.

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Table 1. Baseline Demographic Characteristics Among Those with Lifetime Mental Disorders at Baseline in Risk for Any Suicidal Behaviour Between 2002 and 2018.

	Of those with Baseline Lifetime MDE and any SB		**Of those with Baseline Lifetime PTSD and any SB**		**Of those with Baseline Lifetime any anxiety disorder and any SB**	
	Mean (SE)	**OR (95% CI)**	**Mean (SE)**	**OR (95% CI)**	**Mean (SE)**	**OR (95% CI)**
Age	35.35 (0.59)	**0.97 (0.94-1.00)***	36.20 (0.89)	1.01 (0.96-1.06)	35.54 (0.62)	0.97 (0.94-1.00)
	%	**OR (95% CI)**	**%**	**OR (95% CI)**	**%**	**OR (95% CI)**
Sex						
Male	81.3	1.00	76.3	1.00	86.5	1.00
Female	18.7	0.97 (0.65-1.44)	23.7	1.18 (0.66-2.09)	13.5	0.74 (0.48-1.13)
Marital status						
Partnered	62.6	1.00	54.8	1.00	71.8	1.00
Not partnered	37.4	0.94 (0.59-1.50)	45.2	1.63 (0.82-3.27)	28.2	0.92 (0.53-1.58)
Education						
High school graduate or less	46.1	1.00	53.4	1.00	50.5	1.00
At least some post-secondary	53.9	0.74 (0.47-1.16)	46.6	0.63 (0.32-1.24)	49.5	0.64 (0.40-1.03)
Household income						
$0-49,999	23.9	1.00	22.1	1.00	20.4	1.00
$50,000+	76.1	0.69 (0.38-1.23)	77.9	1.30 (0.55-3.09)	79.6	0.83 (0.43-1.60)

Table 1. *(continued)*

	Of those with Baseline Lifetime MDE and any SB		Of those with Baseline Lifetime PTSD and any SB		Of those with Baseline Lifetime any anxiety disorder and any SB	
	%	**OR (95% CI)**	**%**	**OR (95% CI)**	**%**	**OR (95% CI)**
Environmental command						
Land	61.3	1.00	68.8	1.00	59.3	1.00
Air	22.9	**0.59 (0.36-0.97)***	17.1	0.51 (0.22-1.18)	21.6	**0.38 (0.22-0.65)*****
Sea	15.8	0.69 (0.39-1.22)	14.1	0.44 (0.17-1.16)	19.0	0.67 (0.34-1.30)
Rank						
Junior and Senior NCM	86.5	1.00	90.5	1.00	93.3	1.00
Officer	13.5	**0.60 (0.36-0.98)***	9.5	0.84 (0.36-1.93)	6.7	**0.23 (0.13-0.42)*****
Deployment status						
Never	40.5	1.00	28.1	1.00	41.7	1.00
Deployed	59.5	0.92 (0.61-1.39)	72.0	1.41 (0.71-2.80)	58.3	0.91 (0.57-1.46)

Note. This table examines baseline (i.e., 2002) demographics and military-related characteristics of those with baseline (i.e., 2002) lifetime mental disorders (i.e., MDE, PTSD, and any anxiety disorder) who experienced any suicidal behaviour between 2002 and 2018.
Percentages are weighted. Percentages are to be interpreted as, for example among those with baseline lifetime MDE and of those who had experienced any suicidal behaviour between 2002 and 2018, 81.3% were males and 18.7% were females.
Partnered marital status included those who were married or common-law, and not partnered marital status included those who were widowed, separated, divorced, single, or never married.
SB = any suicidal behaviour between 2002 and 2018, MDE = major depressive episode, PTSD = posttraumatic stress disorder, NCM = non-commissioned member, SE = bootstrapping standard error, OR = odds ratio, CI = confidence interval
Bold font indicates statistical significance. *$p \leq 0.05$; **$p \leq 0.01$; ***$p \leq 0.001$

Table 2. Distal Risk Factors Among Those with Lifetime Mental Disorders at Baseline in Risk for Any Suicidal Behaviour Between 2002 and 2018.

