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BOSTON UNIVERSITY

WHEELOCK COLLEGE OF EDUCATION & HUMAN DEVELOPMENT

Dissertation

DISCLOSURE OF SUICIDAL DRIVERS ON SOCIAL MEDIA: A NATURAL LANGUAGE PROCESSING AND THEMATIC ANALYSIS APPROACH

by

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Doctor of Philosophy

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DISCLOSURE OF SUICIDAL DRIVERS ON SOCIAL MEDIA:

A NATURAL LANGUAGE PROCESSING AND

THEMATIC ANALYSIS APPROACH

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ABSTRACT

It is common for people to search for health information on the internet, share their health issues through social media, and ask for advice from people in online communities. Some people reported feeling more comfortable sharing their psychological stress online and anonymously asking for advice from people. As such, people disclose not only their suicide risk but also their suicidal risk-associated drivers (e.g., suicide ideation, relational stress, financial crisis). This study aims to identify suicidal drivers from narratives extracted from social media, synthesize findings and suicide theories, and provide insights into future suicide prevention policies and practices.

This research gathered and analyzed 128,587 posts written by 76,547 people worldwide. The posts were written in English from January 2021 to December 2022 on the r/SuicideWatch of Reddit. Natural Language Processing and topic modeling, specifically Latent Dirichlet Allocation (LDA), were used to identify clusters of posts based on similarities and differences between posts. Thematic analysis was used to identify suicidal drivers across clusters of posts. The web crawler developed by

Brandwatch was used in data collection, and Python was used for all analyses.

Six theme clusters of posts were identified. The first theme was Disclosure of Repetitive Suicide Ideation (i.e., *"I want to die. I want to die, I want to die…(repeated)"*), and 36.4% of posts had this theme. The second theme was Disclosure of Relational Stress (i.e., *"I don't have any friends"*), and 31.9% of posts had this theme. The third theme was Disclosure of Suicide Attempts and Negative Healthcare Experiences (i.e., *"I've had a suicide attempt before", "The nurses ignored me"*), and 9.9% of posts had this theme. The fourth theme was Disclosure of Abuse (i.e., *"He would beat me black and blue"*), and 8.8% of posts had this theme. The fifth theme was Disclosure of Contextual Stress, including finance and legal matters (i.e., *"every moment was a living fear of the debt collector knocking on the door"*), and 7.2% of posts had this theme. The last theme was Philosophical and Informative Discussions around suicide (i.e., *"After death, the physical begins to deteriorate and life/energy is simply moved to another being"*), and 5.8% of posts had this theme.

Understanding different suicidal drivers is an essential component in designing individualized intervention plans for people at suicide risk. The current research identified the idiosyncrasies in the suicide drivers people talked about when disclosing their suicidality. Furthermore, the findings from this study's data-inspired and exploratory approach provided additional evidence supporting existing suicide theories and frameworks. This research has the potential to lay the groundwork for designing suicide intervention strategies that target individuals' self-disclosures of their struggles online.

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1. INTRODUCTION

Suicide has been a global health concern for decades, with more than 700,000 people lost by suicide every year (World Health Organization, 2021). The disparities that exist across different groups render this situation even more alarming. Less than 30% of global suicide occurrences are in High-income countries; more than 70% of global suicide occurrences are in Low and Middle-Income countries (World Health Organization, 2021). In the U.S., marginalized populations, including people of color, those with immigrant histories, those with disabilities, and individuals with minority sexual and gender identities are more vulnerable to suicide (Centers for Disease Control and Prevention, 2022). In Ethiopia, people who experienced homelessness and financial crisis reported higher suicide risk than other (Yohannes et al., 2023). North Korean Refugees in South Korea also recorded a higher suicide risk than other citizens in South Korea (Nam et al., 2021). These high suicide rates emphasize the severity of the issue of suicide and disparities between people both across and within countries demonstrate current global health inequities.

Among researchers focused on suicide (sometimes termed suicidologists), the phenomenon of low disclosure among people with suicidality has been a particular concern (An et al., 2023; Daudi et al., 2023; Hom et al., 2015; Eskin et al., 2015; Jordans et al., 2018; Hagaman et al., 2017; Zewdu et al., 2019). More than half of people with suicide risk report never sharing their challenges with others (Hom et al., 2015; Husky et al., 2016; Rickwood & Thomas, 2012) and this low disclosure rate is observed in many countries (An et al., 2023; Eskin et al., 2015; Jordans et al., 2018; Hagaman et al., 2017;

Zewdu et al., 2019). The gap between the number of completed suicide attempts and the number of suicidal disclosures is even more significant among marginalized populations, due in part to high stigma directed toward both their identities and mental health. For example, marginalized populations may hesitate to share suicidality due to concerns they will face additional stigma from others due to their identities (e.g., racial and sexual identities, disability status, immigrant status, socioeconomic status; Hom et al., 2015; Nam et al., 2021; Pretorius et al., 2019). Limited reporting may impact suicide prevention strategies and their attempts to reduce gaps in suicidal help-seeking across different communities. Therefore, there is a need for future research to elucidate the barriers to disclosure among people in general and marginalized populations in particular.

A critical limitation of psychology and behavioral science research is that studies are disproportionally conducted with privileged populations such as in Western, Educated, Industrialized, Rich, and Democratic countries (Muthukrishna et al., 2020; Henrich et al., 2010; Schulz et al., 2018). The findings from those populations are often generalized globally to shape suicide prevention and implementation strategies. Those strategies might benefit the privileged populations from which the conclusions were drawn but might not be as relevant or beneficial to those from less privileged backgrounds. The absence of underprivileged populations in research could exacerbate the health inequities which have been reported nationally and internationally (Obando Medina et al., 2014; Zewdu et al., 2019; Hagaman et al., 2017; Jordans et al., 2018). Therefore, it is vital to add more evidence from research conducted with samples comprised of individuals with diverse identities and social locations.

Much previous suicidal research has focused on understanding the suicidal experiences of people in unique environments such as hospitals or schools (Donnelly et al., 2023; Hom & Stanley, 2021; Naghavi et al., 2020). Narratives are absent in the literature that speak to the daily experience of people navigating suicidality outside of clinical and/or research settings. Interactions with researchers or clinicians in previous research might influence how people describe their suicidal experiences and might not capture the experiences of the general population. Suicidologists' current knowledge of suicidality might not apply to understanding and intervening in people's struggles in the natural settings of their daily lives.

New and novel data collection strategies must be considered that result in gathering perspectives from a more diverse range of communities as well as in natural settings (Polanco‐Roman & Miranda, 2022; Tucker et al., 2015). New data collection strategies as well as new approaches to data analysis are needed to bring new perspectives and relevance to future suicide public health policies and practices (Wilcox & Wyman, 2016).

Due to an increase in online suicidal disclosure rates, recent examples of novel data collection strategies have included suicidal disclosure from social media sources. The trend to disclose using social media is attributable to multiple factors including the increase in internet use and increase in people seeking health-related information online. Understanding suicidal disclosure in social media has been emphasized even more since the beginning of the COVID-19 pandemic. A significant increase in internet utilization was reported before and after the pandemic, among both privileged and underprivileged

populations (Datareportal, 2021). The preference for online disclosure is also associated with the inherent strengths of the online space, such as high accessibility to communities (i.e., no time and space restrictions) and low risk of stigma from anonymous communication. Some social media discussion forums, such as Reddit, have been shown to encourage people's disclosure more than other social media platforms due to their guaranteed anonymity and topic-focused conversations rather than social networking (Alambo et al., 2019; Haque et al., 2021). Studying people's disclosure of suicidality online can potentially benefit suicidologists' understanding of how suicidal behavior in the natural environment compares with observations made in clinical and research settings.

This research aimed to identify the primary concerns that "drive" individuals to consider suicide, with a particular focus on the subjective nature of these concerns and how they are described (Jobes, 2016). By delving into the unique narratives of individuals facing these challenges, the study sought to shed light on the underlying factors contributing to their distress and provide a more nuanced understanding of their struggles. The study collected suicide-related narrative data from social media, identified various suicidal drivers from these narratives, and discussed the application of knowledge on suicidal drivers in policy and practice. The literature review chapter introduced the concept of suicidal drivers, identified the research needs in this area, and highlighted the strengths of an interdisciplinary approach on suicidal driver studies. The method chapter described the data and methods employed in this study, such as Natural Language Processing, Latent Dirichlet Allocation, and Thematic Analysis. The results chapter

outlined the identified suicidal drivers from people's social media posts. The discussion chapter delved into these drivers by leveraging suicide theories and explored implications for future suicide prevention policies and practices.

2. LITERATURE REVIEW

2.1. Suicidal Drivers

2.1.1. What is a suicidal driver?

Jobes (2016) proposed the concept of suicide driver to understand individuals' unique suicidal experiences. A suicide driver is defined as the primary concern compelling an individual to consider suicide (Jobes, 2016). People at suicide risk often describe their experience with suicidality as being driven to suicide even when they do not desire to die (Jobes, 2016). In other words, a suicide driver is an individual-defined suicide-provoking problem. Suicidal drivers impact suicide risk both directly and indirectly (Jobes, 2016). For example, intrapersonal factors such as suicidal thoughts and behaviors are considered suicidal drivers which affect suicide risk directly. For instance, suicidal ideation has been identified as a significant contributor to death by suicide (Dunlavy et al., 2015; Klonsky et al., 2021). Some suicide drivers affect suicide risk to a certain extent, even though they do not necessarily contribute to the acute risk of suicide (Jobes, 2016). For instance, disconnectedness from significant others has been recognized as a type of suicidal driver that indirectly impacts suicide risk (Conejero et al., 2018a; Chu et al., 2017; Liem et al., 2022). While it may not increase individual's suicide risk directly, the associated feelings of loneliness can exacerbate suicide risk (Conejero et al., 2018a; Chu et al., 2017; Liem et al., 2022).

Suicidal drivers share similarities and overlap with the risk factors and warning signs associated with suicide (Tucker et al., 2015). Suicide drivers, risk factors, and

warning signs encompass various factors that can cause, trigger, or indicate a risk of suicide (Jobes, 2016). They all serve the purpose of understanding individuals at suicide risk and aiming to reduce that risk. Risk factors and warning signs are generated from suicide theories and previous data, offering insights into the likelihood of predicting the risk of suicide. These factors have the potential to influence an individual's susceptibility to suicidality, but their impact can vary. In other words, it is acknowledged that interventions based on risk factors and warning signs might not universally lead to a reduction in suicidality for all individuals (Jobes, 2016; Tucker et al., 2015).

Suicidal drivers, as defined in this dissertation, refer to individual-defined suicidal experiences. The narratives of suicidal drivers represent person-identified risk factors and person-specific warning signs that they associate with their own experiences of suicidality (Jobes, 2016; Tucker et al., 2015). The narratives of suicidal drivers provide a unique opportunity to delve into individuals' descriptions of their experiences with suicidality. Moreover, they invite clients to engage in the process of crafting intervention plans that are tailored to their specific needs beyond existing theories and research.

The potential value of examining client or patient's suicidal driver orientation may also offer an individualized and preventative approach to managing suicide risk (Jobes, 2016). This approach creates space for individuals to share what drives them to consider suicide and allows them to define those drivers uniquely using their language. There is evidence that the suicidal driver-focused treatment benefits both clinicians and patients (Jobes, 2016); it helps clinicians understand the contexts and details of patients'

suicidal experiences while also empowering patients to feel heard and motivated to engage actively in the design of treatment plans.

Drivers themselves are defined differently by individuals, so even the same driver can be defined differently depending on the individual defining it. For instance, excessive drinking can be a direct suicidal driver for someone if this behavior is a part of suicide plans. At the same time, excessive drinking can be an indirect suicidal driver for someone if it only affects suicide risk by increasing impulsivity. Some individuals may initially consider an indicator an indirect driver and later elevate it to be a direct suicidal driver. Therefore, understanding a suicidal driver of individual should be based on a reflexive process that requires reviews of multiple narratives and ongoing reflection. The implications are that clinicians should regularly revisit the list of drivers with their patients during multiple sessions (Jobes, 2016), and policymakers and researchers should be cautious about overgeneralization.

2.1.2. Examples of suicidal drivers

Reviewing the literature on suicidal drivers helps elucidate factors playing a role in suicidal drivers and how they influence suicidal risk across individuals. This review sought to expand the range of factors that may be considered as potential suicidal drivers. Examples of suicidal drivers identified in previous research include suicidal behaviors, negative parent-child relationships, financial crisis, and marginalization (Gvion & Apter, 2012; Donnelly et al., 2023; Rojas, 2022, Lopez Bernal et al., 2013; Virupaksha et al., 2016).

Suicidal ideation, planning, and attempts. Suicide-related behaviors (e.g., suicidal ideation, planning, and attempts) are consistently reported as suicidal drivers in the literature (Gvion & Apter, 2012; Jobes, 2016; Klonsky et al., 2021; Knipe et al., 2019). These behaviors have shown their causal, influential, and predictive impacts on suicide (Gvion & Apter, 2012; Knipe et al., 2019). Survivors of suicide attempts reported consistent and elevated levels of suicidal ideation before they attempted suicide (Knipe et al., 2019; Tong et al., 2018). Survivors of suicide often report that they had specific plans before they attempted suicide (Synnott et al., 2018). People with a history of suicide attempts are more likely to attempt suicide in the future (Wexler et al., 2008).

Co-occurrence of suicidality and other mental health challenges exacerbates the risk of suicide. For instance, it is not unusual that people at suicide risk to struggle simultaneously with multiple mental health challenges (Conejero et al., 2018b; Bentley et al., 2016; Hüsler et al., 2005; Maloney et al., 2010; Jeon 2011; Takahashi, 2001). People often report symptoms associated with depression (Jeon 2011; Takahashi, 2001; Palfreyman, 2021), anxiety (Bentley et al., 2016; Pramukti et al., 2020), borderline personality disorder (Yen et al., 2021; Ongeri et al., 2023), and substance use disorder (Armoon et al., 2021; Maloney et al., 2010; Wilcox et al., 2004) in addition to their suicidality. Suicide behavior and risk are sometimes related to reports of psychological pain such as feeling worried, hopeless, and/or depressed (Beck et al., 1975; Viñas Poch et al., 2004; Wray & Jarrett, 2019). Managing divergent mental health challenges with suicidality exacerbates the experience of psychological pain and the complexity of mental

health symptoms. Multiple mental health challenges can interact with suicidality and be directly associated with increased suicidal behaviors, and therefore suicide risk.

Negative relationships during youth. Globally, suicide stands as the leading cause of death among adolescents and young adults (World Health Organization, 2021). Many suicidologists have focused on cognitive, neurological, and psychological characteristics as risk factors for youth suicide (Gunn & Lester, 2015). For instance, impulsivity and mood instability caused by hormonal changes during adolescence and young adulthood have been highlighted as critical suicidal drivers (Manceaux et al., 2015).

While historically, suicidologists have primarily focused on individual factors of suicide risk among youth, there are some studies investigating whether and to what extent social factors such as negative family relationships and bullying may increase the suicidal risk of youth (Donnelly et al., 2023; Howard et al., 2023; Sewall et al., 2020). One study used machine learning to compare the prediction effects of suicide-related factors at different levels (i.e., individual, behavioral, academic, social) with rates of suicidal ideation. They found that social factors (i.e., negative parent-child, peer, and teacher-student relationships) were more strongly associated with youth suicidal ideation than individual factors (i.e., gender, sleep hours, risk behaviors), with the exception of mental health (Donnelly et al., 2023). Another research reported that adults who experienced negative peer relationships as youth are more likely than other adults to attempt suicide (Meltzer et al., 2011). Together, this evidence highlights the importance of social factors and, more specifically, that a history of problematic relationships can serve as a suicidal driver.

Financial stress. Financial stress has also been identified as a salient suicidal driver. For example, one study found that perceived financial status increased the suicide risk of people from Low and Middle-income countries, including Bangladesh, Vietnam, Indonesia, and other countries in South and Southeast Asia (Knipe et al., 2015). People who struggle with debt are more likely to attempt suicide than people who do not in Sweden (Rojas, 2022). The global financial crisis was correlated with an increase in the suicide rate in Spain (Lopez Bernal et al., 2013). Young adults in South Korea reported that their concerns with unemployment and finances led to suicidal ideation (Jo et al., 2011). Research has shown a relationship between suicide risk and disparities among occupational groups, particularly highlighting the gap in suicide death rates between low-class and high-class occupations (Milner, et al., 2015). During COVID-19, financial insecurity, including being fired and experiencing housing instability, were positively correlated with the suicide risk of people (Elbogen et al., 2021).

Dealing with financial issues can make people feel defeated, perceive their life as a failure, feel entrapped in that situation, and feel hopeless that the situation will not improve (Rojas, 2022; Gunn & Lester, 2015). Another study showed that higher levels of debt increased the likelihood of depression and anxiety, affective states which are suicide risk factors (Amit et al., 2020). These findings highlight the notion that financial stress and hardship can increase suicidality by contributing to negative affect and/or other mental health challenges.

Marginalization. Marginalized populations are communities that are socially, geographically, or/and economically disadvantaged to any extent due to their identities

and socioeconomic status (Patton et al., 2016), including due to identities associated with race, gender, and sexual minority status, and people with low-income or immigrant backgrounds (Patton et al., 2016). A review of multiple studies conducted in different countries found that people living in rural areas report higher suicide rates than those residing in urban areas (Casant & Helbich, 2022). In the U.S., individuals who are in jail have reported a rate of suicidal death that is two times higher compared to those who are not in jail (Carson 2021). Refugees reported a higher suicide rate than native citizens in South Korea (Nam et al., 2021). People experiencing homelessness reported a higher suicide rate than those who are not homeless in Ethiopia (Yohannes et al., 2023).

Moreover, high suicide rates are often observed among individuals with minority identities (Virupaksha et al., 2016; Knipe et al., 2019). For example, suicide rates among transgender adults are 32-50% higher compared to those among cisgender adults across various countries (Virupaksha et al., 2016). Health inequality is related to high stigma and discrimination among minorities due to identities including related to being an immigrant (Valentín-Cortés et al., 2020), LGBTQ+ (Hatzenbuehler & Pachankis, 2016), and for people with Autism Spectrum Disorder (Botha & Frost, 2020). People with minority identities report higher levels of feeling lonely and rejected (Rood et al., 2016; Moseley et al., 2021). These stigmatized experiences, negative feelings, and negative self-image have the potential to elevate the suicide risk of people (de Lange et al., 2022; Khazem et al., 2021). Collectively, these findings reinforce the notion that being marginalized in society increases the risk of suicide.

2.2. Barriers to Studying Suicidal Drivers

Suicidal drivers are a relatively new concept in suicidology compared to suicide risk factors and warning signs (Tucker et al., 2015). For decades, researchers have developed theoretical frameworks to understand risk factors and warning signs and how they affect suicide risk. The theoretical frameworks have contributed to designing structural suicide prevention plans for the practices in suicide prevention. Numerous studies on risk factors and warning signs have also validated these theories with different samples and by applying divergent research methods (Tucker et al., 2015). They contributed to provide evidence of treatment plans that can be applied to diverse populations and contexts. This validation encouraged the implementation of research to practice by displaying the developed suicide prevention plans as evidence-based approaches—a process that is key to increasing the efficacy of intervention and decreasing the biases of clinicians. However, despite its strong capability in individualized treatment planning, there is a lack of empirical research addressing suicidal drivers. Other than the relatively short history of the suicidal driver, there are additional potential reasons why suicidal drivers have not been researched actively. In the next section, these potential reasons for this lack of research, and alternative approaches that have the potential to grow this body of research are reviewed to provide insights on how to add more evidence for suicidal drivers in the future.

2.2.1. Lack of disclosure among people with suicidality

How does the lack of disclosure hinder research on drivers? Disclosure is the first step and prerequisite for identifying suicide drivers of people. However, low disclosure of

suicidal risk and drivers has been reported in many research studies. For instance, more than half of people with suicide risk have never shared their challenges with suicidality with others (Hom et al., 2015; Husky et al., 2016; Rickwood & Thomas, 2012). In one study, only 40% of people disclosed their suicidal ideation to friends and family, only 20% of people disclosed their suicidal ideation to health professionals, and only 1% of people disclosed their suicidal ideation to the suicide prevention hotlines or associations (Encrenaz et al., 2012). It is even more alarming that there is a disclosure disparity between different groups of people, which serves to increase health inequities nationally and globally. People with minority identities are less likely to ask for help and use healthcare services than their counterparts due to prejudice toward their identities (Chu et al., 2011; Wu & Lee, 2021). The lack of disclosure among people with suicidality hinders understanding of diverse suicidal drivers and increases the gap between the prevalence rate of suicidality and the utilization of mental health care services (Hom et al., 2015; Rickwood & Thomas, 2012). Increasing disclosure of people is an ongoing task for suicidologists to provide more support and resources to people at suicide risk to prevent their suicide death.

Stigma. Psychologists have strived to identify barriers to disclosure. One of the main barriers to disclosure is stigma. Stigma is any negative perception and behaviors toward individuals' issues, such as stereotypes, prejudices, labeling, and judgment. There are different types of stigma, such as anticipated/expected, experienced, internalized/self, public/social, and systematic. Anticipated or expected stigma refers to the belief that others will have a negative reaction if one was to share their suicidality (Hom et al.,

2015). The high level of anticipated/expected stigma is a crucial factor in discouraging disclosure and help-seeking for people at suicide risk (Hom et al., 2015; Pretorius et al., 2019). Experienced stigma is about negative experiences that an individual has experienced following disclosure of their challenges with others (Hom et al., 2015). Internalized or self-stigma relates to the internal experience of individuals and how they label their suicidality (Hom et al., 2015). Public or social stigma is the negative perception and understanding among most society members toward suicidality (Hom et al., 2015). Systematic stigma is related to the unfair treatment of people with mental health challenges by societal systems (i.e., unemployment or imprisonment due to mental health challenges). Stigmas, in all these forms, contribute to the hesitation to disclose issues and publicly ask for help. Indeed, research has shown that people concerned more about stigma were less likely to disclose their suicidality with others (Hom et al., 2015; Pretorius et al., 2019).

Unwanted intervention. Potential unwanted intervention makes people hesitate to share their suicidal risk with others (Blanchard & Farber, 2020; Pretorius et al., 2019). People have reported feeling forced by others to a certain extent after disclosing their suicidality (Sheehan et al., 2019; van der Schyff et al., 2023). For example, when a friend of family member recommends that a person seek treatment (e.g., hospitalization or therapy), people may feel obligated to appease the person who made the recommendation. However, disclosing their suicidality doesn’t mean they are ready to commit to treatment. People may want to share their suicidality with their friends but may not be sure if they would like to start therapy or take medicine. The fear of

involuntary hospitalization has often been reported as the main reason for hiding suicidality from others (Hom et al., 2015; Jones et al., 2021). Individuals may experience confusion and a sense of coercion when clinicians' decision-making does not align with their cultural context (Kim, 2022). This disconnect can lead to additional uncertainty and challenges in understanding and navigating the treatment process (Kim, 2022). Even when people seek advice and help from others, most still want to exercise self-determination. They want to maintain their autonomy by deciding who, when, and how much they want to disclose, and what they want to do next (Blanchard & Farber, 2020; van der Schyff et al., 2023).

Limited accessibility. During times of acute suicide risk, it can be especially challenging to find someone who is accessible and available to provide immediate support or intervention. Some people may not feel able to disclose their suicidality because family, friends, and mental health professionals are perceived as unavailable. One challenge is that people with suicide risk often do not think of suicide or feel suicidal all the time (Stanley & Brown, 2021), therefore people can feel fine before or during a therapy session, but can feel suicidal soon after the session. As such, they might not talk about suicidal experiences because they did not experience suicidality while they were with a therapist. However, later, at a time of acute suicide risk, the therapist may not be available. The individual may disclose their suicidality in the next session, but that experience is described differently because it relies on the memory and reflections of the individual post-acute suicide risk. This missed opportunity for disclosure impacts both the individual's understanding of their own acute suicide risk and the therapist's ability to

address it. It is widely known that many people report a high risk of suicidality late at night (Burns et al., 2010; Ferdous & Alam, 2021; Person et al., 2019; Tubbs et al., 2020; Rahman et al., 2013). Therefore, there is a recognized need for 24-hour mental health support services to assist individuals anytime they need help (Chavan, et al., 2012).

In addition to the restriction of time, restriction of space hinders disclosure of suicide risk for some people (Hom et al., 2015). Indeed, some people have limited access to mental health treatment within their daily schedule. This was especially true during the COVID-19 pandemic when people were physically separated from others. Therefore, it is essential to discuss how to construct environments that allow people to disclose their suicidality whenever and wherever they need it.

Limited chance to find community. People often perceive groups with shared experiences as a strong and supportive community (Bell et al., 2018). They report feeling more heard and understood when they can discuss their mental health concerns with individuals who have gone through or are going through similar experiences (Bell et al., 2018). The absence of those with shared experiences may makes people reluctant to disclose their suicidal thoughts. In fact, people use selective disclosure, deciding with whom to share, in order to avoid feeling unheard and judged by others without similar experiences (Karnieli-Miller et al., 2013). However, the chances of finding others with similar suicidal experiences can be low, particularly in offline spaces. With a prevalence rate of suicidal ideation around 5% in the U.S. (Substance Abuse and Mental Health Services Administration, 2021), the likelihood of encountering individuals who have had comparable experiences is limited. This limited chance of meeting others with similar

experiences in one's living range may be a barrier for people in disclosing their mental health concerns.

2.2.2. Lack of narrative, naturally occurring, and inclusive data

Traditionally, suicide research has used structured assessment protocols that examine the extent to which the individual's experience matches evidence-based risk factors and warning signs (Hjelmeland & Knizek, 2010). While these research strategies strive to validate theories about risk factors and warning signs, they may miss the experiences of individuals and hypotheses about risk that are not included in the structured assessment protocols. However, to expand research on suicidal drivers, it is important to consider a data-inspired or bottom-up approach. These approaches have the potential to guide researchers to explore suicide-related factors from scratch, and to add examples of factors and build frameworks for understanding drivers that might not have been previously identified. Data from narratives, stories, or testimonies are critical for this approach to uncover and understand drivers of suicide.

Lack of narrative data. However, existing research on suicide-related factors, including studies on suicidal drivers and broad studies on risk factors and warning signs, has generally focused on using quantitative data (Hjelmeland & Knizek, 2010). These studies examined pre-determined suicide-related factors based on theories and previous literature (Tucker et al., 2015). Again, the goal of applying the concept of suicidal drivers is to define unique and personalized suicide-provoking factors by leveraging the language of individuals experiencing suicidality rather than the language of researchers. It is important to note that throughout the process of defining suicidal drivers, individuals also

may use labels derived from theories to define their suicidal drivers. However, adopting labels after they described their suicidal drivers through their language is different from simply selecting factors from a predefined list. Therefore, data collected quantitatively might not entirely reflect the unique, complex, and contextualized suicidal drivers of each individual.

Lack of naturally occurring data. Some studies have employed a qualitative approach to identify suicidal drivers, allowing individuals to describe their suicidal experiences using self-defined factors rather than relying solely on factors previously identified by researchers (Jobes, 2016). However, it is important to acknowledge that these studies often collect narratives from individuals within limited time and place contexts, such as research or clinical settings. For instance, narratives obtained in a clinical setting are often created during scheduled appointments, which may not coincide with the exact moment individuals experience suicidal thoughts or behaviors. Even if individuals vividly recall their acute suicidal experiences, they may describe them differently in a clinical setting compared to within their own home. Consequently, it is crucial to recognize that the narratives collected in previous research may not fully capture the everyday experiences of individuals with suicidal drivers.

Lack of inclusive data. Last, a critical limitation of existing studies is that they mainly included only people who have access to healthcare systems or are in the mainstream of social systems (Comtois et al., 2011; Ellis et al., 2015; Pistorello et al., 2021; Ryberg et al., 2019). Therefore, it is unclear whether the conclusions can be extrapolated to other groups of people navigating different contexts and holding diverse

identities. For example, a case study conducted with one patient, a middle-aged white male with high socioeconomic status and multiple mental health challenges, identified romantic relational stress with a partner as a suicidal driver (Jobes, 2016). A driver-focused intervention was tailored for this person and was shown to be effective in decreasing this individual's suicidality. However, the intervention plan tailored for this patient may or may not be effective for others holding different identities and/or situated in different contexts. Youth in higher education systems are usually invited to participate in research more than youth who are not (Rad et al., 2018). However, suicidal drivers of youth in school from previous studies may also diverge from those of youth outside of school (Pistorello et al., 2021; Qu et al., 2021). Therefore, the existing evidence related to suicidal drivers may only reflect the experiences of specific groups of people and not diverse groups of people.

To capture the nuance and complexity of suicidal drivers, future research projects should strive to collect and analyze (1) narrative data rather than quantitative data, (2) data created naturally in people's daily lives rather than data collected from research or clinical settings, and (3) data which includes the stories of diverse populations.

2.3. The Benefit of Using Social Media Data in Suicide Research

Online space is now where people find health-related information (Inthiran, 2017; Pretorius et al., 2019; Thornton et al., 2017; Wilks et al., 2019). Almost three out of four internet users in the U.S. have searched for health information online within a year (Fox & Duggan, 2013). People report that they use the internet to find information more than

connect with others (Datareportal, 2021). Considering more people use online medical resources than before, understanding people's social media communication is vital to promote future public health (Datareportal, 2021). In this section, the benefits of using social media data on suicidal driver research are explained, with particular attention paid to how social media data may function to compensate for the limitations of existing research (i.e., lack of disclosure and limited data sources to study suicidal drivers) discussed above.

2.3.1. High disclosure rate in social media

People often share their health concerns, express emotional stress, and seek social support in virtual spaces (De Choudhury & De, 2014; Park et al., 2018). Similar to offline help-seeking behavior, online help-seeking behavior has been found to promote healthier behaviors and enhance the effectiveness of healthcare services (Tan et al., 2017). Researchers have consistently observed that individuals feel more comfortable disclosing their sensitive and personal problems online rather than in offline settings (Haner & Pepler, 2016). The following section introduces five reasons why individuals are more inclined to disclose their suicidal risk in virtual spaces compared to offline environments.

Low risk of stigma. People reported experiencing less anticipated/expected and public/social stigma in online communication compared to offline communication (Robinson et al., 2016; Pretorius et al., 2019). These low risks of stigma encourage people to disclose more about their suicidality with others in a virtual space (Frost et al., 2016). Low risk of stigma in a virtual space is especially crucial to disclosing suicidal risk among people with minority identities. People with minority identities reported more

suicidal experiences and stigma around these challenges than their counterparts (Rose & Friedman, 2013). For example, individuals with a marginalized sexual identity often deal with stigma directed toward their identities on top of stigma toward mental health challenges (Lucassen et al., 2011). Due to this experience, they are less likely to publicly disclose their mental health concerns (Rose & Friedman, 2013). They are more likely to share their mental health challenges in an online space, because these virtual spaces do not require them to disclose their identity (Haner & Pepler, 2016).

Self-determination. As discussed above, people tend to hesitate to share their suicidality with others because they want to be self-determinant, self-reliant, and autonomous (Sheehan et al., 2019). Many people hide their suicidality in their offline space to avoid potential interference by others (Jones et al., 2021; Hom et al., 2015). Unlike offline spaces, people perceive online spaces as a place where they are in control of their disclosures and future actions following disclosure (Pretorius et al., 2019). People worry less about unwanted interventions such as involuntary hospitalization and treatment, when disclosing online versus offline spaces (van der Schyff et al., 2023). They also feel less obligated to take advice from others and to put that advice into action (Pretorius et al., 2019). Online disclosure allows people to be autonomous in decisions related to treatment and medication. Even with this autonomy, people who disclosed their suicidality online are more likely to use professional mental health services than those who did not (Frost & Casey, 2016). For this reason, many researchers and clinicians highlight the need to pay attention to mental help-seeking behaviors online to identify

individuals at suicide risk (De Choudhury & De, 2014; Monselise & Yang, 2022; Pretorius et al., 2020; Song et al., 2016., Wong et al., 2021).

High accessibility. Online platforms provide instant access to advice and information, facilitating immediate support and assistance to people. The availability of mental health communities and resources online allows people to disclose their concerns at their convenience (Burns et al., 2010; Tirel et al., 2020). People perceive online communication as an accessible and effective means of social interaction, which helps reduce the burdens of time and travel costs (Mohr et al., 2010). For instance, research indicates that individuals particularly benefit from online mental health services after 6 pm when formal services are typically less accessible (Tirel et al., 2020; Lekić et al., 2014). It is particularly beneficial for those with limited access to healthcare facilities, such as individuals in rural areas (Yellowless et al., 2008) or with disabilities (Oudshoorn et al., 2020). During the COVID-19 pandemic, the utilization of e-mental health significantly increased, providing vital connections and support in a time of social and physical isolation (Ellis et al., 2021). This evidence suggestions that online spaces for communication permit people to be connected to, share health concerns with, and ask for advice from others more easily than offline.

Finding community. People found that it is easier to meet others who have similar experiences with them in online spaces (Bell et al., 2018). Because they can find those with similar experiences online, the expectation is to receive non-judgmental and affirming reactions from people in online spaces (Pretorius et al., 2019). Finding others with similar experiences online makes people aware that they are not the only ones

struggling with suicidal issues (Bell et al., 2018). This has been shown to induce feelings of relief and acceptance after disclosing suicidality to others online (Bell et al., 2018). Finding a community online that shares the same mental health concerns may reduce the level of self-hatred, loneliness, and suicide risk of individuals.

Catalysts of discussion-based social media. Online space, there are formal and informal platforms where people can get mental health-related support and information. Formal platforms include official websites of national and international health organizations such as the World Health Organization (WHO) and the International Association for Suicide Prevention (IASP). Websites run by private or non-profit suicide prevention organizations are included here as well, such as American Foundation for Suicide Prevention (AFSP). These platforms mainly provide information, resources, and structured professional help. Informal platforms include social media such as Facebook, Instagram, TikTok, Reddit, and Quora. They focus on providing a space for individuals to exchange thoughts, concerns, information, and resources with each other. On informal platforms, people consume health information and provide them to others (De Choudhury & De, 2014; Park et al., 2018; Stockdale et al., 2010). In fact, people reported they prefer to use informal platforms over formal platforms when they need health-related advice and help (Brown et al., 2022, Pretorius et al., 2019).

Among informal online platforms, people may feel more comfortable sharing their mental health concerns in discussion-based social media as opposed to network-based social media. Network-based social media (e.g., Facebook, Twitter) are designed to connect people, so they are bound by offline relationships. However, discussion-based

social media (e.g., Reddit, Quora) are designed to create an environment for people to connect regardless of their offline network. People can create accounts without putting their personal information, such as name, gender, and age, in discussion-based social media. This enables anonymous communication, which has been considered a key to increasing help-seeking behaviors of people (Masur, 2018, Pretorius et al., 2019). People feel more comfortable disclosing their suicide risk in a space where anonymous communication is guaranteed (Bradford & Rickwood, 2014; Ellis et al., 2013). The guaranteed anonymity of discussion-based social media permits people to share their mental health concerns more comfortably with others than on other online platforms.

2.3.2. Natures of discussion-based social media data

Previously, the lack of pertinent data (i.e., individuals' narratives in a daily natural setting) and the biased sample of previous research were discussed as limitations in suicidal driver research. Social media data can be an alternative and novel data source that can compensate for many of these limitations. Specifically, discussion-based social media data is suitable for understanding suicidal drivers due to three characteristics — naturally occurring data, qualitative narrative data, and data created by samples different from those who tended to engage in previous research.

First, people write posts and comments voluntarily in discussion-based social media because they want to, not because they were asked to do so by researchers or clinicians (naturally occurring data). Second, people describe their current and past thoughts, feelings, and experiences on social media by using their own language (narrative data). Furthermore, because Reddit does not impose a word limit, people can

write and add details of their suicidal risk and drivers to the extent to which they would like. Therefore, discussion-based social media can be considered an archive of people's written narratives related to suicidal experiences. Third, previous research recommended novel sampling in suicidal driver research (Tucker et al., 2015). However, the samples of previous suicide research were mainly people in the mainstream of society or with access to healthcare systems. It should be noted that sampling people on social media still does not represent the whole population in the real world. However, the value lies in these samples being distinct from those collected in clinical settings or educational institutes. Furthermore, previous research identified that the choice to disclose or not disclose mental health concerns online was not related to socioeconomic status and educational attainment (Best et al., 2014). Social media data may provide various narratives created naturally by different groups of people who were not included in previous research.

The ability to accrue a large data set on social media also stands to benefit suicidal driver research. Existing suicidal driver research is mainly conducted with a limited number of narratives, such as case studies with a few patients (Jobes, 2016). However, there is a paucity of suicidal driver research conducted with large-scale data. What makes large-scale data appealing to suicide research is the alignment between human behavior and the data (Donnelly et al., 2019). Human behavior is complex, diverse, and changing. Even though researchers may be interested in one specific human behavior (i.e., suicide), the behavior has occurred many times, in different forms, and is changing over time between and within people. Large-scale or big data refers to data with 3Vs—high volume, variety, and velocity (Gartner, 2013). Large-scale social media data

represents a record of various human behaviors (volume of data), diverse forms of these behaviors (variety of data), and behaviors created over time (velocity of data). Because the nature of large-scale data (3V) is aligned with these three characteristics of human behavior (Donnelly, et al., 2019), large-scale data is becoming increasingly popular in social science research as a way to understand human behavior. For instance, previous research used large-scale data from social media to track the number (high volume), different forms (high variety), and changes (high velocity) of bullying behaviors among youth (Donnelly et al., 2019). Using large-scale social media data can help to understand the numerous, diverse, and changing narratives of people with suicidal risks.