	Of those with Lifetime Baseline MDE and any SB		**Of those with Lifetime Baseline PTSD and any SB**		**Of those with Lifetime Baseline Any Anxiety Disorder and any SB**	
	%	**OR (95% CI)**	**%**	**OR (95% CI)**	**%**	**OR (95% CI)**
Any history of SB 2002						
No	44.7	1.00	46.6	1.00	33.0	1.00
Yes	55.3	**2.74 (1.79-4.19)*** **	53.4	**2.22 (1.13-4.38)** **	67.0	**5.22 (3.14-8.68)*** **
Any comorbidity 2002						
No	41.3	1.00	30.9	1.00	40.1	1.00
Yes	58.8	**1.86 (1.21-2.85)** **	69.1	1.81 (0.93-3.52)	59.9	1.41 (0.87-2.31)
Deployment-associated traumatic experiences 2002						
No	11.8	1.00	8.2	1.00	17.0	1.00
Yes	88.2	**1.80 (1.02-3.19)** *	91.8	1.22 (0.46-3.22)	83.0	1.17 (0.62-2.22)
'Other' traumatic experiences 2002						
No	17.9	1.00	8.7	1.00	8.7	1.00
Yes	82.1	1.24 (0.73-2.10)	91.3	1.10 (0.34-3.53)	91.3	1.29 (0.72-2.33)
Sexual traumatic experiences 2002						
No	74.2	1.00	74.1	1.00	75.1	1.00
Yes	25.9	1.35 (0.84-2.19)	25.9	0.74 (0.40-1.35)	24.9	1.49 (0.87-2.55)

Table 2. *(continued)*

	Of those with Lifetime Baseline MDE and any SB		**Of those with Lifetime Baseline PTSD and any SB**		**Of those with Lifetime Baseline Any Anxiety Disorder and any SB**	
	%	**OR (95% CI)**	**%**	**OR (95% CI)**	**%**	**OR (95% CI)**
Child Maltreatment						
Exposure to IPV						
No	77.4	1.00	74.3	1.00	74.3	1.00
Yes	22.6	**2.27 (1.27-4.03)****	25.7	1.24 (0.56-2.74)	25.8	**2.54 (1.39-4.63)****
Neglect						
No	46.5	1.00	47.0	1.00	50.1	1.00
Yes	53.5	**1.82 (1.18-2.79)****	53.0	1.37 (0.72-2.58)	49.9	**2.10 (1.28-3.42)****
Emotional abuse						
No	54.1	1.00	54.6	1.00	60.6	1.00
Yes	45.9	**2.46 (1.57-3.83)*****	45.4	1.37 (0.71-2.64)	39.4	**1.98 (1.18-3.33)****
Sexual abuse						
No	74.2	1.00	72.0	1.00	73.6	1.00
Yes	25.8	**1.79 (1.04-3.08)***	28.0	1.47 (0.73-2.97)	26.4	**2.08 (1.17-3.71)****
Physical abuse						
No	27.5	1.00	33.1	1.00	35.3	1.00
Yes	72.5	**2.40 (1.53-3.77)*****	66.9	1.75 (0.93-3.30)	64.7	**1.75 (1.08-2.82)***
	Mean (SE)	**OR (95% CI)**	**Mean (SE)**	**OR (95% CI)**	**Mean (SE)**	**OR (95% CI)**
Self-Medication Coping 2002	4.86 (0.17)	**1.19 (1.05-1.35)****	4.94 (0.23)	**1.23 (1.02-1.49)***	4.86 (0.17)	**1.19 (1.04-1.37)****
Avoidance Coping 2002	12.97 (0.28)	1.06 (0.98-1.14)	13.16 (.40)	**1.14 (1.00-1.30)***	13.33 (0.28)	**1.11 (1.02-1.21)***
Work stress 2002	20.93 (0.55)	**1.07 (1.02-1.12)****	21.44 (0.67)	**1.08 (1.01-1.15)***	20.89 (0.58)	**1.08 (1.03-1.14)****
Number of traumatic experiences 2002	5.34 (0.26)	**1.15 (1.07-1.24)*****	7.02 (0.43)	**1.13 (1.02-1.25)***	5.37 (0.35)	**1.09 (1.02-1.17)***

Table 2. *(continued)*

Note. This table examines distal risk factors for any suicidal behaviour between 2002 and 2018 of those with baseline (i.e., 2002) lifetime mental disorders (i.e., MDE, PTSD, and any anxiety disorder).

SB = any suicidal behaviour between 2002 and 2018, MDE = major depressive episode, PTSD = posttraumatic stress disorder, IPV = intimate partner violence, SE = bootstrapping standard error, OR = odds ratio, CI = confidence interval

Percentages are weighted. Percentages are to be interpreted as, for example among those with baseline lifetime MDE and those who had experienced any suicidal behaviour between 2002 and 2018, 55.3% had a history of lifetime suicidal behaviour prior to 2002.