2.4. Limitation in Interdisciplinary Suicide Research

2.4.1. Lack of interpretable findings of research

There are two main streamlines of interdisciplinary research in social science—research using data science for suicide risk prediction, and research using data science for explaining mechanisms around suicide risk and related factors (Johns et al., 2023). Previous data science approaches to studying suicide have focused on developing accurate and efficient prediction models to screen individuals at risk (Chatterjee et al., 2022; Renjith et al., 2022). By striving to increase model performance (i.e., high accuracy and sensitivity scores), this line of research contributes to improving efficient screening and risk detection systems in healthcare. However, the low interpretability of findings is a major limitation from previous research that slows down practical applications among policymakers and clinicians (Zhang et al., 2022). There is an absence of suicide research

weighted toward describing the suicidal experience of people by social scientists. More engagement of social scientists is necessary to provide in-depth discussions in the implementation of interdisciplinary research to promote public health policy and clinical practices (Proferes et al., 2021).

2.4.2. Lack of public suicide prevention research

Suicide prevention can be categorized according to whether the focus is on clinical populations or public populations (D'Hotman & Loh, 2020). While there has been significant research on suicide prevention for the clinical population, the area of public suicide prevention has received comparatively less attention (Le Glaz et al., 2021). For instance, most mental health studies with data science have predominantly relied on clinical data, particularly Health Care Electronic Medical Records (EMR) and clinical notes, to enhance "medical suicide prediction" (Le Glaz et al., 2021; D'Hotman & Loh, 2020). However, these studies generally target individuals with access to healthcare systems or those at high risk, limiting the generalizability of their results to the wider population. Fewer studies have utilized public data to enhance "social suicide prediction" for suicide prevention at the community and population levels (Le Glaz et al., 2021; Su et al., 2020; Walsh et al., 2018; Zheng et al., 2020). To identify patterns of behavior that can be used to engage in "social suicide prediction," it is important to consider large-scale alternative data sources from the public (D'Hotman & Loh, 2020).

2.4.3. Lack of research using content features

Research using social media has often focused on linguistic features (e.g., forms of noun and verbs, pronouns, first person-centered language use) and quantitative features (e.g., number of posts or comments, length of posts, visits of forums) of data (De Choudhury & De, 2014; Homan et al., 2022; Monselise & Yang, 2022). For instance, a study analyzing Reddit posts (Monselise & Yang, 2022) identified patterns where individuals commonly posted on depression or self-harm-related subreddits before transitioning to suicide-related subreddits. While the finding suggests that providing suicide-related resources on other mental health platforms can be beneficial for suicide prevention, there is a lack of in-depth discussion on the psychological dynamics underlying these posting patterns and specific recommendations for individualized interventions. Although previous interdisciplinary studies in the field of suicide have made valuable contributions, there is a need for further suicide research with data science that aims to incorporate psychological knowledge and insights into clinical practices.

3. CURRENT RESEARCH

The literature review highlights the need for suicidal driver research, particularly for research using social media data to provide naturally occurring narratives among diverse groups of people. An in-depth discussion of findings from interdisciplinary research is also needed to inform public health policy and practices.

The overarching goal of this research is to contribute to understanding suicidal experiences of people by providing diverse examples of suicidal drivers. The specific goals of this research are to explore types of suicidal drivers, to explain those drivers within the context of suicide theories, and to provide suggestions for the future direction of suicide prevention policies and practices. Using data from a single online community, this study answers the following questions.

Research questions

- What are the suicide-related topics addressed by individuals in the online community?
- What types of suicidal drivers are disclosed by individuals in the online community?
- How do existing suicide theories explain the identified suicidal drivers?

4. METHOD

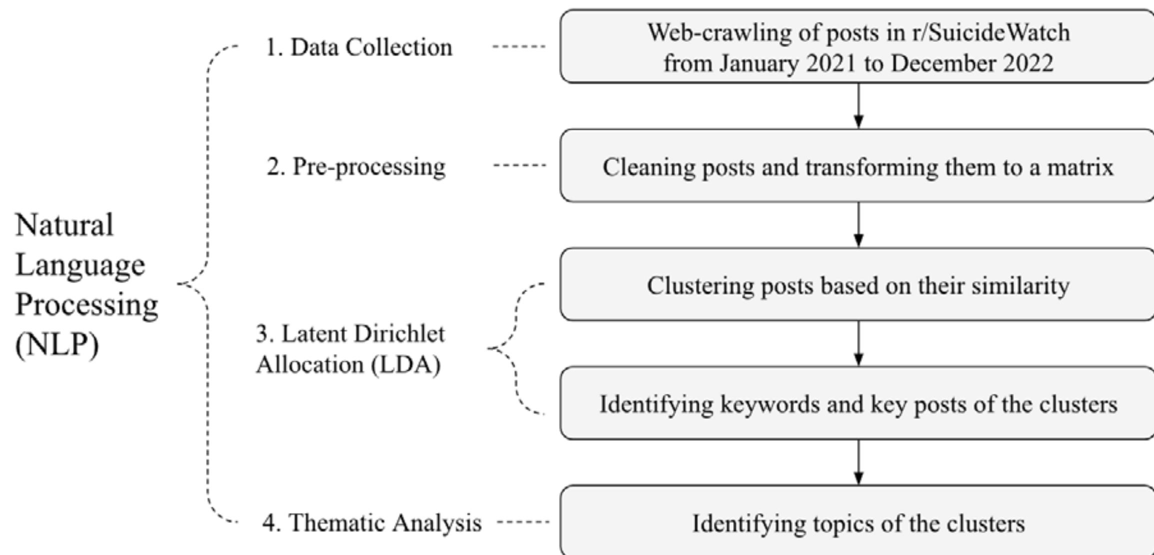
This study is designed with a data-informed, interdisciplinary, and mixed-method approach using three specific steps. The first step is data collection and preprocessing of naturally occurring narratives using Natural Language Processing. The goal of this step is to transform qualitative data (unstructured text data) into quantitative data (statistically analyzable structured matrix data). The second step is analyzing data quantitatively by using probability-based topic modeling. This step aims to cluster high-dimensional and large-scale data into a small number of clusters based on their similarity. The third step is identifying topics of clusters qualitatively using thematic analysis. This step aims to interpret the findings from the second step and provide detailed information for each cluster.

4.1. Natural Language Processing (NLP)

Natural Language Processing (NLP) is the overarching approach in data science research for text mining. It aims to extract information and knowledge from numerous text data with different computational strategies. It has previously been used to describe the complexity of mental health and improve screening systems (Zhang et al., 2022). NLP is not only an analytical method, but also a comprehensive process including extracting diverse forms of text data (data collection), transforming them into structured matrix data (data cleaning), and analyzing them to provide knowledge from massive text data (data analysis). The needs and usages of this approach have increased over the last ten years due to its strengths in getting interpretable results and its practical applications.

Because of its capability for collecting and analyzing large amounts of unstructured data from different sources, text mining is useful to summarize numerous text data (e.g., social media posts, news articles, research papers, interview manuscripts, counseling notes, and diaries) and develop interactive text-based Artificial Intelligence (i.e., ChatGPT). The current study is designed with NLP as the overall structure of the method, using four specific steps of analysis in detail (Figure 1).

Figure 1. Research Process

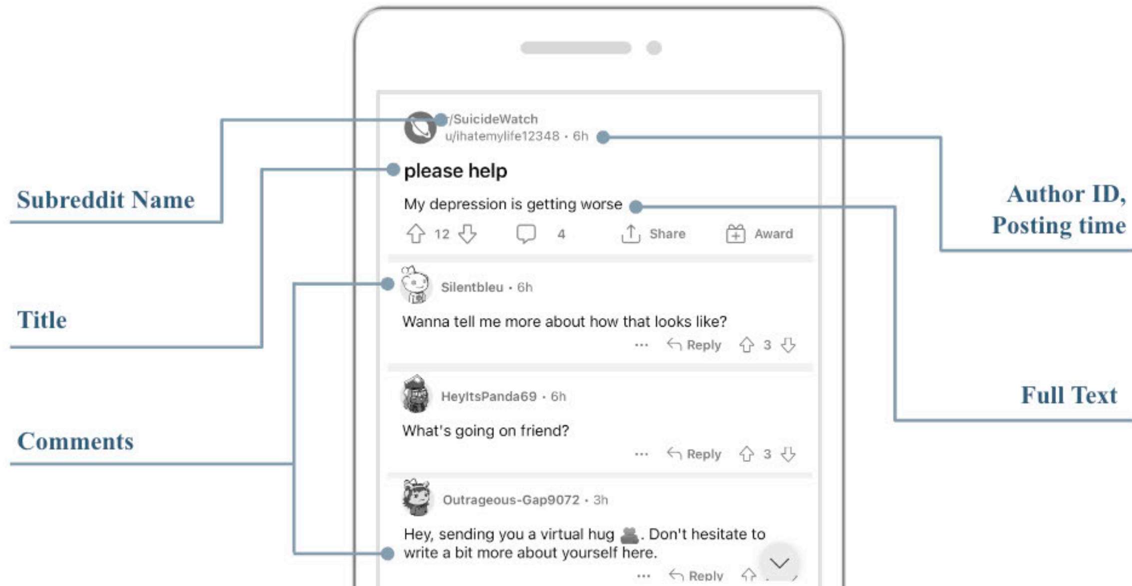


4.2. Data Collection

This research used 128,587 posts in r/SuicideWatch on Reddit. Reddit has numerous subreddits and each subreddit has specialized topics. People can access, post, and comment anytime on different subreddits depending on their interests and needs. r/SuicideWatch is the subreddit for *"Peer support for anyone struggling with suicidal thoughts."* Any suicide-related topics can be discussed in this subreddit, and irrelevant

posts are usually moved to other subreddits aligned with their topics. The posts in r/SuicideWatch can be considered written narratives of people focusing on suicide-related issues. All posts extracted for the current study were written in English by 76,547 people across the world. As previously noted, it is crucial to acknowledge that the sample of this study (social media users) does not represent the entire population. However, it stands as a distinctive sample, differing from those of previous studies conducted in clinical settings or educational institutes. The number of posts per individual ranged between 1 to 158 posts (more details of this are provided in the result section). This study used posts written between January 1st, 2021 to December 31st, 2022 for its analysis. The travel trends over the years 2021 and 2022 have the same trend as the trends of pre-COVID years (OAG, 2023), while the travel trend of 2020 was unique from other years due to the COVID-19 pandemic. To minimize the impact of the pandemic on the relationship between suicidal risk and drivers, and to focus on the recent behaviors of people, this research collected posts written from the beginning of 2021 (January 2021) until the latest month during the data collection period of this study (December 2022). The data were collected by a web crawler developed by Brandwatch utilizing Reddit's API. The crawler gathered multiple features in Reddit, including the name of the subreddit, author ID, posting time, titles of post, full texts of post, comments, and so forth (Figure 2). Among the features gathered, this research specifically focused on analyzing the posts, posting dates, and author IDs.

Figure 2. Features in Reddit



Identification of users such as name, age, race/ethnicity, gender, and location were not available publicly. Therefore, this research is qualified for the exemption of the IRB process of Institutional Review Board (IRB) at Boston University. Although demographic information is not available for the current data, demographic information for overall Reddit users is provided here to help to understand the general characteristics of people using Reddit. Based on Reddit Statistics in 2022, over 70% of users are from countries using English as a primary language (Reddit Statistics, 2022). Over half (52%) of Reddit users are from the U.S., 8% are from Canada, 8% are from the United Kingdom, and 5% are from Australia (Reddit Statistics, 2022). Following these four countries, 2% are from Germany, and 1% are from India. By age, 51% of Reddit users are between the ages of 18 and 29, 31% are between 30 and 49 years old, 14% are between 50 and 64, and 4% are 65 or older (Reddit Statistics, 2022). Especially, over one

in three young people aged between 18 and 29 in the U.S. reported that they use Reddit (Reddit Statistics, 2022). By gender, 68% of Reddit users were male, and 32% of them were female (Reddit Statistics, 2022).

4.3. Data Pre-processing

Pre-processing of data for this study included cleaning texts, tokenizing the texts, and transforming the tokenized texts into a document-term frequency matrix. In the cleaning process, non-English letters were removed, and all English letters were changed to lowercase. All numbers, punctuation, HTML, and stopwords were also excluded. In the tokenizing process, nouns, verbs, and adjectives were lemmatized and tokenized as (1,1) of n-gram. The tokenized texts were transformed into a document-term matrix based on their frequency across the document.

4.4. Topic Modeling: Latent Dirichlet Allocation (LDA)

Latent Dirichlet Allocation (LDA) is the most widely used topic modeling method. The purpose of topic modeling is to identify clusters among numerous data sources based on similarities across the data. This clustering has the benefit of identifying common patterns from high-dimensional and large-scale data. Each cluster provides keywords and key documents. Keywords and key documents are examples that represent common patterns across numerous posts in a cluster. These patterns are considered topics or themes of the clusters as major information identified from massive data sources.

LDA assumes that sets of words indicate latent topics within the studied

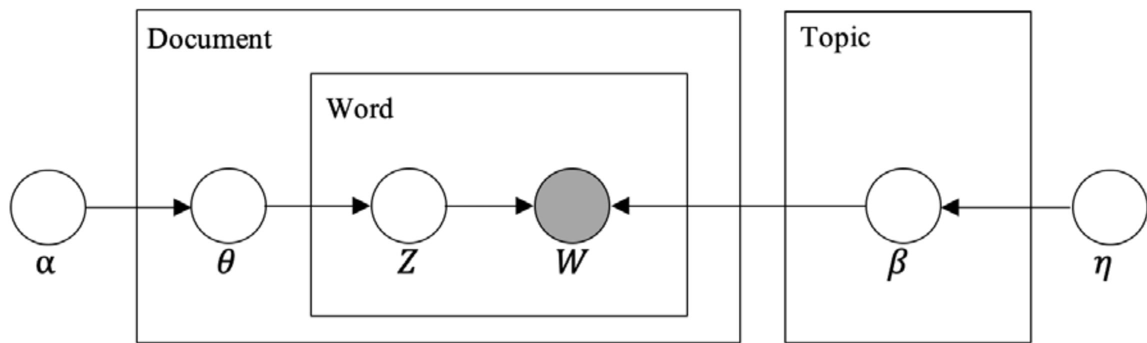
documents. Blei, Ng, and Jordan (2003) explained LDA as follows: *"The basic idea is that documents are represented as random mixtures over latent topics, where each topic is characterized by a distribution over words."* A topic is explained by a set of words, not by a single word, and words can be used multiple times to explain different topics (Blei et al., 2003). Figure 3 visualizes the analysis process of LDA. Distributions of words in a document, distributions of words in a topic, and distributions of topics in a document are used to identify distributions of topic clusters in a dataset. Each vocabulary is denoted by a vector that was created by its distribution across documents. Each topic cluster is identified based on similarities and differences across the vectors of vocabularies. Each document is summarized by the vector of topic distribution. All vectors are created with probabilities in how likely vocabularies, topics, and documents appear or correlate.

Multiple research models with different numbers of clusters are explored and compared to each other by a grid search. The final optimal number is decided based on the perplexity of the models. Perplexity is the measure of how many unpredictable patterns were identified in the LDA model (Blei et al., 2003). Perplexity is a widely used and powerful criterion in LDA to decide the optimal number of clusters (Williams et al., 2020). Therefore, lower perplexity indicates a more generalizable classification model (Blei et al., 2003) and a smaller value in perplexity indicates better performance of the model.

After finding an optimal number of topic clusters, distributions of the topics are estimated for each document. In this study, each document was classified into a topic cluster that is most aligned with that document. Keywords of each cluster were identified

based on how often a word was used to illustrate topic. Key posts of each cluster were identified based on how the distribution of words in a post aligned with the distribution of words in a topic. Ultimately, these keywords and key posts were used to explain similarities across numerous posts in a cluster and define the themes of each cluster.

Figure 3. Graphical Model of LDA (Blei et al., 2003)



Note: α = proportion hyper-parameter; θ = topic probabilities of documents; Z = topic probabilities of vocabularies, W = vocabulary vectors; β = topic vectors, μ = topic hyper-parameter.

4.5. Thematic Analysis

LDA is a method of thematic analysis that offers statistical evidence for determining the optimal topic model. However, the process and rationale for identifying and labeling topics from keywords and documents are relatively less emphasized in LDA approach. To address this limitation and achieve a more systematic approach to identifying topics from LDA, the current study employed thematic analysis, a traditional qualitative research method widely used in social science.

Given the extensive data volume (128,587 posts), analyzing all posts using qualitative thematic analysis was not feasible. Therefore, thematic analysis in the current

study was focused on the top 30 posts for each LDA cluster. Five professionals, inclusive of two doctoral in psychology, two master students in social work, and one scientist who is familiar with Reddit, analyzed key posts to identify potential themes of LDA clusters. The process involved open coding, axial coding, and selective coding. In open coding (level 1), sentences and paragraphs within posts were coded based on their contents (e.g., conflicts with dad, jealousy from siblings, arguments with a friend). In axial coding (level 2), the codes from level 1 were categorized based on their similarity (e.g., conflicts with dad and jealousy from siblings were coded as negative family relationships; arguments with a friend were coded as negative friend relationships). Lastly, in selective coding (level 3), the overarching topics across categories from level 2 (e.g., relational stress) were identified. The author of this study cross-validated the analysis results to define the final themes. In this research, the number of themes was intentionally limited to align with the proposed number of clusters determined by LDA. This decision aimed to make a balance between LDA and qualitative thematic analysis as a mixed-method approach. As a result, thematic analysis assigned one label to each cluster derived from LDA. Consequently, the final theme or label may encompass different potential sub-themes within a cluster.

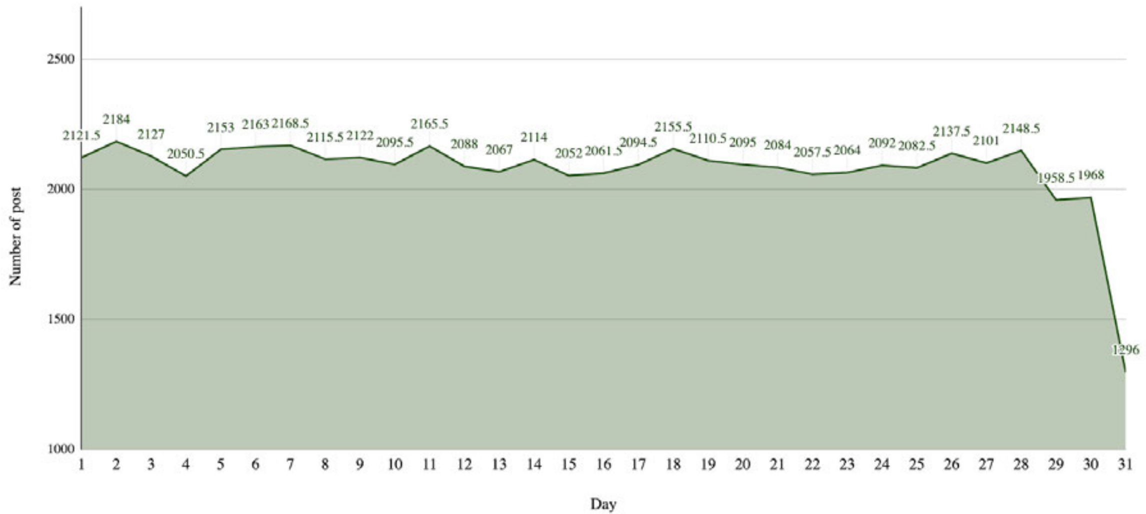
5. RESULTS

5.1. Descriptive Statistics

A total of 128,587 posts written by 76,547 individuals between January 1st, 2021 to December 31st, 2022 were collected. 67,110 were posted in 2021 and 61,477 were posted in 2022. The number of posts by month and day is presented in Figure 4 and 5. The average number of posts per each month ranged between 5,000.5 (September) to 5,838 (May) with a mean of 5,358. The last quarter of the year (from September to December) had fewer than 5,200 posts per month which was a relatively lesser number of posts than other quarters. The average numbers of posts per day ranged between 1,296 (31st of a month) to 2,184 (2nd of a month) with a mean of 2,073. Because only seven months include a 31st day in their month, the number of posts on the 31st of a month was uniquely lower than on other days in a month.

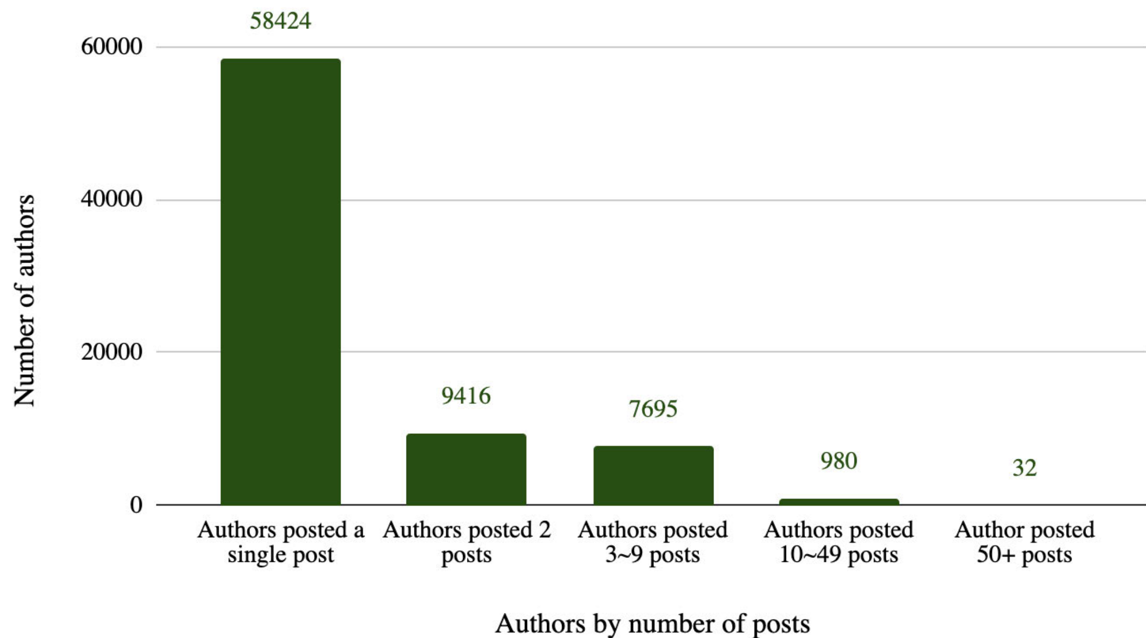
Figure 4. Number of Posts per Month

Figure 5. Number of Posts per Day



The number of post per author varied from 1 to 158. The mean number of posts per author was 1.7, and the median was 1. The mode was 1, indicating that a majority of authors (n = 58,424, 76.3% of users) wrote only one post in r/SuicideWatch between 2021 and 2022 (Figure 6). A total of 9416 authors posted twice and the number of authors posting more often continued to decline, for example, 32 authors posted 50 times and more. Only four authors posted more than 100 posts, and the researcher carefully reviewed their content to ensure it was all relevant to suicide-related topics.

Figure 6. Number of Authors by Number of Posts



5.2. Grid Search

Two LDA grid searches were performed to determine the optimal number of latent topic clusters, considering both the model's statistical performance (perplexity score) and their capacity to explain multi-facets of suicide-related discussion. The initial grid search suggested the LDA model with three latent topic groups as the best fit (Figure 7). However, summarizing massive data on suicide-related discussion into only three categories might lead to overlooking valuable information. To address this concern, an additional LDA grid search was performed. The second grid search was conducted to identify the best number of topics for three sub-datasets which were derived from the initial grid search. As a result, two topics were recommended as the optimal number for each sub-dataset (Figure 8). In other words, this second grid search resulted in a total of

six topics, which offered diverse types of suicide-related topics compared to the three topics obtained from the first LDA grid search. Hence, these six topics were selected as the final optimal number to describe suicide-related discussion in this study.

Figure 7. First LDA Grid Search Result

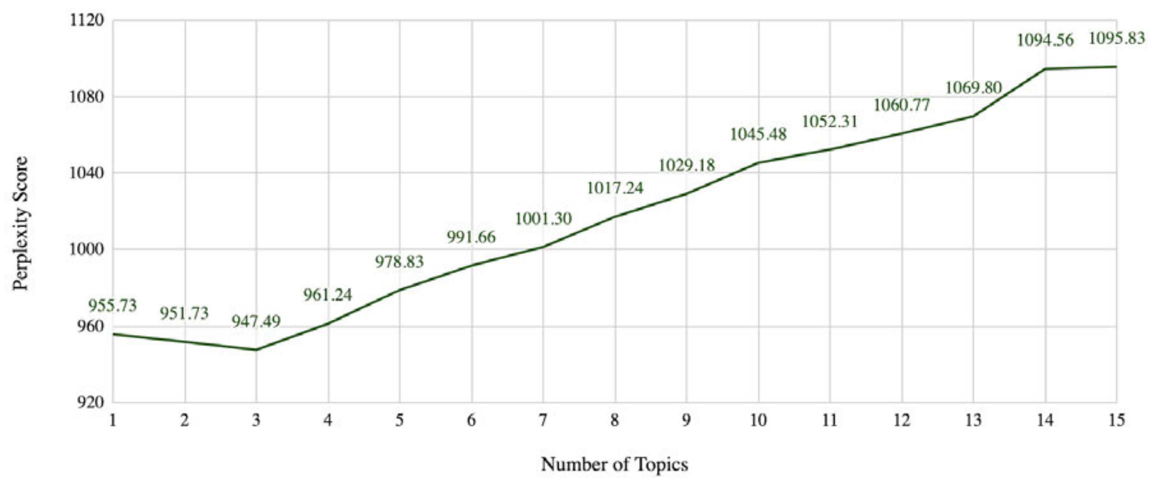
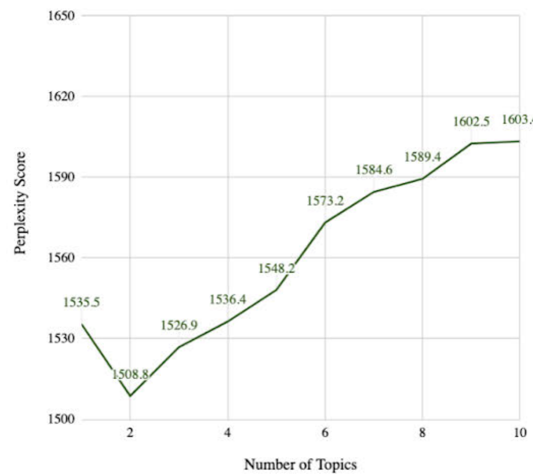
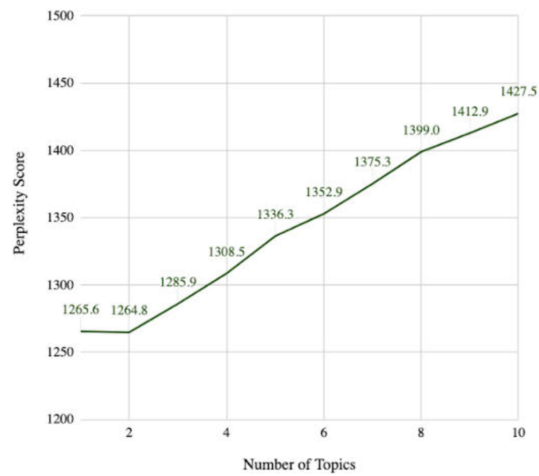
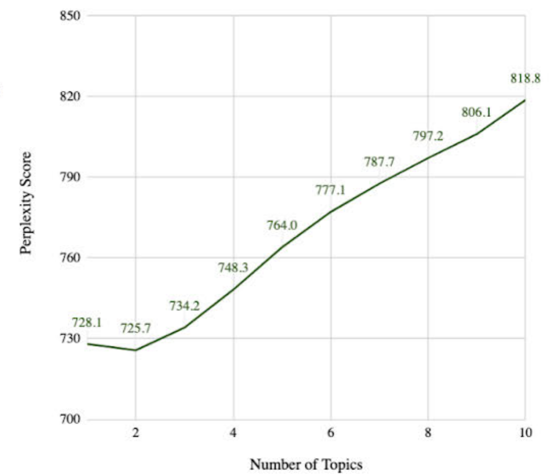


Figure 8. Second LDA Grid Search Result







The distribution of posts across the clusters differed in size: 36.4% of posts (n = 46,815) were classified in cluster 1, 31.9% of posts (n = 41,049) were classified in cluster 2, 9.9% of posts (n = 12,729) were classified in cluster 3, 8.8% of posts (n = 11,295) were classified in cluster 4, 7.2% of posts (n = 9,254) were classified in cluster 5, 5.8% of posts (n = 7,445) were classified in cluster 6.

5.3. Keywords of Six Clusters

Table 1 shows the top 50 keywords of the six clusters. The odds of representing the theme by all 89,818 words used across 128,587 posts are calculated in LDA. For the ease of interpretation, only the top 50 keywords per group were presented. There are words that were identified as the top 50 keywords for more than one cluster. For example, some words were identified as keywords for all clusters (i.e., bad, day, end, feel, good, kill, know, life), five clusters (i.e., die, leave, love, need, say), four clusters (i.e., care, family, help, suicide, tell), three clusters (i.e., friend, hate, hope, mental, pain), and two clusters (i.e., death, depression, fuck, reason, self). These words are considered important words to understand the clusters of all posts in r/SuicideWatch. In other words, they are considered as keywords for posts in r/SuicideWatch because they were used to describe different clusters across different posts.

Some words were identified as keywords for only one cluster. For instance, cluster 1 has unique keywords such as alive, dead, deserve, exist, happy, hurt, matter, tired, and wake. These words commonly indicate the physical and psychological status of people. Cluster 2 has unique keywords such as ask and relationship. Only two unique

keywords are identified for cluster 2 which means keywords in cluster 2 are mostly overlapped with keywords from other clusters. Cluster 3 has unique keywords such as anxiety, attempt, cut, hospital, hour, pill, plan, today, and write. These words indicate severe suicidal behavior (i.e., attempt, cut, plan) and mental health service (i.e., hospital, pill). Cluster 4 has unique keywords such as car, dad, head, jump, let, room, sit, and walk. These words indicate physical movement (i.e., jump, sit, walk) and closed space (i.e., car, room). Cluster 5 has unique keywords such as able, college, fail, health, high, money, mother, and pay. These words indicate finance (i.e., money, pay) and performance (i.e., able, fail). Cluster 6 has unique keywords such as believe, change, experience, human, man, mean, mind, problem, use, and woman. These words indicate human beings (i.e., human, man, woman).

Table 1. Top 50 Keywords of Six Clusters

	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6
1	want	feel	feel	want	year	life
2	feel	know	know	feel	want	people
3	life	friend	want	know	life	feel
4	die	want	time	time	work	want
5	know	year	think	think	job	make
6	people	think	day	day	time	thing
7	live	make	try	life	feel	know
8	think	time	help	make	know	think
9	hate	tell	year	say	make	world
10	end	say	work	try	school	live
11	make	try	suicide	come	try	time
12	kill	help	make	tell	friend	way
13	thing	talk	kill	leave	family	try
14	tired	thing	bad	thing	live	good

15	wish	bad	need	friend	think	end
16	love	life	thought	look	day	die
17	pain	people	month	year	parent	look
18	day	good	week	die	thing	suicide
19	care	family	die	head	help	love
20	time	day	life	work	money	say
21	try	work	end	mom	start	year
22	way	start	pain	end	good	day
23	hurt	parent	tell	night	month	point
24	fucking	school	attempt	start	tell	pain
25	bad	need	pill	live	end	death
26	world	love	thing	people	say	self
27	fuck	month	suicidal	sleep	leave	come
28	happy	thought	plan	good	bad	person
29	good	suicidal	say	car	pay	bad
30	stop	mom	hospital	love	people	human
31	point	leave	way	way	need	mean
32	shit	job	sleep	fuck	lose	suffer
33	hope	care	start	kill	old	hate
34	alive	person	stop	walk	college	body
35	leave	come	happen	stop	come	change
36	death	end	depression	room	way	hope
37	reason	week	mental	fucking	week	believe
38	need	kill	hour	family	mother	help
39	person	lose	come	bad	kill	need
40	deserve	way	live	shit	care	woman
41	matter	suicide	anxiety	sit	mental	kill
42	dead	depression	cut	dad	able	experience
43	suicide	mental	today	jump	die	reason
44	family	ask	self	let	talk	man
45	suffer	relationship	good	hate	point	care
46	happen	old	hope	school	fail	use
47	exist	live	write	break	mom	thought
48	look	point	night	body	health	mind
49	wake	break	leave	talk	high	problem
50	sleep	happen	people	happen	love	wish

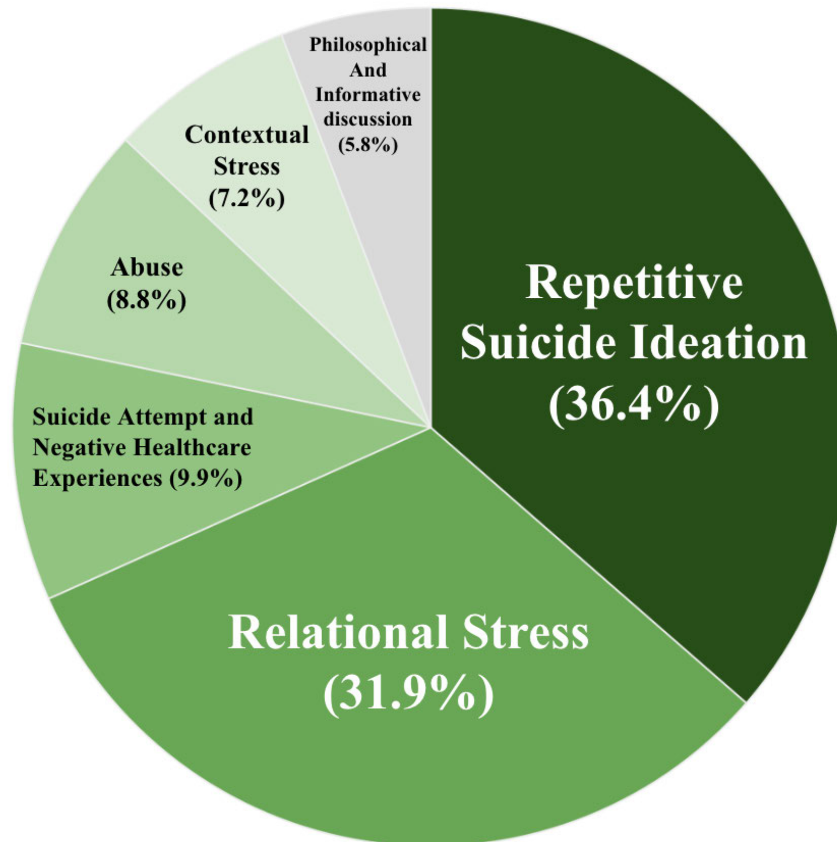
5.4. Topics of Six Clusters

Topics of the six clusters were presented in Table 2. LDA provided the top 30 key posts that represented each theme the best. These 180 posts (30 posts per cluster) were analyzed using qualitative research methods. Thematic analysis was conducted to identify patterns and themes in the six clusters. The final themes of the six clusters and their distributions across the data are presented in Table 2 and Figure 9.

Table 2. Topics of Six Clusters

Cluster	Topic	Contents
1	Disclosure of Repetitive Suicide Ideation	Wish to die
2	Disclosure of Relational Stress	Negative relationship with family, friend, teacher, romantic partners
3	Disclosure of Suicide Attempts and Negative Healthcare Experience	Past suicide attempt, means of suicide, negative experiences with mental health services
4	Disclosure of Abuse	Incidents of abuse, emotions toward abusive experiences
5	Disclosure of Contextual Stress	Financial crisis, performance issue, the COVID-19 pandemic, imprisonment experiences
6	Philosophical and Informative Discussion	Meaning of living and death, right to choose suicide, knowledge of mental health

Figure 9. Distributions of Six Topic Clusters



5.4.1. Common patterns across the clusters

Across the clusters, three common patterns were identified from theme analysis (Table 3). This includes an absence of someone to talk to, manifestation of suicidal stress, and apologies to people in r/SuicideWatch. These patterns are only identified from the first five clusters—Disclosure of Repetitive Suicide Ideation, Relational Stress, Suicide Attempts and Negative Healthcare Experiences, Abuse, and Contextual Stress. These patterns were not identified from the cluster of Philosophical and Informative Discussion.

1) *"I have no one to talk to"* (Absence of someone to talk to)

People commonly said that they don't have anyone to talk to about their suicidal issues (i.e., *"I have no one to talk to", "I have nowhere and no one to go to", "I don't know who else I can talk to or rely on.", "I don't really have anybody to talk to"*).