Bold font indicates statistical significance. *$p \leq 0.05$; **$p \leq 0.01$; ***$p \leq 0.001$

Table 3. Proximal Risk Factors Among Those with Lifetime Mental Disorders at Baseline in Risk for Any Suicidal Behaviour Between 2002 and 2018.

	Of those with Baseline lifetime MDE and any SB		**Of those with Baseline lifetime PTSD and any SB**		**Of those with Baseline lifetime any anxiety disorder and any SB**	
	%	**OR (95% CI)**	**%**	**OR (95% CI)**	**%**	**OR (95% CI)**
Persistence or recurrence of mental disorder						
No	14.3	1.00	31.7	1.00	22.5	1.00
Yes	85.7	**9.40 (5.52-16.02)*****	68.3	**7.48 (3.61-15.52)*****	77.5	**7.67 (4.39-13.39)*****
Current comorbid mental disorder						
No	49.6	1.00	-	-	19.2	1.00
Yes	80.4	**8.09 (4.98-13.14)*****	-	-[a]	80.9	**7.59 (4.23-13.64)*****
Alcohol use disorder						
No	73.0	1.00	68.4	1.00	71.2	1.00
Yes	27.0	**2.04 (1.17-3.55)****	31.6	**2.99 (1.28-6.98)****	28.8	**2.12 (1.15-3.92)***
Any chronic physical health condition						
No	8.7	1.00	8.8	1.00	12.4	1.00
Yes	91.3	2.03 (0.97-4.23)	91.2	2.51 (0.75-8.41)	87.6	1.77 (0.87-3.59)
Any chronic pain condition						
No	20.7	1.00	18.7	1.00	25.8	1.00
Yes	79.3	1.52 (0.92-2.52)	81.3	2.11 (0.89-4.98)	74.2	1.37 (0.80-2.36)

Table 3. *(continued)*

	Of those with Baseline lifetime MDE and any SB		**Of those with Baseline lifetime PTSD and any SB**		**Of those with Baseline lifetime any anxiety disorder and any SB**	
	%	**OR (95% CI)**	**%**	**OR (95% CI)**	**%**	**OR (95% CI)**
Deployment-associated traumatic experiences 2018						
No	34.1	1.00	33.1	1.00	40.5	1.00
Yes	65.9	1.52 (0.98-2.37)	67.0	1.32 (0.67-2.61)	59.5	1.17 (0.70-1.95)
'Other' traumatic experiences 2018						
No	30.4	1.00	26.2	1.00	36.1	1.00
Yes	69.6	**1.99 (1.24-3.19)****	73.9	**2.61 (1.26-5.41)****	63.9	**1.78 (1.08-2.94)***
Sexual traumatic experiences 2018						
No	92.8	1.00	88.3	1.00	92.2	1.00
Yes	7.2	0.83 (0.43-1.62)	11.7	1.55 (0.67-3.61)	7.8	1.70 (0.76-3.81)
Released from service in 2018						
No	23.3	1.00	14.9	1.00	19.1	1.00
Yes	76.7	1.31 (0.78-2.21)	85.1	2.31 (0.92-5.76)	80.9	**1.84 (1.01-3.38)***
	Mean (SE)	**OR (95% CI)**	**Mean (SE)**	**OR (95% CI)**	**Mean (SE)**	**OR (95% CI)**
Avoidance coping 2018	14.67 (0.27)	**1.32 (1.22-1.43)*****	14.78 (0.36)	**1.28 (1.13-1.45)*****	15.09 (0.27)	**1.43 (1.28-1.59)*****
Self-medication coping 2018	7.33 (0.16)	1.08 (0.94-1.24)	7.55 (0.23)	1.18 (0.98-1.42)	7.77 (0.17)	**1.22 (1.02-1.46)***

Table 3. *(continued)*

	Of those with Baseline lifetime MDE and any SB		Of those with Baseline lifetime PTSD and any SB		Of those with Baseline lifetime any anxiety disorder and any SB	
	Mean (SE)	**OR (95% CI)**	**Mean (SE)**	**OR (95% CI)**	**Mean (SE)**	**OR (95% CI)**
Work stress 2018[b]	17.68 (0.66)	1.00 (0.94-1.06)	16.98 (0.97)	0.95 (0.87-1.03)	19.13 (0.90)	1.07 (0.99-1.16)
Number of traumatic experiences 2018	3.89 (0.36)	**1.15 (1.07-1.23)*****	4.45 (0.55)	**1.14 (1.03-1.27)****	3.32 (0.35)	**1.14 (1.04-1.24)****
Number of deployment-related experiences (DEX) between 2002 and 2018	1.68 (0.20)	**1.16 (1.03-1.30)****	1.74 (0.31)	1.09 (0.93-1.28)	1.23 (0.19)	**1.17 (1.01-1.34)***