2) "I wanted to get my feelings out there" (Manifestation of suicidal stress)

In the beginning or at the end of posts, people often said that they wrote posts because they just wanted to talk to someone about their suicidal stress. People said they wanted to vent their emotions through their posts (i.e., *"I'm using this post as a place to vent as I feel maybe someone can help or make me feel better", "I guess I just wanted to make this post because I feel like I need to vent"*). They also said they felt better after writing the post (i.e., *"I feel a little bit better writing this."*). Additionally, they expressed their appreciation for letting them share their suicidal risk (i.e., *"Thank you Reddit for letting me get this off my chest safely.", "Thank you for letting me rant.", "Anyways, thanks for hearing the rant.")*

3) "I'm so sorry" (Apology)

People often apologized to others who would read their posts (i.e., *"I'm so sorry. I'm so sorry. I'm so sorry.", "Sorry for the rant.", "I'm so sorry for rambling on"*). People most commonly apologized for a long length of post (i.e., *"Okay I'm really sorry, that was a long intro but I felt like having the context is necessary and honestly, writing everything down kind of helps too.", "I'm sorry this was so long and I hope don't come off as too whiny."*). People also apologize for their mistakes in writing (i.e., *"I'm sorry if there are any mistakes in this, I'm not a native.", "Sorry for my grammar and shitty typing on this post I just want advice."*)

Table 3. Examples of Common Patterns

Common patterns identified across multiple of the five suicidal driver clusters	
Contents	**Examples**
"I have no one to talk to"	• *"I have no one to talk to"* • *"I have nowhere and no one to go to"* • *"I don't know who else I can talk to or rely on."* • *"I don't really have anybody to talk to"* • *"I'm left with no one"* • *"I've never told anybody any of this before"* • *"who do I have no one."*
"I wanted to get my feelings out there"	• *"I wanted to get my feelings out there"* • *"I'm using this post as a place to vent as I feel maybe someone can help or make me feel better"* • *"I guess I just wanted to make this post because I feel like I need to vent, and it's easier talking to strangers on the internet than people you know in real life."* • *"If it seems like complaining my bad it is just to vent so don't take offense to it. It's not meant to bother you"* • *"I feel a little bit better writing this"* • *"Thank you, Reddit for letting me get this off my chest safely."* • *"Thank you for letting me rant."* • *"Anyways, thanks for hearing the rant."* • *"Thanks for reading this long ass rant."* • *"Thank you for reading this"*
"I'm so sorry"	• *"I'm sorry."* • *"I'm so sorry. I'm so sorry. I'm so sorry."* • *"I'm so sorry I'm just so tired tired tired tired…"* • *"I'm so sorry for rambling on"* • *"I'm sorry for the repost."* • *"Sorry for the rant."* • *"I'm sorry this was so long and I hope don't come off as too whiny."* • *"Okay I'm really sorry, that was a long intro but I felt like having the context is necessary and honestly, writing everything down kind of helps too."* • *"Sorry I don't want to get into more detail, I'm also sorry if anything like this happened to anyone else"* • *"If anyone I know happens to see this and knows it's me, I'm sorry."*

	• *"Sorry this was so long"* • *"I'm sorry if there are any mistakes in this, I'm not a native."* • *"Sorry for my grammar and shitty typing on this post I just want advice."*

5.4.2. Disclosure of Repetitive Suicide Ideation

The first topic was defined as "Disclosure of Repetitive Suicide Ideation" (Table 4). This topic was identified as 36.4% of posts and the most common theme across the six clusters. People declared their wish to die (i.e., *"I wanna die.", "I want to fucking die."*), intention to kill themselves (i.e., *"I'm going to kill myself"*), and self-loathing (i.e., *"I'm useless", "I want to punish myself. I deserve it."*) in their posts. Especially, there was a clear common pattern that they repeated these declarations many times (i.e., *"I wanna die. I wanna die. I wanna die.…*[repeated]*", "I'm going to kill myself I'm going to kill myself I'm going to kill myself …* [repeated]*"*). People disclosed their thoughts, wishes, and intentions related to suicide over and over by using short, simple, and first-person-centered sentences (I-sentences). People disclosed only their suicidal ideation but no other information such as social relationships or living conditions. People's disclosure is disproportionally focused on describing acute suicidal experiences at the moment of writing posts rather than describing past suicide-related experiences.

Table 4. Examples from Cluster 1

Disclosure of Repetitive Suicide Ideation (Cluster 1)
• *"I wanna die. I wanna die. I wanna die.…*[repeated]*"* • *"I want to fucking die. I want to fucking die. I want to fucking die. …* [repeated]*"* • *"I'm going to kill myself I'm going to kill myself I'm going to kill myself …* [repeated]*"* • *"I'm useless I'm useless I'm useless…*[repeated]*"* • *"I want to punish myself. I deserve it. I want to punish myself. I deserve it. I want to punish myself. I deserve it. …* [repeated]*"* • *"I need to die. I need to die. I need to die. …* [repeated]*"* • *"let me die let me die let me die …* [repeated]*"*

5.4.3. Disclosure of Relational Stress

The second topic was defined as "Disclosure of Relational Stress" (Table 5). Different relational stress from family, friends, and romantic relationships were identified from the disclosure of people at suicidal risk. Additionally, explicit help-seeking behaviors were identified in this topic cluster. This topic was the second most common topic among the six topics and was identified as 31.9% of posts.

People disclosed negative relationships with different family members and how those experiences are related to their suicidal risk. Their negative relationships included arguments, conflicts, negative parenting of caregivers (i.e., *"it's not that my mom abuses me or harms me in any way, it's the way that she treats me and how she shows 0 respect for me. today I turned 16"; "My grandma would always act differently to me alone then when other people were around.", "my parents are divorced and both abusive and neglectful"*), siblings (i.e., "*I'm not sure if this is the root of everything but fast forward I basically had a bad relationship with my siblings (I'm assuming maybe because they*

think I'm the 'favorite child')"), and extended family members (i.e., *"My extended father family (age 60 - 70) like to compare me with their children since I was teenager."*). They also shared negative reactions of family toward their disclosure of suicidality. This includes the actual experience of negative reaction (i.e., "*She [mother] then confronted me after I pointed out the alcohol problem from my parents to which she replied: "aren't you the one who tried to kill yourself last year?"*) and expected negative reactions (i.e., *"I can't go to therapy or get help for any of my problems because my parents wouldn't believe me"*).

When people disclosed their suicidal risk, some of them disclosed negative relationships with their friends too. This includes having no friends (i.e., "*I barely have any friends"; I've never been close to anyone" "I don't have any friends. I used to in like 8th grade but I was in a very toxic relationship and lost everyone."; "I even sat alone during most high school lunch periods, and whenever I did sit with people during middle school and high school, I mostly just zoned out or daydreamed while other people talked because I didn't feel like I belonged and felt like I was just sitting there to make myself look normal"*), fear of making friends (i.e., *"That pissed me off a bit because I can't exactly stop a nightmare inducing fear to make friends."*), and conflicts with friends (i.e., *"We had a couple of arguments and I don't think we're friends anymore."*).

When people disclosed their suicidal risk, some of them disclosed negative romantic relationships as well. This includes experience in breakup (i.e., "*My sweet, kind, wonderful college boyfriend who pretty much felt like my soulmate dumped me, and it was all my fault."),* an affair of a romantic partner (i.e., *"after my ex cheated on me (after*

3 years) i was a complete wreck and attempted"; "She had cheated on my multiple times, with multiple different guys and girls."), low confidence in dating (i.e., *"I'd love to have a boyfriend, but I know that won't happen, probably ever because first of all, who'd want me"*), and stress from dating in general (i.e., *"Unfriending him broke my heart because I felt like I was giving up on all guys, not just my crush. Now, I just hope that if he did notice that I unfriended him that I didn't hurt his feelings because it isn't his fault that I unfriended him."*).

Additionally, some stress was caused by interaction between different social relationships. For instance, people disclosed relationship stress from negative experiences between family and romantic partners (i.e., *"My mistake is introducing her to my father family…In the end my father family said that I need to choose one: my girlfriend or my father family. The result is shitstorm. Me and my parent and girlfriend had a huge fight. My parent hates me, my gf doesn't want to see me and my family again. My fight with my parents lasted for 1 year."*) or family and friends (*"one my best friend who was really toxic and shit but I didn't wanna tell my mom since she despises her anyway and the consequences of me telling her would be severe"*).

When people disclosed their suicidal risk and relational stress, they also usually disclosed their age in the posts. At the time when they wrote the posts (between 2021 and 2022), they were either adolescents (i.e., *"today I turned 16", "I'm a 17-year-old guy that is seriously contemplating suicide and has been for some time now.", "I'm a junior in high school for context."*) or emerging adults (i.e., *"I'm 18F and I'm not okay.",*

"Even though I'm in my early 20's, I feel like I'm still 12 years old.", "Some background, I'm a 5th-year college student").

When people disclosed their suicidal risk and relationships, they asked for advice and help explicitly from the members of r/SuicideWatch. They asked for advice on how to handle their suicidal risk (i.e., *"So could please someone help me out here and tell me their opinion on this?", "Please help because I fear that my belief that I have nothing to live for will go from 90% certainty to 100%.", "maybe then I will feel better and get something to help me help me help me"*). People here also asked advice on how to support their significant others with suicide risk (i.e., *"I don't know what to say to help him, or even how to act when I see him in person again this Friday. I feel so bad for him, I just want to help. Any advice?", "I really need help before it might be too late. ... I really really have no idea how to help my best friend."*). These explicit help-seeking behaviors were consistently identified from all key posts of this cluster, however, this behavior was identified only in one or a few number of key posts of other clusters.

Table 5. Examples from Cluster 2

Disclosure of Relational Stress (Cluster 2)	
Contents	**Examples**
Family	• *"it's not that my mom abuses me or harms me in any way, it's the way that she treats me and how she shows 0 respect for me. today I turned 16"* • *"My grandma would always act differently to me alone then when other people were around. She would be nice and normal around other family members but at home she always seemed irritated at me and would usually act angry at me but would never really say why and sometimes give the silent treatment for days at a time."* • *"my parents are divorced and both abusive and neglectful"*

	• *"I have 3 siblings, one older sister, older brother and younger brother. Growing up, I was definitely the "mama's boy", I was always so clingy to my mom back then while my other siblings had normal interaction with mom. I'm not sure if this is the root of everything but fast forward I basically had a bad relationship with my siblings (I'm assuming maybe because they think I'm the 'favorite child').."* • *"My extended father family (age 60 - 70) like to compare me with their children since I was teenager. They always said that I: - I can't speak eloquently (unable to make small talk) to people compare to their family - They like to compare me with their children, why I'm not smart and great compare to their family. - I can't speak Japanese well (I used to study Japanese, it just I don't have talent learning language) compare to their child."* • *"I didn't wanna tell my mother since she has a really weird way of talking with me about things but she still found out two weeks later because my dad told her. She then confronted me after I pointed out the alcohol problem from my parents to which she replied: "aren't you the one who tried to kill yourself last year?" She then tried to make me feel bad about it because I didn't tell her and how awful this situation is for her and forcing me to give a reason why I did it even though I couldn't really find a specific one myself."* • *"I can't go to therapy or get help for any of my problems because my parents wouldn't believe me, every day the only thing on my mind is running away or killing myself or others, maybe I wasn't meant to be born, maybe I should give into my conscience and kill a bunch of people"*
Friend	• *"I barely have any friends, I still feel worthless, I see no point in anything and anything positive I try to do somehow always ends up coming crashing down."* • *"I don't have any friends. I used to in like 8th grade but I was in a very toxic relationship and lost everyone. I've tried making friends but I live in such a toxic town. it's no use."* • *In middle school and high school, I was known as the "weird, quiet girl" and didn't really have many friends. I even sat alone during most high school lunch periods, and whenever I did sit with people during middle school and high school, I mostly just zoned out or daydreamed while other people talked because I didn't feel like I belonged and felt like I was just sitting there to make myself look normal. I also didn't go to school dances including prom because I didn't have anybody to go with (not even a friend)"*

	• *"That pissed me off a bit because I can't exactly stop a nightmare inducing fear to make friends. I'm just so confused about all this. I should be afraid of girls, but I'm afraid of boys, who've done nothing to me."* • *"We had a couple of arguments and I don't think we're friends anymore. I'm not going to go into detail about that because I feel it's not necessary. I honestly don't know if the main problem of me barely having friends is myself."* • *"But on Friday when I wore something a good friend of mine didn't like and said some mean stuff and laughed at me in particular when I started speaking and stuttering a little during a presentation because I always get extremely nervous when I have to do those (she knows that), I realized how dependent I still am on other people's opinion on me and that the only thing that keeps my self-esteem high is everyone always being nice to me or instantly calling someone that wasn't out and giving me compliments since even though my friend stopped being an asshole after sometime"*
Romantic partner	• *"The best year of my life in the last decade was my first year of college when I met my first (and only) boyfriend, but even that came with a cost. After being together for over a year, he dumped me because I became too emotionally dependent on him (I increasingly treated him like a therapist as I struggled more and more in college). My sweet, kind, wonderful college boyfriend who pretty much felt like my soulmate dumped me, and it was all my fault."* • *"after my ex cheated on me (after 3 years) I was a complete wreck and attempted. I had attempted a couple times while in that relationship because I thought nobody would ever love me. he was very very psychologically and physically abusive."* • *"Her best friend tells me everything that has been going on behind my back, She had cheated on my multiple times, with multiple different guys and girls."* • *"I'm only sixteen and haven't had a crush on a guy in a long time because of my fear of them. I'd love to have a boyfriend, but I know that won't happen, probably ever because first of all, who'd want me (other than the two boys above who were both manipulative and scary in general)?"* • *"Unfriending him broke my heart because I felt like I was giving up on all guys, not just my crush. Now, I just hope that if he did notice that I unfriended him that I didn't hurt his feelings because it isn't his fault that I unfriended him."*

Adolescence and emerging adulthood	• *"today I turned 16"* • *"I'm a 17-year-old guy that is seriously contemplating suicide and has been for some time now."* • *"I don't know what to do. I'm only 15, a freshman in high school."* • *"I'm a junior in high school for context. … I think my only choice right now is to work hard and go into college where I won't have as much contact with my parents."* • *"she is the same age as the ones about us but had to retake ninth grade so they went out to a party that was for 18+ only and they had a few drinks"* • *"I'm 18F and I'm not okay. I've been struggling with suicidal thoughts since I was 13."* • *"Even though I'm in my early 20's, I feel like I'm still 12 years old."* • *"I feel like I'm at a crossroads in my life. Some background, I'm a 5th-year college student."*
Asking advice and help	• *"So could please someone help me out here and tell me their opinion on this? I'd really appreciate it."* • *"I have nowhere and no one to go to. Please help because I fear that my belief that I have nothing to live for will go from 90% certainty to 100%."* • *"maybe then I will feel better and get something to help me help me help me"* • *"Any advice would be helpful thank you for taking the time to read this."* • *"Reddit, Your thoughts?"* • *"So could please someone help me out here and tell me their opinion on this?"* • *" I don't know what to say to help him, or even how to act when I see him in person again this Friday. I feel so bad for him, I just want to help. Any advice?"* • *"I really need help before it might be too late. I don't know where to post this and asking advice on something like this on reddit seems lowkey weird but I really really have no idea how to help my best friend."* • *"I was wondering if anyone had any tips because I don't want to mess this up."* • *"I am asking for any advice I'm not sure if this is the right subreddit to ask, but idk where else to put this so please help me."*

5.4.4. Disclosure of Suicide Attempts and Negative Healthcare Experiences

The third topic was referred to as "Disclosure of Suicide Attempts and Negative Healthcare Experiences" (Table 6). This topic was identified in 9.9% of posts and is the third most common topic among the six topics. People talked about their past suicide attempts, means of suicide, long-term suicidal experiences, other mental health challenges, experiences with mental health facilities and medication, and negative experiences with mental health utilization.

People disclosed their past suicide attempts and self-harm behaviors in their posts (i.e., *"I've had a suicide attempt before.," "Then I got worse again, was sent to a psychiatric ward for my first suicide attempt.", "I tried suicide twice but got scared but the thoughts have always been around."*).

People also asked for advice on the means of suicide especially focused on overdosing on medicine (i.e., *"Is putting 200 metformin tablets in a blender, then mixing the fragments with alcohol a good way to go? By good I mean is the method and dosage enough for it to be quick and relatively painless?"; "Would Lisdexamfetamine power or the Bupropion XL I crushed up bring about a faster demise (I have lethal quantities of both)? Or maybe the Lamotrigine I got and never bothered trying…"; "I also have a bottle of clonazepam and I've read that it's rarely fatal."*).

People disclosed their long history of suicidality, and described the onset of suicidality (i.e., *"From age 8 I've been struggling with suicidal thoughts", "I've been struggling with anxiety and suicidal thoughts since I was 14."*), as well as the long length of period they have struggled with suicidality (i.e., *"I've been suffering with my mental*

health for years now"; "I am now 63 and have battled since my earliest years.", "Latent, persistent suicidal thoughts").

People disclosed their other mental health challenges (i.e., *"I was diagnosed with unipolar depression.", "(I) was diagnosed with BPD this year", "I have bipolar 2, generalized anxiety disorder, mild autism, PTSD, ADD, ADHD, and Restless Leg Syndrome.")*.

People disclosed experiences with mental health services. These experiences include visiting mental health facilities and professionals (i.e., *"I've been hospitalized twice. I've done 13 ECT sessions. I've been put on a bunch of new meds. I've done therapy.", "For the past weeks, I've been sent to the emergency department repeatedly, after expressing thoughts of suicide, only to end up staying in the hospital for a couple of days, my medication being increased and being sent home after a couple of days."*), using medication support (i.e., *"Over the past year I've been on at least 4 different depression medications", "A few weeks ago he prescribed 150mg Wellbutrin.", "They prescribed more duloxetine (2 times now, from once (60MG) so now is 120 MG and taking 0.5MG Xanax."*).

Within this general history of mental health service utilization, people described their negative experiences with mental health services. For instance, people complained about negative interactions with professionals (i.e., *"First time I get an intern who interviews me for 2 hours asking me the same basic questionnaire about mental health I've answered dozens of times.", "I had a hard time being in the psych ward. The nurses ignored me.", "I can tell my therapist has no idea how to help me or where to take the*

sessions.", "What scares me is this episode all started because my neurologist made a mistake and I was off one of my meds for a week,"), a long wait time (i.e., *"I currently don't have therapy since I'm on 2 different waiting lists for a new one.", "but of course I'll wait the 30-60 business days first, I'm sure my gravestone will be a good meeting place to discuss."*), and side effects from medicine (i.e., *"First I was prescribed 10mg of Prozac and had pretty much every awful side effect possible and zero positive effects. My psychiatrist told me I'd likely not even notice any change at all being such a low dose but that was not the case.", "The medicine makes me drowsy. Recently, my anxiety seems to have turned to depression. Even things I loved doing before, I get so moody and completely lose the excitement that I'd have for the activity before. I can't sleep the way I would before."*).

People felt tired and hopeless after trying different mental health treatments and perceived that these treatments were not helpful in reducing their suicidality (*"Nothing is helpful, not even therapy.", "More pills, therapy, talking, all the works. Didn't work."*). When they experienced no positive impact from treatment, people reported feeling defeated (*"I just feel so defeated. Taking medication was supposed to help me. I wanted to get better and be happy. But all they've done so far is heighten all the negative things I think, feel, and do."; "Everything is such a failure. The psychiatrists. The psychologists. The counselling that goes nowhere."*), tired (*"I'm honestly tired of being sent to the emergency department, only for nothing to work.", "Enough is enough. I have tried so many different treatments, therapies, and drugs over the years. I am now 63 and have*

battled since my earliest years."), and lost (*"What do I do? I just feel lost and no clue what to do anymore. Why do I feel like this, even after trying to get help?"*).

Table 6. Examples from Cluster 3

Disclosure of Suicide Attempt and Mental Health Service Experiences (Cluster 3)	
Contents	**Examples**
Suicide attempt	• *"I've had a suicide attempt before."* • *"Then I got worse again, was sent to a psychiatric ward for my first suicide attempt."* • *"I tried suicide twice but got scared but the thoughts have always been around."* • *"I started self-harming"* • *"He told me that when he drinks he thinks he's doing it excessively to kill himself. He also told me he's worried about his ability to access to opioid meds because he thinks about purposefully mixing them with alcohol to commit suicide"* • *"I have tried twice before and my relief for many years has been to deepen the layer of physical scars on my body."*
Means of suicide	• *"Is putting 200 metformin tablets in a blender, then mixing the fragments with alcohol a good way to go? By good I mean is the method and dosage enough for it to be quick and relatively painless?"* • *"I wanted to ask what the guaranteed fatal dose would be for a 185lb/85kg male. Once I know that, maybe mixing it with alcohol will also provide me with a far less likely alternative option as opposed to the firearm. If any reddit experts want to weigh in, I'm all ears."* • *"Would Lisdexamfetamine power or the Bupropion XL I crushed up bring about a faster demise (I have lethal quantities of both)? Or maybe the Lamotrigine I got and never bothered trying…"* • *"I also have a bottle of clonazepam and I've read that it's rarely fatal."* • *"My suicidal thoughts are also still there, and I just feel like overdosing on Xanax and getting over with it"*

Long-term suicidality	• *"From age 8 I've been struggling with suicidal thoughts"* • *"I've been struggling with anxiety and suicidal thoughts since I was 14."* • *"I've been suffering with my mental health for years now"* • *"I am now 63 and have battled since my earliest years."* • *"Latent, persistent suicidal thoughts"*
Other mental health challenges	• *"(I) was diagnosed with BPD this year"* • *"I have bipolar 2, generalized anxiety disorder, mild autism, PTSD, ADD, ADHD, and Restless Leg Syndrome."* • *"I was diagnosed with unipolar depression."*
Mental health service utilization	• *"I've been hospitalized twice. I've done 13 ECT sessions. I've been put on a bunch of new meds. I've done therapy."* • *"For the past weeks, I've been sent to the emergency department repeatedly, after expressing thoughts of suicide, only to end up staying in the hospital for a couple of days, my medication being increased and being sent home after a couple of days."* • *"Over the past year I've been on at least 4 different depression medications"* • *"A few weeks ago, he prescribed 150mg Wellbutrin."* • *"They prescribed more duloxetine (2 times now, from once (60MG) so now is 120 MG) and taking 0.5MG Xanax."*
Negative experiences with mental health services	• *"Now the psychologist, I've talked to a total of maybe two times for less that 20 minutes. First time I get an intern who interviews me for 2 hours asking me the same basic questionnaire about mental health I've answered dozens of times. They give a 10-minute summary to the psychologist who then comes in and gets me to give them a 10 minute summary of the same shit I've just gone over, like I'm some criminal they're trying to catch in a lie about their alibi or some shit."* • *"I had a hard time being in the psych ward. The nurses ignored me and most of the people on the ward were elderly people, which made me feel so alone."* • *"I can tell my therapist has no idea how to help me or where to take the sessions."* • *"What scares me is this episode all started because my neurologist made a mistake and I was off one of my meds for a week"* • *"I currently don't have therapy since I'm on 2 different waiting lists for a new one. that appointment got postponed*

	though to February since my psychiatrist needed to go to something. now feeling lost and ignored my suicidal tendencies crept up telling me if I was dead now I wouldn't really have any of those issues or needed to run from doctor to doctor." • *"I tried to get professional mental health help from a psychologist and a person who helps people find counselling (through my doctor) during the few months out of the year I'm feeling mentally well enough to do anything. Since I wasn't ready to off myself within a week, they decided I was fine without running it past me. So, I guess I'll go off myself once the depression hits and see if they can do anything after that, but of course I'll wait the 30-60 business days first, I'm sure my gravestone will be a good meeting place to discuss."* • *"First, I was prescribed 10mg of Prozac and had pretty much every awful side effect possible and zero positive effects. My psychiatrist told me I'd likely not even notice any change at all being such a low dose but that was not the case."* • *"The medicine makes me drowsy. Recently, my anxiety seems to have turned to depression. Even things I loved doing before, I get so moody and completely lose the excitement that I'd have for the activity before. I can't sleep the way I would before."*
Helplessness	• *"Nothing is helpful, not even therapy."* • *"More pills, therapy, talking, all the works. Didn't work."* • *"I just feel so defeated. Taking medication was supposed to help me. I wanted to get better and be happy. But all they've done so far is heighten all the negative things I think, feel, and do. A lot of my family takes meds for depression and anxiety and it helps them. What's wrong with me? Obviously, something if not even meds can fix me."* • *Everything is such a failure. The psychiatrists. The psychologists. The counselling that goes nowhere.* • *"That's why I decided not to tell my therapist about my plan, because I'm honestly tired of being sent to the emergency department, only for nothing to work."* • *"Enough is enough. I have tried so many different treatments, therapies, and drugs over the years."* • *"What do I do? I just feel lost and no clue what to do anymore. Why do I feel like this, even after trying to get help?"*

5.4.5. Disclosure of Abuse

The topic of the fourth cluster was defined as "Disclosure of Abuse" (Table 7). This topic was identified as 8.8% of posts. People disclosed anecdotes of abuse victimization with their suicidal risk. Abuse experiences from these posts include experiences of sexual, physical, and verbal abuse among people with suicidal risk.

People disclosed their experience with sexual abuse (i.e., *"When I was 10 I was molested by my cousins… Suddenly she tug my shirt off and my pants off. I was frozen, I didn't know what to do, I could not move"; "She would bring me to her house, and her two older siblings would want to play with us, showing us things about our bodies."*, *"While he's just squeezing my ass while making me feel his chest, shoulders, stomach, thighs and his dick which is still."*).

People disclosed their experience with physical abuse (i.e., *"Proceeded to hit me with the plank. After this I got dragged to my room and got beaten again.", "He would force me to call him dad, would beat me black and blue, wack me with belts, slippers, anything he could get hold of and he would drag me out of bed late at night while my mum was at work.", "the times where he did physically abuse me I hadn't done anything prior but he had just been using me as a punching bag"*).

People disclosed their experience with verbal abuse (i.e., "*You don't deserve to be my daughter" "I wish I had a son instead of you" "You're ugly", "My brothers started to disrespect me, started to call me names mainly "Fag, Gay, HOMO" I hated it.", "Every time I tried to say even a single word he yelled at me ordering me to stay quiet."*).

The posts in this cluster included information on social relationships and experiences with family and friends similar to posts in Cluster 2 (Disclosure of Relational Stress). Compared to the Relational Stress cluster, this cluster tended to describe only one or a few specific figures (e.g., perpetrator) rather than multiple social relationships in their lives. This cluster also tended to focus on only one or a few specific incidents of negative social experiences, while the Disclosure of Relational Stress cluster described multiple examples of social experiences in daily situations.

Additionally, some people described their abuse experience happening in their early childhood (*"I'm like, "Stop it," COMING FROM A 6 YEAR OLD", "We never wanted to know, a little 8-year-old not knowing how to say or ask for help", "When I was 10 I was molested by my cousins.", "from the age of 4-13 I was mentally and physically abused by him"*). There was also a small portion of posts (10 % among key posts) with the theme of negative body image (i.e., *"I hate that that's my actual weight", "it's just the restricted life I have because I'm ugly and seeing good looking dudes treated better even when they're complete cocky arrogant assholes"*) in this cluster. These body image-related posts didn't necessarily include content of sexual, verbal, or physical abuse. However, multiple common words (i.e., clothes, body, hands, women, girl, man) were identified in both abuse-related posts and body-image-related posts.

Table 7. Examples from Cluster 4

Disclosure of Abuse (Cluster 4)	
Contents	**Examples**
Sexual abuse	• *"When I was 10 I was molested by my cousins… Suddenly she tug my shirt off and my pants off. I was frozen, I didn't know what to do, I could not move"* • *"She would bring me to her house, and her two older siblings would want to play with us, showing us things about our bodies. We never wanted to know, a little 8-year-old not knowing how to say or ask for help"* • *"While he's just squeezing my ass while making me feel his chest, shoulders, stomach, thighs and his dick which is still... You know- I'm like, "Stop it," COMING FROM A 6 YEAR OLD"*
Physical abuse	• *"Around 20 minutes passed, he took a plank and dragged me by ear to the corridor. Proceeded to hit me with the plank. After this I got dragged to my room and got beaten again.",* • *"He changed and from the age of 4–13 I was mentally and physically abused by him. He would force me to call him dad, would beat me black and blue, wack me with belts, slippers, anything he could get hold of and he would drag me out of bed late at night while my mum was at work."* • *"the times where he did physically abuse me I hadn't done anything prior but he had just been using me as a punching bag"*
Verbal abuse	• *"Every morning my day starts with me waking up to a screaming mother. She screams like a demon. "You're a vamp" "You don't deserve to be my daughter" "I wish I had a son instead of you" "You're ugly" "You are a prostitute and it shows" "I just want to get rid of you" "You eat a lot"";* • *"My brothers started to disrespect me, started to call me names mainly "Fag, Gay, HOMO" I hated it."* • *"Every time I tried to say even a single word he yelled at me ordering me to stay quiet."*

5.4.6. Disclosure of Contextual Stress

The fifth topic was referred to as "Disclosure of Contextual Stress" (Table 8). In this topic group, people disclosed stress from the context of living. This includes stress

related to financial crisis, work, school, imprisonment, and the COVID-19 pandemic. This topic was identified as 7.2% of posts.

People disclosed their current financial stress related to debt (i.e., *"every moment was a living fear of the debt collector knocking on the door", "I have $20K in credit card debt"*), rent and housing instability (i.e., *"My landlord said I would be able to pay off my portion of the rent gradually with part time jobs while he looked for replacement tenants."; "With my disabilities I am completely unable to drive and I only get $795 a month to live off of which isn't even enough to pay for rent and utilities."*), and a lack of financial support (*"I don't qualify for a debt consolidation loan…I had no insurance…I can't get food stamps"*).

People disclosed their stress related to work. The work-related issues include low job performance (i.e., *"I will be fired from my job due to "performance issues" that were never brought up to me previously and are unfounded."*), losing a job (i.e., *"I lost my job due to cost cutting measures."*), fear of losing a job (i.e., *"And my job is one of the only things keeping me going…Please, don't fire me tomorrow."),* stress in searching for a job (i.e., *"I have been job hunting and interviewing for weeks and gotten mostly rejections or just gotten ignored for the most part."*), and overtime work (i.e., *"No help was offered nor given when asked and (unpaid) overtime work was a daily occurrence for months."*). Sometimes, job-related stress was associated with financial stress (i.e., *"This job makes me want to kill myself. It makes me want to hurt myself. I want a new job but rely on help from my family in terms of credit score to sign a new lease since I move in 2 months.", "I*

have been so bad about going to work that my last checks have been 5 dollars, 6 dollars, 1 dollar, 0 dollars.").

People described contextual stress related to academic performance. This includes struggles to focus on studying (i.e., *"I started losing focus on my study"*), low levels of academic achievement (i.e., *"I failed a few units at university", "I kept getting terrible results in the second and third semester, so I didn't pass the year and I had to re study every subject from the second and third semester."*), and dissatisfaction with their academic achievement ("*my grades were excellent but I was still disappointed"*).

Individuals' imprisonment-related issue was also described. This includes their imprisonment history (*"I went to 3 prisons for a year and a half and I sat in jail for about 3 years.", "The judge and prosecutor approved this violation and it was served to me about 5 months ago. I was not arrested. This is my 4th violation."*) and past imprisonment history of their significant others (i.e., *"my brother was getting in with wrong crowds his best friend actually murdered someone a couple years before we moved…my mum got sent to jail again shortly"*).

People mentioned the COVID-19 pandemic and its impacts on their daily life. This includes disconnectedness due to the pandemic (i.e., *"I was able to study but with Covid I was left alone with my thoughts and kept thinking about what would happen if I failed again"*), and frustration with travel restrictions and limited transportation (i.e., *"due to COVID travel restrictions along with threats of not having my work visa renewed by company, I was unable to visit my grandmother in her final days"*, *"This is also during Covid and during a time which I have been having transportation issues."*).

Table 8. Examples from Cluster 5

Disclosure of Contextual Stress (Cluster 5)	
Contents	**Examples**
Finance	• *“every moment was a living fear of the debt collector knocking on the door”* • *“Things have just been snowballing for so long and I’m drowning….I have $20K in credit card debt. My husband and I both have decent jobs but I can’t make any headway on anything because shit just keeps coming up”* • *“He currently owes me a few thousand dollars and went outside to legal lenders to borrow money, I just received a letter today stating that I owed money to the Apt and is at risk of Eviction”;* • *“My checking account is overdrawn. Next week when I get paid I have to pay $700 on the credit card and then rent and utilities and we will have about $20 left for food for 2 weeks. The credit cards are maxed out now because I have to keep using them for emergencies.”* • *“My landlord said I would be able to pay off my portion of the rent gradually with part time jobs while he looked for replacement tenants.”* • *“My landlord said if I don’t clean the place up entirely before I leave he was going to sue me. I can’t afford that. I keep meaning to contact legal aid but lately I just want to lay in bed and hide from the world.”* • *“With my disabilities, I am completely unable to drive and I only get $795 a month to live off of which isn’t even enough to pay for rent and utilities.”* • *“I don’t qualify for a debt consolidation loan…I had no insurance…I can’t get food stamps”* • *“Have y’all ever payed bills at 16? Cuz I have, and I still do”*
Work	• *“I will be fired from my job due to “performance issues” that were never brought up to me previously and are unfounded.”* • *“I lost my job due to cost cutting measures.”* • *“And my job is one of the only things keeping me going…Please, don’t fire me tomorrow.”* • *“I have been job hunting and interviewing for weeks and gotten mostly rejections or just gotten ignored for the most part.”*

	• *"I had during the daily overtime in previous months and could not take a break from work under threats of not having my working contract (thus my working visa) renewed and being kicked out of my apartment and thus being homeless."* • *"From September 2021, I had been having additional pressure put on me at work due to being the only senior member on the team. No help was offered nor given when asked and (unpaid) overtime work was a daily occurrence for months."* • *"This job makes me want to kill myself. It makes me want to hurt myself. I want a new job but rely on help from my family in terms of credit score to sign a new lease since I move in 2 months."*
School	• *"I started losing focus on my study"* • *"I failed a few units at university"* • *"I kept getting terrible results in the second and third semester, so I didn't pass the year and I had to re study every subject from the second and third semester."* • *"my family always wanted me to be a doctor,....,my grades were excellent but I was still disappointed"* • *"I struggle at school….They* [family] *have stupid high expectations of me, they want me to get all straight A grades and become a doctor or an engineer or some shit. And I'm not that good."*
Imprisonment	• *"I went to 3 prisons for a year and a half and I sat in jail for about 3 years."* • *"The judge and prosecutor approved this violation and it was served to me about 5 months ago. I was not arrested. This is my 4th violation."* • *"From young, my mother and father were imprisoned for drug dealing I was around 2 years old and was passed around my parents siblings until I ended up with my dad's sister…my mum got sent to jail again shortly"* • *"my older brother who was 5 years older was constantly getting in trouble with the police"*
The COVID-19 pandemic	• *"I was able to study but with Covid I was left alone with my thoughts and kept thinking about what would happen if I failed again"* • *"due to COVID travel restrictions along with threats of not having my work visa renewed by company, I was unable to visit my grandmother in her final days"*

	• *"This is also during Covid and during a time which I have been having transportation issues."*

5.4.7. Philosophical and Informative Discussion

The sixth topic was referred to as "Philosophical and Informative Discussion" (Table 9). This topic was identified as 5.8% of posts. Rather than disclosing suicidal risk and drivers, people here shared thoughts and information about suicide, life, death, and mental health. This includes philosophical and metaphorical discussions (i.e., *"After death, the physical begins to deteriorate and life/energy is simply moved to another being.", "A soul is like a piece of the sea within the sea, a system of energy that had become self-perpetuating.", "If self-esteem was a boat used to sail on the ocean of life in, then the inability to forgive oneself could be considered to have the effect of a hole in the hull."*) and sharing knowledge and information related to mental health (*"Just three years ago the WHO decided (by a simple vote) not to classify transsexuality as a "cognitive disorder" any longer and that is not due to the inability of scientists to identify it as a (physical) disease"; "Depression differs in type, - a common definition of depression is 'sub-optimal psychological function', …" "If I feel fear, my body odour will be smelt by people around me and they may start to feel fear themselves, unconsciously, said a professor at the Department of…"*).

Table 9. Examples from Cluster 6

Philosophical and Informative Discussion (Cluster 6)	
Contents	**Examples**
Philosophical and metaphorical discussion	• *"After death, the physical begins to deteriorate and life/energy is simply moved to another being. The insects thrive and feast on the flesh, cycling nutrients and energy. - Partially releasing the energy back into the soil where the plants are free absorb and blossom; ultimately feeding the organisms within their realm. - and the other portion of the energy is moved on through the trophic web and into every other living creature."* • *"Everything affects everything. Even the forces we don't see, the things we don't care about. A soul is like a piece of the sea within the sea, a system of energy that had become self-perpetuating. A more evolutionarily attractive soul is one that can acquire energy the best."* • *"Metaphorically speaking; What if I have a healthy reaction to an unhealthy-making environment?"* • *"The subject matter addresses the following question: "Why Is Self-forgiveness Important For Self-Esteem?" If self-esteem was a boat used to sail on the ocean of life in, then the inability to forgive oneself could be considered to have the effect of a hole in the hull."*
Informative discussion	• *"Just three years ago the WHO decided (by a simple vote) not to classify transsexuality as a "cognitive disorder" any longer and that is not due to the inability of scientists to identify it as a (physical) disease"* • *"Depression differs in type, - a common definition of depression is 'sub-optimal psychological function', or 'suboptimal being', which can be termed 'depressed'; the causes of depression are often rooted in synergies of a multi-polar aspect, and productive of depression."* • *"If I feel fear, my body odour will be smelt by people around me and they may start to feel fear themselves, unconsciously, said a professor at the Department of…"*

6. DISCUSSION

The current research aimed to understand different suicidal drivers disclosed on social media by people across countries. This research was designed as a data-inspired, interdisciplinary, and mixed-methods research project. The approach of this study focused on gathering naturally occurring narratives, employing innovative research methods to interpret the narratives, and providing insights into public health policy and practice implementation. Moving forward, this study discusses what types of suicidal drivers exist, how suicide theories explain the relationships between suicidal drivers and risks, and what clinical strategies can be considered to address suicidal drivers to prevent suicide of individuals. To focus on the target of this research (suicidal drivers), the five disclosure topics of suicidal drivers are only discussed and the sixth topic Philosophical and Informative Discussion is not included in this section.

First, psychological agencies linked to common disclosure patterns across clusters are discussed to understand common symptoms among people at suicide risk. The suicide risk screening plan for the general population is considered here with the identified common symptoms of suicidality. Second, before discussing the implications for the five suicidal drivers, an overarching approach in suicidal driver-focused intervention is discussed. Collaborative Assessment and Management of Suicidality (CAMS; Jobes, 2016) is presented to introduce the overall process of suicidal driver-oriented clinical practice. Third, the alignments between five suicidal drivers and the existing suicide theories are reviewed (Table 10). Synthesizing current data and existing theories helps to understand the identified suicidal drivers in-depth and discuss implementation strategies

(Sheehan et al., 2019). Most importantly, links between current findings and existing theories are used to suggest to future directions of suicide prevention policies and practices.