Note. This table examines proximal risk factors for any suicidal behaviour between 2002 and 2018 of those with baseline (i.e., 2002) lifetime mental disorders (i.e., MDE, PTSD, and any anxiety disorder).

[a]Cell size too small to be calculated, trend in increased likelihood of suicidal behaviour since last interview among those who had a current comorbid mental disorder.

[b]Among those who were currently employed.

Percentages are weighted. Percentages are to be interpreted as, of those with baseline lifetime MDE and who experienced any suicidal behaviour between 2002 and 2018, 85.7% had persistence or recurrence of mental disorder, and 14.3% did not have persistence or recurrence of mental disorder.

SB = any suicidal behaviour between 2002 and 2018, MDE = major depressive episode, PTSD = posttraumatic stress disorder, SE = bootstrapping standard error, OR = odds ratio, CI = confidence interval

Bold font indicates statistical significance. *$p \leq 0.05$; **$p \leq 0.01$; ***$p \leq 0.001$

Table 4. Protective Factors Among Those with Lifetime Mental Disorders at Baseline in Risk for Any Suicidal Behaviour Between 2002 and 2018.

	Of those with Baseline Lifetime MDE and any SB		**Of those with Baseline Lifetime PTSD and any SB**		**Of those with Baseline Lifetime Any Anxiety Disorder and any SB**	
	Mean (SE)	**OR (95% CI)**	**Mean (SE)**	**OR (95% CI)**	**Mean (SE)**	**OR (95% CI)**
Problem solving/active coping in 2002	13.19 (0.17)	0.90 (0.80-1.01)	13.25 (0.19)	0.93 (0.79-1.08)	12.76 (0.21)	**0.78 (0.69-0.88)*****
Social support level in 2002	58.79 (1.36)	1.00 (0.98-1.01)	57.99 (1.97)	1.00 (0.98-1.02)	59.19 (1.54)	1.00 (0.98-1.01)
Problem solving/active coping in 2018	12.46 (0.18)	**0.74 (0.67-0.83)*****	12.19 (0.26)	**0.73 (0.62-0.85)*****	12.12 (0.21)	**0.68 (0.60-0.77)*****
Social support level in 2018	31.85 (0.89)	**0.97 (0.95-0.99)****	32.26 (1.27)	0.99 (0.96-1.01)	30.62 (1.18)	**0.96 (0.93-0.98)*****

Note. This table examines potential protective factors against any suicidal behaviour between 2002 and 2018 of those with baseline (i.e., 2002) lifetime mental disorders (i.e., MDE, PTSD, and any anxiety disorder)

SB = any suicidal behaviour between 2002 and 2018, MDE = major depressive episode, PTSD = posttraumatic stress disorder, SE = bootstrapping standard error, OR = odds ratio, CI = confidence

Bold font indicates statistical significance. *$p \leq 0.05$; **$p \leq 0.01$; ***$p \leq 0.001$

Table 5. The Positive Predictive Value of Characteristics and Risk Factors Significantly Associated with Any Suicidal Behaviour Between 2002 and 2018 Among Those with Baseline Lifetime Mental Disorder.

	Of those with Baseline Lifetime MDE and any SB	**Of those with Baseline Lifetime PTSD and any SB**	**Of those with Baseline Lifetime any anxiety disorder and any SB**
	Positive Predictive Value as a % (95% CI)	**Positive Predictive Value as a % (95% CI)**	**Positive Predictive Value as a % (95% CI)**
Demographic Characteristics			
2002 Younger Age[a]	43.3 (36.3-50.6)	-	-
2002 Environmental command			
Land	43.2 (36.1-50.6)	-	47.2 (38.8-55.8)
Air	31.1 (23.6-39.7)	-	25.3 (18.4-33.8)
Sea	34.4 (24.6-45.6)	-	37.4 (25.4-51.1)
2002 Rank			
Junior and Senior NCM	40.3 (34.8-46.1)	-	43.1 (36.6-49.7)
Officer	28.7 (20.5-38.5)	-	14.8 (9.3-22.7)
Distal Risk Factors			
2002 Any history of SB	52.4 (44.3-60.4)	51.1 (38.8-63.2)	59.6 (50.7-68.0)
2002 Any comorbidity	44.4 (37.5-51.6)	-	-
2002 Deployment-associated traumatic experiences	40.4 (34.9-46.1)	-	-