6.1. Common Psychological Characteristics in Suicidality

1) *"I have no one to talk to"* (Absence of someone to talk to)

People explained that they disclosed suicidal risk online due to an absence of someone offline to connect with. The challenges of sharing their issues offline and using online platforms for disclosure were observed consistently across people with different suicidal drivers. This finding is aligned with previous findings in which perceive that their offline relationships do not appear suitable for the sharing of suicidality (Hom et al., 2015; Pretorius et al., 2019). It is also aligned with previous findings in which people shared their suicidality online as an alternative option for offline disclosure (Brown et al., 2022, Pretorius et al., 2019).

This finding emphasizes the notion that helping to build supportive social networks both offline and online is essential for all people at suicide risk, regardless of their specific suicidal drivers. Therefore, future public health policy and implementation in suicide prevention needs to consider providing more community spaces in which people can experience meaningful connections and share their suicidality both in offline and online living spaces.

2) *"I wanted to get my feelings out there"* (Manifestation of suicidal stress)

It emerged that suicidal disclosures online possessed a cathartic element. More

specifically, people explained that their posts functioned to vent their suicide-related stress. Combined with the absence of a supportive offline community, the manifestation of stress was commonly identified among people with different suicidal drivers. This finding shows people with suicidality require psychological stress manifestation regardless of their suicidal drivers. Currently, the most common online, automatic (i.e., artificial intelligence) response to peoples' suicidal disclosure is the provision of information and resources related to suicide. For instance, links to evaluate suicide risk and addresses of suicide prevention organization websites were frequently shared. Suicide hotlines are often provided as well, however, using a hotline may require individuals to reiterate their narratives from scratch, even though they have already shared them in online community. This form of support may not fully meet the needs of individuals seeking informal community support to express their stress. In fact, people expressed their preference for informal online platforms to share their emotions and vent their suicidal stress rather than formal online platforms (Brown et al., 2022, Pretorius et al., 2020). Therefore, it is important to discuss strategies to offer different forms of support creating a safe space for individuals to vent their stress and receive emotional support online, beyond the current approach focusing on informational and structural support.

3) *"I'm so sorry"* (Apology)

People often apologized when they disclosed their suicidal experiences to others. This behavior has been explained by the concept of burdensomeness in the Interpersonal Theory of Suicide (Van Orden et al., 2010). It is common for people with suicidality to

consider themselves a burden to others regardless of how others perceive them (Van Orden et al., 2010). The current finding also supports that the sense of burdensomeness is a common symptom observed among people with different drivers of suicidality (Joiner et al., 2009; Van Orden et al., 2010).

The theory initially understood burdensomeness as a causal agent in increasing suicidality (Joiner et al., 2009; Van Orden et al., 2010). However, apologies in this study were more related to concerns about the length of their narrative, grammar, or taking up the time of others. Therefore, feeling sorry, as observed in this study, does not seem to be a direct suicidal driver. Indeed, however, these behaviors substantiate the notion that burdensomeness is a common characteristic among people with suicidality (Van Orden et al., 2010). Moreover, it may further hinder the future help-seeking behaviors of people. Those whose first language is not English were observed to apologize more for possible mistakes in their writing. This provides support for the idea that people who are not a majority in a community are more likely to feel burdensome, and, that burdensomeness can be an additional barrier to help-seeking behavior. Therefore, it is salient to be aware of what factors hinder online help-seeking behavior specifically in the designing of supportive online environments where all people feel comfortable sharing their suicidal narratives.

6.2. Suicidal Driver-oriented Intervention

Collaborative Assessment and Management of Suicidality (Jobes, 2016) is a suicide prevention approach focused on suicidal drivers for individuals. CAMS is

introduced here first to illustrate the overarching approach of suicidal driver-oriented intervention in general, and then specific evidence-based treatments (i.e., Dialectical Behavior Therapy, Safety Planning) for each driver are introduced in the following sections in detail.

CAMS is a suicide prevention strategy focusing on the concept of suicidal drivers to decrease the suicidal risk of individuals. This approach was designed to honor the idiosyncrasies of suicidal drivers by identifying unique drivers and collaborating in the creation of treatment plans (Jobes, 2016). Collaboration with patients is the key to this approach, with continual encouragement and maintenance of an egalitarian relationship for clinicians.

The activity for identifying suicidal drivers for individuals includes brainstorming factors activating and increasing suicidality, defining them using the patient's language, and revisiting lists of suicidal drivers over time. This activity invites patients to understand their suicidal experiences and suicide-relevant factors that have a particular influence on their suicidality. Patients felt that clinicians were interested in and cared for their needs in this collaborative process (Jobes, 2016).

It is recommended that this approach be implemented in conjunction with other intervention strategies for a particular suicidal driver. At the treatment planning phase after identifying a suicidal driver, CAMS applies other evidence-based treatments designed for specific suicidal drivers based on theoretical frameworks. Planning individualized treatment also requires collaboration between clinicians and patients (Jobes, 2016). Ultimately, this approach helps individuals to become experts in their

suicidality, which CAMS described as being a “junior suicidologist” and “coauthor” of their suicide intervention plan (Jobes, 2016).

6.3. Suicidal Driver 1: Repetitive Suicide Ideation

36.4% of people disclosed their repetitive suicide ideation to people in the online community. Suicidal ideation is a critical driver of suicide (Jobes, 2016). This may be particularly true for individuals who wrote their suicidal thoughts multiple times in a post. People might manually write down the same sentence repeatedly, or copy and paste the same sentence multiple times. Either way, it is apparent that those thoughts are not just transient thoughts that appear and dissipate within a few seconds. Repeatedly thinking about suicide is associated with an increase in the intensity of suicide ideation (Law & Tucker, 2018; Rogers & Joiner, 2018), which in turn elevates the risk of completed suicide and suicide attempts (Rossom et al., 2017).

The symptom of repetitive suicidal thoughts is called suicide-specific rumination. Rumination is broadly defined as negative, repetitive, and passive thinking focusing on the stress of individuals (Nolen-Hoeksema, 1991; Nolen-Hoeksema & Lyubomirsky, 2008). Rumination can happen at the onset and post-onset of mental health challenges (Morrison & O’Connor, 2008; Nolen-Hoeksema, 1991). Suicide-specific ruminations are disorder-specific ruminations that are defined as “a repetitive mental fixation on one’s suicidal thoughts and intentions (Rogers et al., 2022).” People want to stop thinking of suicide, feel powerless when they are unable to do so, and experience unbearable psychological pain as a result (Kerkhof & van Spijker, 2011). Psychological pain and

distress caused by ruminative suicidal thoughts increase the risk of severe suicide behaviors (Kerkhof & van Spijker, 2011). For instance, people who experienced suicide-specific rumination were found to be more likely to plan and attempt suicide than those who did not experience suicide-specific rumination (Wong et al., 2022).

Intrusiveness is one characteristic of rumination (Magson et al., 2019; Rogers et al., 2021, Kerkhof & van Spijker, 2011). Intrusive thoughts dominate people's minds and reduce their capability to create distance from their thoughts. Intrusive thoughts are passive, involuntary, uncontrollable, and hard to disengage from (Brinker & Dozois, 2009; Magson et al., 2019; Nolen-Hoeksema & Lyubomirsky, 2008). This cognitive rigidity makes it challenging to conceive of alternative options other than suicide to solve one's problems (Patsiokas et al., 1979). Repetitive, intrusive suicidal thoughts were commonly observed among people with suicidality (Teismann et al., 2021). People who experience intrusive thoughts are at a higher risk of a suicide attempt (Teismann et al., 2021).

To disrupt the loop of repetitive and intrusive suicidal thoughts, suicidologists have developed different clinical intervention programs. For instance, the Safety Planning Intervention developed by Stanley and Brown (2012) is a well-known acute suicide risk intervention approach used widely among professionals. This intervention aims to distract people from suicidal thoughts and identify warning signs and coping skills (Stanley et al., 2008). Safety Planning Intervention includes identifying warning signs, coping skills, and distractors for reducing suicidality (Stanley & Brown, 2012). Distractors are people and environments that help to keep individuals safe by diverting

attention from suicide ideation, the associated affects, and behavioral urges when at high risk for suicide (Stanley & Brown, 2012). For instance, when an individual experiences suicide-specific ruminations (warning signs), the safety plan guides the individual to transition to a new environment (distractors). In fact, researchers have shown that the Safety Planning Intervention has prevented the elevation of suicidality in patients (Chesin et al., 2016). Another intervention, Cognitive behavioral therapy (CBT), provides psychoeducation related to cognitive distortions and how this phenomenon influences thoughts and emotions. This approach ultimately aims to help people challenge and change their thought processes to cope with suicidal thoughts.

Repetitive thoughts related to suicide are also observed among people with obsessive-compulsive disorder (OCD) and is referred to as suicidal obsessions. Suicide-specific rumination and suicidal obsessions can often share some qualities regarding repetitiveness and intrusiveness (Mattera et al., 2022). However, not all people who report repetitive suicidal ideations have suicidal obsessions, and vice versa (Mattera et al., 2022). Researchers have highlighted that repetitive suicidal ideations and suicidal obsessions are different from each other (Mattera et al., 2022). For instance, people with suicide-specific rumination experience repetitive thoughts about suicide with the risk of suicide (e.g., I want to die). But people with suicidal obsession experience repetitive thoughts about suicide with or without the risk of suicide (e.g., what if I killed myself because I accidentally didn’t turn off the stove; Mattera et al., 2022). Therefore, it is essential to be curious and specific about the content, development, and behavioral urges that accompany repetitive thoughts to design suitable clinical prevention and intervention

plans. For example, people with intense suicidal obsessions without suicidality may need obsession-focused interventions rather than hospitalization—which aims to ensure their safety from acute suicidal risk (Mattera et al., 2022). It is important to use well-designed measurements for each construct. For instance, for people who show repetitive suicidal ideation, as seen in the current research, can have their suicide-specific ruminations validated using an evidence-based measures, such as the Suicide Rumination Scale (Rogers et al., 2022) and Perseverative Thinking about Suicide Questionnaire (PTSQ; Höller, et al., 2022). After identifying the appropriate construct, it is important to consider the effects of these two different symptom clusters on individuals' mental health both individually and collectively (Rachamallu et al., 2017).

Additionally, people in this cluster often wrote posts with present tenses and simple verbiage that described their suicidal thoughts representing acute suicidal experiences. It is necessary to be sensitive to understanding acute suicidal thoughts considering how short the time between reported suicide ideation and suicide attempts. For instance, more than half of people who attempted suicide reported attempting suicide within one hour of suicidal ideation (Deisenhammer et al., 2009). 70% of people who attempted suicide reported they attempted suicide within one hour of planning suicide (Simon et al., 2001). Understanding in the moment of acute suicidality is very important to prevent the progression from suicidal ideation to an attempt (Gao et al., 2018). Additionally, research has highlighted that the disclosure of acute suicidal behavior should be treated differently from the disclosure of past suicidal behaviors (Sheehan et

al., 2019). A behavior-level approach to suicide prevention is crucial for detection of acute suicidal risk and time-sensitive intervention (Renjith et al., 2022).

6.4. Suicidal Driver 2: Relational Stress

In this research, 31.9% of people disclosed suicidality and relational stress together. Different social relationships, including parents, siblings, friends, and romantic partners, were described when people disclosed their suicidal risks. It emerged that adverse social situations and relationships can give rise to negative emotions such as anger, frustration, and loneliness. Reddit participants also described how their suicidal risk is related to these negative social experiences.

The Interpersonal Psychological Theory of Suicide (IPTS; Joiner et al., 2009; Van Orden et al., 2010) explains the role of negative social relationships in increasing suicidal risk. IPTS introduced two concepts, thwarted belongingness and perceived burdensomeness, as contributing to suicidal ideation (Joiner et al., 2009; Van Orden et al., 2010). The findings in this study emphasize the potential impact of thwarted belongingness on the development of suicidality.

Thwarted belongingness is a psychological status of frustration or disappointment when the desire for belonging is not satisfied. The deepest truth of us as humans is our wish to be connected with and be cared for by others (Britton et al., 2014). When that need for belonging is unmet, people experience thwarted belonging, a psychological experience that can function as a suicidal driver. Any negative social experience can be a suicidal driver. For instance, negative parenting, disconnectedness from peer groups, and

breakup from romantic relationships increase suicide risk through thwarted belongingness (Nakano et al., 2022). Previous research has shown that parent and peer relationships are important predictors of suicide ideation after following other mental health symptoms such as depression among youth (Donnelly et al., 2023).

Various family factors (e.g., family structure, support, and communication) have been commonly considered crucial factors in preventing suicide (Eshun, 2003; Frey & Cerel, 2015, Low, 2021; Nakano et al., 2022; Wagner et al., 2003). Among these various factors, negative relationships within the family have been highlighted as a particularly important suicidal driver (Diamond et al., 2022; Low, 2021; Wagner et al., 2003). For instance, people who experienced negative relationships with their family members (i.e., parents, siblings, extended family) were more likely to be at high suicide risk (Mubashar & Butt, 2022).

A negative relationship with friends is also a driver of an individual's suicidality. Negative peer relationships, including low levels of peer connectedness, bullying, and victimization, were related to the risk of suicidality (Cui et al., 2011). Negative peer relationships not only increase suicidality directly but also increase suicidality indirectly by exacerbating loneliness and depressive symptoms in individuals (Cui et al., 2011; Rivers et al., 2021). Building positive friendships has been shown to buffer against suicidality for different age groups and communities (Bowersox et al., 2021; Handley, et al., 2012.; Kadirappulli-Hewage & Jayasekara, 2020; Sewall et al., 2020).

In addition to family and friends, romantic relationships can drive suicide risk. The impact of negative experiences in the context of romantic relationships on suicidality

has been gaining increased attention in the literature (Mirsu-Paun & Oliver, 2017; Still, 2021). Negative experiences in romantic relationships (e.g., break-ups, conflicts, dissatisfaction) increase the risk of suicide (Donald et al., 2006; Mirsu-Paun & Oliver, 2017). Evidence has shown that, not long before people the onset of suicidal risk or death by suicide, many people experienced negative events in romantic relationships, such as break-ups and affairs (Kazan et al., 2016). Specially, research has suggested that being in a romantic relationship does not affect the level of individuals' suicidality, however, being in a high-quality romantic relationship does reduce the suicidal risk of individuals (Still, 2021).

In the current study, adolescents and young adults were particularly likely to disclose the impact of relationships on suicidality. Suicide has been identified as a leading cause of death among adolescents and young adults globally (World Health Organization, 2021). Adolescents and young adults have been considered high-risk groups among different age groups (Centers for Disease Control and Prevention, 2021). For example, 18.8% of youth seriously considered suicide and 8.9% of youth have attempted in the U.S. (Ivey-Stephenson et al., 2020). One-fourth of early adolescents and almost half of the late adolescents reported they had attempted suicide or self-harm behaviors at least once in England (Cheung et al., 2020). Youth suicide in Korea was strongly associated with social factors, as well as psychological, behavioral, and academic factors (Donnelly et al., 2023).

Although the impact of negative social relationships on suicide has been identified among all age groups, it is especially strong among adolescents and young

adults (Diamond et al., 2022; Gençöz & Or, 2006). Adolescence and young adulthood are critical periods for individuals' social and identity development. During adolescence and young adulthood, social relationships are expanded from caregivers and family to friends, teachers, and romantic partners. Suicidologists identified that negative relationships with family, friends, and romantic partners increase the risk of suicide among youth across countries (Donald et al., 2006; Eshun, 2003; Ford et al., 2017; Peng et al., 2019). The current findings also support the notion that social development is as important as biological and neurological development for preventing suicide during adolescence and young adulthood. Therefore, mental health professionals working with youth especially need to apply evidence-based psychotherapy, validated in its impact on youth suicidality tied to social relationships. For instance, Dialectical Behavior Therapy (DBT) has been suggested as a valuable psychosocial intervention program for youth with relational stress and suicidality (Glenn et al., 2019). DBT includes training in interpersonal effectiveness skills, emotional/distress regulation skills, and mindfulness for youth at suicide risk (Lenz et al., 2016).

Explicitly requesting advice for managing suicidality is very common among people who disclosed relational stress in this research. Indeed, few people asked for advice within other topic clusters, in comparison. Negative social relationships in offline spaces and the developmental phase of authors of this cluster may explain why help-seeking behaviors are identified more frequently among people who disclosed relational stress. People with negative relationships with their family, friends, and romantic partners are less likely to disclose their suicidality and ask for help from others they know

(Beaulaurier et al., 2008; Srebnik et al., 1996). Research has found that people with low offline social support are more likely to disclose and ask for help from people in online spaces (Leung, 2011).

Another potential reason for frequent help-seeking behaviors from those disclosing relational stress in the suicide discussion forum may be related to the age group of authors—adolescents and young adults. Young people use social media more often than other age groups and more commonly ask for advice in virtual space (Pew Research Center, 2021; Pretorius et al., 2020). Negative social relationships are suicidal drivers for all age groups (Beaulaurier et al., 2008; Handley, et al., 2012; Kadirappulli-Hewage & Jayasekara, 2020), but youth struggling with negative social relationships are more likely to ask for help from others online (Pretorius et al., 2020).

Additionally, a few people asked for advice to help their significant others at suicide risk in r/SuicideWatch. They commonly expressed that they don't know what to say and what to do to support their family, friends, and romantic partners with suicidal risk. This phenomenon may not be a suicidal driver of people who wrote posts, but this finding highlights the need to provide psychoeducation for the general population such as suicide literacy education and gatekeeper training to help people support their significant others (Batterham et al., 2013; Shin & Kim, 2013).

6.5. Suicidal Driver 3: Suicide Attempts and Negative Healthcare Experiences

Less than 10% of people disclosed multiple suicidal drivers, including past suicide attempts, means of suicide, chronic suicidality, a history of other mental health

challenges, negative experiences with mental health services, and feelings of helplessness. Narratives in suicide attempts, means of suicide, chronic suicidality, and co-occurrence of other mental health challenges all indicate the higher level of suicide risk of individuals compared to other clusters. Their feelings of helplessness were also linked with negative experiences with mental health services.

Research has shown that past suicide attempts drive future suicide risk behaviors (Wexler et al., 2008). Suicide attempts are a powerful suicidal driver and increase the risk of suicide death compared to suicidal ideation (Klonsky & May, 2015; Van Orden et al., 2010). Suicide capacity in the Three-Step theory (3ST; Klonsky & May, 2015) and acquired capability in the Interpersonal Psychological Theory of Suicide (IPTS; Van Orden et al., 2010) elucidate the factors that contribute to suicide attempts beyond the presence of suicidal ideation. Suicide capacity and acquired capability are an individual's capability of attempting suicide such as stress tolerance, available means of suicide, and learned violent behaviors, which is gained from either biological and/or social factors (Klonsky & May, 2015; Van Orden et al., 2010). For instance, if their current situation is too painful, people perceive the pain of killing themselves is relatively less than pain of the situation and become more capable of dealing with the pain of suicide. If an individual at suicide risk has access to firearms, they are also more capable of harming themselves compared to when they don't have access to them.

In the current research, people also talked about the means of suicide specifically. People talked about overdosing on medication and other substances, using firearms, and hanging themselves as a means of suicide. People often spoke about specific fatal doses

of those medications and used the particular name of medications (e.g., Lamotrigine) more often than general terms (e.g., mood stabilizers). People shared the means of suicide they have used in past attempts. People asked for suggestions for potential means of suicide. People did not clarify that they were planning suicide, but asking about methods of suicide may indicate an individual is going beyond thinking about suicide and is engaged in planning.