Table 5. *(continued)*

	Of those with Baseline Lifetime MDE and any SB	**Of those with Baseline Lifetime PTSD and any SB**	**Of those with Baseline Lifetime any anxiety disorder and any SB**
	Positive Predictive Value as a % (95% CI)	**Positive Predictive Value as a % (95% CI)**	**Positive Predictive Value as a % (95% CI)**
Child Maltreatment			
Exposure to IPV	55.0 (42.2-67.2)	-	57.0 (44.1-69.1)
Neglect	45.2 (37.7-52.9)	-	48.8 (39.9-57.9)
Emotional abuse	52.3 (43.5-60.9)	-	49.2 (39.2-59.3)
Sexual abuse	49.0 (37.6-60.5)	-	52.6 (40.2-64.6)
Physical abuse	46.0 (39.2-52.8)	-	43.8 (36.3-51.6)
Greater 2002 self-medication coping[a]	40.7 (34.5-47.1)	44.1 (34.8-53.9)	41.2 (34.4-48.3)
Greater 2002 avoidance coping[a]	-	44.1 (35.1-53.5)	39.9 (33.3-46.8)
Greater 2002 work stress[a]	42.9 (36.0-50.1)	49.1 (39.4-59.0)	44.5 (36.9-52.3)
Greater 2002 number of traumatic experiences[a]	44.0 (37.5-50.7)	42.6 (34.1-51.6)	42.4 (35.4-49.7)
Proximal Risk Factors			
2018 Persistence or recurrence of mental disorder	57.5 (50.8-63.9)	66.3 (53.6-77.1)	60.5 (52.3-68.2)
2018 Current comorbid mental disorder	60.2 (53.4-66.5)	~	58.4 (50.7-65.7)
2018 Alcohol use disorder	52.5 (40.2-64.4)	61.5 (43.8-76.6)	53.0 (40.0-65.5)

Table 5. *(continued)*

	Of those with Baseline Lifetime MDE and any SB	**Of those with Baseline Lifetime PTSD and any SB**	**Of those with Baseline Lifetime any anxiety disorder and any SB**
	Positive Predictive Value as a % (95% CI)	**Positive Predictive Value as a % (95% CI)**	**Positive Predictive Value as a % (95% CI)**
2018 'Other' traumatic experiences	44.2 (37.7-51.0)	48.3 (38.7-58.0)	43.5 (35.7-51.7)
Released from service in 2018	-	-	41.8 (35.1-48.7)
Greater 2018 avoidance coping[a]	50.9 (44.5-57.3)	51.7 (42.0-61.2)	50.0 (42.8-57.2)
Greater 2018 self-medication coping[a]	-	-	45.6 (36.4-55.2)
Greater 2018 number of traumatic experiences[a]	45.8 (37.7-54.2)	43.9 (33.3-55.2)	43.6 (34.3-53.3)
Greater number of deployment-related experiences (DEX) between 2002 and 2018[a]	44.7 (36.7-52.9)	-	43.8 (34.5-53.5)

Note. This table portrays the Positive Predictive Value (PPV) of demographic characteristics and risk factors significantly associated with any suicidal behaviour between 2002 and 2018 among those with baseline lifetime mental disorder. PPV calculations were performed if there was a significant association with the characteristics or risk factor and any suicidal behaviour.
[a]All variables that were assessed on continuous scales, were converted to categorial variables based on a median split to calculate PPV. All items below the median were in one category, and all others above the median were in the other category.

Percentages (%s) were weighted. Percentages are to be interpreted as, among individuals with baseline MDE, younger age (i.e., those who were 18-38 years of age), was 43.3% predictive of any suicidal behaviour between 2002 and 2018.

Dashes denote associations that were not significantly related, as such the PPVs are not reported in the table. The cells denoted with ~ had cell size issues and were therefore not able to be released by Statistics Canada regulations.

SB = any suicidal behaviour between 2002 and 2018, MDE = major depressive episode, PTSD = posttraumatic stress disorder, NCM = non-commissioned member, IPV = intimate partner violence.