People in this cluster also indicated that they experienced other mental disorders, such as depression, anxiety, and bipolar disorder as suicidal drivers. Co-occurrence of suicidality and other mental health challenges are not uncommon (Armoon et al., 2021; Jeon 2011; Yen et al., 2021; Bentley et al., 2016; Donnelly et al., 2021; Maloney et al., 2010; Wilcox et al., 2004). In previous studies, people who have suicidality and other mental health reported a high risk of suicide, compared to people who only have suicidality (Svanborg et al., 2008; Donnelly et al., 2021). Therefore, to help people with suicide risk, it is vital to be aware of comorbid mental health challenges, and the comprehensive mental health profiles of individuals.

People also revealed a long history of suicidality in the posts. People with persistent suicidality are a high suicide-risk group (Gunn & Lester, 2015). Previous research found that people with long-term suicidality were more likely to report a history of suicide attempts and other mental health concerns than those with only acute suicidality (Oquendo et al., 2006). This helps to explain why the narratives of people in this cluster (Disclosure of Suicide Attempt and Negative Healthcare Experience) included past suicide attempts, co-occurrence with other mental health challenges, and long-term

suicidality together. Their narratives also described their negative experiences with mental healthcare services over time. For example, some people complained that they needed to take complete the same intake interviews and assessments multiple times. They said that they were offered similar suggestions they had already tried when meeting a new clinician. Therefore, a different clinical approach is recommended for people who have experienced long-term suicidality (Wilcox et al., 2010). For instance, clinicians are encouraged to approach this group by using the Chronological Assessment of Suicide Events (CASE) as well as assessing the acute risk of suicide (Shea, 1998; Freedenthal, 2018).

In the current research, people also shared their experiences with different mental health services, including using suicide hotline services, psychiatric medication, engaging in psychotherapy, visiting the emergency room, and hospitalization. Mainly, people talked about their negative experiences with and mistrust toward mental health professionals. People were unsatisfied with mental health services because of extended wait times for appointments, a lack of empathy shown by professionals, and repeated intake processes with different professionals. People felt unheard by psychiatrists and did not believe that psychiatrists fully understood their situation. People complained that professionals were unaware of their needs. Some people in this study perceived no progress in reducing suicidal stress after inpatient and outpatient treatments. Negative experiences or mistrust of psychiatric medication were also identified in people's narratives. This included experiencing side effects from medication, feeling uncertain about whether the prescription was accurate, and experiencing no improvements in

mental health since starting psychopharmacological treatment. All these dissatisfactions with healthcare increase the dropout rate from mental health treatment and resistance to future help-seeking behaviors (Miglietta et al., 2018).

Linked with these negative mental health service experiences, people shared their feelings of helplessness and expressed the pointless of using mental health services. They commonly felt helpless because they experienced no progress or negative experiences even after attempts to get better by utilizing mental health services. These narratives of people are consistent with the theory of learned helplessness (Maier & Seligman, 1976). Learned helplessness is when people become unwilling to solve problems after repetitive experiences of negative outcomes (Maier & Seligman, 1976). People in this study reported they felt helpless when they did not experience positive results, despite multiple therapy sessions and different medication trials. After negative experiences with mental health services, people report believing that using those services will not help resolve the situation. They describe themselves as feeling lost and say they do not know how to get better outside of being in therapy and taking prescribed medication. Learned helplessness is a critical barrier in encouraging help-seeking behaviors of people with suicidality (Wilson & Deane, 2010; Staiger et al., 2017). It minimizes hope, help-seeking, and continued engagement with the healthcare system (Wilson & Deane, 2010; Staiger et al., 2017).

These narratives underscore the needs of improvement in mental health care services for people with suicidal risk. Especially increasing the number of mental health professionals seems necessary to reduce waiting periods for individuals seeking to

engage in psychotherapy or psychiatric services considering the narratives in this study. Offering other mental health services beyond individual therapy such as support group or psychoeducation programs may improve the accessibility of mental health care services. It is also recommended that clinicians are sensitive to the patient's history of suicidality and the patient's history of mental health services experiences (Shea, 1998). Enhancing the referral system may help prevent patients from feeling like they are restarting from the beginning when they meet a new professional.

6.6. Suicidal Drivers 4: Abuse

Trauma-related stress has been highlighted as critical suicidal drivers across prior research (Decker et al., 2018; Miller et al., 2013; Wilcox et al., 2009). People who experienced sexual, physical, and verbal abuse were more likely to report suicidal thoughts, planning, and attempts than people who did not (Bruffaerts et al., 2010; Miller et al., 2013). Among different types of abuse, sexual abuse was more strongly associated with suicidal risk than physical and verbal abuse (Collin-Vézina et al., 2021; Joiner et al., 2007; Mossige et al., 2016). The negative impact of abuse on people's suicidality was still significant after controlling for demographic and environmental factors (Miller et al., 2013). The long-term effect of abuse on suicide risk has also been identified (Mossige et al., 2016). When people experienced abuse in their early childhood, the risk of suicide was higher in their lifespan (Lopez-Castroman et al. 2013). The current research also found that a group of people mentioned that their abuse experiences happened in their early childhood. Indeed, people who survived abuse conducted by people who they

perceived themselves to be close with, and who also experienced a lack of social support during periods of abuse, were more likely to report high suicide risk (Miller et al., 2013).

The high prevalence rate of suicide among people who survived abuse can be explained by Escape theory (Shneidman, 1993), suicide capacity in the Three-Step theory (3ST; Klonsky & May, 2015), and acquired capability in the Interpersonal Psychological Theory of Suicide (IPTS; Van Orden et al., 2010). Escape theory explains that people consider suicide to escape from the unbearable pain of traumatic memories (Shneidman, 1993). 3ST and IPTS explain the high risk of suicide among people with abuse experience. These theories elucidate what makes people with suicide ideation attempt suicide by using the concept of acquired capability (Joiner et al., 2007). Suicide capacity and acquired capability are abilities to execute actual suicidal behavior, and it is exacerbated by individuals' pain tolerance and fearlessness of death (Klonsky & May, 2015; Joiner et al., 2007). Experiencing extremely painful situations, such as abuse, increases people's endurance of pain (Joiner et al., 2007) and may lead people to think the pain from self-harming behaviors is less painful than abusive experiences themselves (Cheng et al., 2021).

Self-hatred, self-blame, and negative self-image were commonly reported among survivors of abuse, and they hindered the disclosure of mental health issues (McElvaney et al., 2022). Some people with abuse experiences were less likely to disclose their suicidality, especially when abuse experiences were major suicidal drivers (Collin-Vézina et al., 2021; McElvaney et al., 2022). Some people disclosed their suicidality as a gateway for disclosing abuse experiences and asking for help from others (Collin-Vézina

et al., 2021). This disclosure of suicidality might lead people to engage in trauma-informed therapy and suicide intervention treatment.

For people who have abuse experience as major suicidal drivers, CAMS suggested diverse suicide intervention strategies, including “exposure therapy, insight-oriented work, clinical hypnosis, EMDR therapy, cognitive processing therapy, and the like.” (Jobes, 2016 p. 110). Suicide interventions with a deeper understanding and intervention for feelings of shame and a negative self-image are also recommended to help people with abuse experiences (McElvaney et al., 2022). Other research highlighted that people could be overwhelmed with strong emotions or triggered by painful memories before, while, and after disclosure of abuse (McElvaney et al., 2014). Therefore, it is especially salient for clinicians to explore people’s feelings, thoughts, and behavioral urges, especially after disclosure of abuse and suicidality. It is also vital to increase the sensitivity to abuse experiences among all staff in healthcare systems. As well as patients, support for mental health professionals is important to prevent trauma stewardship, secondary trauma, compassion fatigue, and vicarious trauma of professionals from the disclosure of intense abuse experiences and suicidal risk (Jacobson et al., 2004; van Dernoot Lipsky, 2009). Broadly, increasing awareness among the general public is important to prevent stigma toward survivors and provide supportive environments where survivors can ask for helps from others.

6.7. Suicidal Drivers 5: Contextual Stress

A small percent (7.2%) of people disclosed contextual stress related to their living conditions as suicidal drivers. People in r/SuicideWatch disclosed multiple living problems. These included work and finance and the COVID-19 pandemic. Often these factors were combined rather than described as a single living challenge, as with previous literature (Crayne, 2020; Elbogen et al., 2020; Madianos et al., 2014).

Strain Theory of Suicide (STS; Zhang, 2019) explains how contextual stressors such as financial crises and performance issues at work and school impact individuals' suicidal risk. STS suggests "strain" as the primary cause of suicidal risk, especially for suicide ideation. Strain is a very similar concept to stress but with additional conditions. A strain occurs when two facts conflict (Zhang, 2019). For instance, the gap between one's aspirations and reality—"Reality versus Aspiration"—is a strain that increases the suicidality of individuals. The gap between the crisis level and the capability to handle the situation is also considered a strain to increase the risk of suicide. This concept of strain explains why not all people with low socioeconomic status have suicide risks. More specifically it is a lower socioeconomic status than one's expectation that increases the likelihood of suicidality. This also explains why low academic achievement does not predict the suicidal risk of students, rather, dissatisfaction with academic achievement does. Therefore, it is crucial to identify potential stressors and how individuals perceive them to remove suicidal drivers.

The narratives from the Contextual Stress cluster of this research exemplify this relationship between strain and suicidality from STS. The gap between the current

situation and expectations in financial, career, and academic areas of life were identified as suicidal drivers in the current study, as well as previous research (Choi, 2014; Elbogen et al., 2021; Milner et al., 2015; Lee & Chun, 2012). For instance, people whose debt exceeds their income reported a risk of suicide (Elbogen et al., 2020; Kidger et al., 2011). People with less access to financial support as needed also reported a risk of suicide (Thakur & Jain, 2020). People having difficulty finding jobs reported a risk of suicide (Milner et al., 2015). Students who are not satisfied with their academic achievement reported suicide risk (Kwak & Ickovics, 2019). In summary, the bigger the gap between one's situation and aspiration, the greater the risk of suicide (Milner et al., 2015; Zhang, 2019).

People also disclosed their experiences with legal violation and imprisonment as suicidal drivers. This experience includes their violation of the law, stress related to the legal process, and their own or their significant others' imprisonment. The suicide rate of incarcerated people has been higher than the suicide rate of the overall population. For instance, the suicide rate in prison is 1.6 times higher, and the suicide rate in jail is 3.7 times higher than the suicide rate of overall populations in the U.S. (Carson, 2021). Therefore, it is essential to discuss how to prevent suicide among people with suicidality, especially those who disclose legal violations and imprisonment-related stress as a suicide driver.

Limited mobility and social interaction could also be considered suicidal drivers. Much literature has examined how the suicide rate has changed during the COVID-19 pandemic. Unlike many media entities that were concerned that the suicide rate would be

increased during the pandemic (Marzanno et al., 2022), researchers found no significant changes in the global suicide rate during this period of time (Pirkis et al., 2022). This suggests that the changes in people's daily lives during the COVID-19 pandemic may not affect suicide directly or promptly. Although being in the COVID-19 pandemic era itself might not increase the risk of suicide, pandemic-related stress may influence individuals' suicidal risk as indirect suicidal drivers. During the pandemic, people lost their job (Kawohl & Nordt, 2020), people struggled with their financial situations (Crayne, 2020; Thakur & Jain, 2020), and students reported difficulty focusing (Aftab et al., 2021; Barzani & Jamil, 2021). Limited transportation options may also increase suicidal risk by reducing the accessibility of mental health care services (Ainamani, 2020; Oluyede et al., 2022). The impact of the changes during the pandemic may be identified longitudinally, considering that it might affect suicide indirectly via other factors such as financial issues, housing instability, and social isolation (Crayne, 2020; Elbogen et al., 2021).

Systemic and instrumental support is essential to reduce the suicide risk of people with contextual stressors. Financial supports from governments are crucial to decreasing people's mental health issues during the financial crisis (Diaz, 1999; Thakur & Jain, 2020). Protection legislation for employers and supportive policies for unemployed people can reduce suicide risk (Shand et al., 2022). Mental health support for people discharged from correction facilities is also necessary to prevent suicide and re-incarceration (Begun et al., 2016). Providing contextually sensitive tele-therapy practices is helpful in reducing the suicidal risk of people with specific contextual stress during the COVID-19 pandemic (Jobes et al., 2020). Moving forward, it will be essential to develop

macro-level implementation considering different contextual stressors and evaluate its effectiveness in decreasing the impact of contextual stressors on suicide.

Table 10. Theoretical Framework of Suicidal Drivers

Suicidal Drivers	Suicidal Drivers from Suicide Theories
Repetitive Suicide Ideation	• Suicide-specific rumination (Rogers et al., 2022)
Relational Stress	• Thwarted belongingness (IPTS; Van Orden et al., 2010)
Suicide Attempt and Negative Healthcare Experience	• Acquired capability from IPTS (Van Orden et al., 2010), Suicide capacity from 3ST (Klonsky & May, 2015) • Learned helplessness (Maier & Seligman, 1976)
Abuse	• Escape theory (Shneidman, 1993) • Acquired capability from IPTS (Van Orden et al., 2010), Suicide capacity from 3ST (Klonsky & May, 2015)
Contextual Stress	• Strain Theory of Suicide (Zhang, 2019)

Note: IPTS = Interpersonal Psychological Theory of Suicide; 3ST = Three-Step Theory

7. LIMITATIONS AND FUTURE RESEARCH SUGGESTIONS

The most important focus for future research is identifying sub-themes of the five suicidal drivers identified from this research. This research originally identified three themes in the initial analysis and conducted additional analysis to provide more specificity and nuance. However, the five suicide drivers are still too simplistic to explain the diversity and complexity of suicidal drivers. In fact, within the five suicidal driver clusters, additional potential drivers were observed. For example, contextual stress includes many different aspects of people's living situations including work, school, and finance. This clustering was attributable to the fact that disclosures of these drivers were similar compared to disclosures of other drivers such as repetitive suicidal ideation and relational stress. This clustering helps to guide the planning of initial interventions for people with contextual stress. However, additional analysis is needed to understand subthemes of suicidal driver disclosure by individuals for further personalized interventions.

This study primarily focuses on posts directly expressing authors' suicidal-related stress and the associated drivers that influence their suicidal risk. In-depth analysis was conducted on only the five topic clusters in the disclosure of suicidal drivers, while the sixth topic, Philosophical and Informative Discussion, was not extensively examined in this study. Nevertheless, it is crucial to be aware that authors within the sixth topic cluster may also be dealing with suicide-related stress although they might not directly express their stress on the post. Therefore, future research is recommended to delve into posts within the Philosophical and Informative Discussion cluster. This will help examine

whether there are any signs showing suicide-related stress and drivers among the authors.

Suicidologists highlight that understanding “reason to live” is as important as understanding “reason to die”. In r/SuicideWatch, people disproportionally talked about what prompted suicidality as opposed to protective factors. This study found that venting suicide-related stress functions as the common motivation for posting across people with different suicidal drivers. If people used r/SuicideWatch to vent their stress, they might focus more on describing negative feelings and situations rather than positive factors that help them stay alive. As an automatic response to their posts in the r/SuicideWatch community, it would be helpful to provide resources that encourage people to think about their reason to live. A few of them mentioned their reason for living (e.g., family), however, they were described very briefly compared to the length of an overall post or content related to reason to die. Because the goal of topic modeling and LDA is to find a dominant topic in a post, the short description of protective factors might not be identified in the analysis. Therefore, alternative datasets and analytic strategies might be more suitable, such as using data from communities of people with lived experiences, to understand the reason for living among people with suicidality.

This research attempted to understand people’s experiences at the behavioral level and discussed suicide intervention strategies by focusing on each post rather than each individual. However, suicidal drivers and risk of an individual can change over time depending on the context. Some people may post repetitive suicidal ideation at first but proceed to post about suicide attempts. In that sense, one behavior is not enough to understand the overall and longitudinal suicidal experiences of individuals. Exploring

multiple disclosure posts by individuals may provide patterns and trends in suicidal drivers over time. Future research is needed to understand an individual's holistic experience by tracking the posts of each individual.

It is also important to understanding suicidal drivers at different developmental stages. In the current study, it is important to note that not all posts include information about the age of the authors. However, despite this limitation, interesting findings have emerged from certain clusters. For instance, adolescents and young adults were consistently found in the Relational Stress cluster. Early childhood was often described in the Abuse cluster as when an abuse incident happened. People in the Suicide Attempts and Negative Healthcare Experiences cluster mentioned their long history of suicidality across their lifespans. People who disclosed contextual stress as suicidal drivers were more likely to in adulthood rather than childhood or adolescence considering their stress are related to finance, housing, and jobs. Although not all individuals included their age in posts, there is still potential to use Reddit posts to understand suicidal drivers from developmental perspectives. For instance, future research can adopt ontology in age and developmental stages—which lists all words indicating age and developmental stage (e.g., ten years old, high school student, elderly). This approach enables research to filter only the posts with age information. The finding from this data will show how different types of suicidal drivers are related to suicide risk at different developmental stages.

This research attempted to understand people's intrapersonal disclosure through posts on social media. This study did not consider interpersonal communications from posts and comments on social media. Indeed, receiving comments from people may

impact people's disclosures over time. Studying reactions and further communication between people who disclosed suicidality and others is crucial to understand social support and stigma (De Choudhury & De 2014). It is recommended that future research collect both posts and comments and examine their relationships.

Finally, the literature has highlighted that marginalization is a crucial suicidal driver. However, the findings of this research were unable to identify the experience of holding a minority identity, and associated stress, as major themes. This may be linked with the research method of this study (i.e., NLP, LDA) which disproportionally relies on quantity of data. The major findings from skewed data are most likely to be biased to most common data. In other words, gaps in the number of post created by minoritized individuals and their counterparts might hinder the identification of minority narratives. A few of the posts only described suicidal-related stress linked with their racial, sexual identity, or imprisonment. Considering the Reddit community is facilitated by English communications, suicidal drivers of people who don't speak English were also missing in the current findings. Therefore, applying the other analytic methods that are effective for skewed data analysis is needed to provide insights into suicidal drivers of minorities. Alternatively, using r/SuicideWatch posts disclosing identity information or suicide-related data from specific minority community platforms is also recommended for future studies.

8. CONCLUSION

This research identified suicidal drivers from generated on social media. The findings suggest that suicide prevention strategies should be designed differently for people with repetitive suicide ideation, who are experiencing stress in the context of social relationships, who have attempted suicide, who have experienced negative experiences from mental healthcare services, who had abuse experiences and trauma, and who have, or are, experiencing financial, performance, and legal issues. The strength of this research lies in its use of alternative data and methods that compensate for the limitations of previous suicide research that focused primarily on clinical populations. The finding from this study's data-inspired and exploratory approach adds evidence in support of the existing suicide theories and frameworks. Continuing efforts of suicidologists are necessary to add insights into public health policy and practices by using more inclusive data and innovative methodological approaches in the realm of suicidal driver research.

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