

Co-occurring factors associated with suicidal ideation among individuals with parole involvement: A classification and regression tree analysis

Leah MCCOY¹, Javier F. BOYAS^{2*}, Sung Seek MOON³, Michael A. ROBINSON⁴,
Onick LEWIS⁵, Amy E. COX⁶

Affiliations:

¹ Troy University, 204P Jones Hall, Troy, AL, 36082, USA, E-mail: lamccoy@troy.edu ORCID: 0000-0002-6777-6212

² Troy University, 211A Jones Hall, Troy, AL, 36082 USA. E-mail: jboyas@troy.edu ORCID: 0000-0002-4322- 8385

³ Baylor University, School of Social Work, 811 Washington Ave, Waco, TX 76701, USA E-mail: sungseek_moon@baylor.edu ORCID: 0000-0002-4956-5358

⁴ Florida Atlantic University, 777 Glades Rd, Boca Raton, FL 33431 USA E-mail: michaelrobinson@fau.edu ORCID: 0000-0003-1533-804X

⁵ Troy University, 204S Jones Hall, Troy, AL, 36082, USA, E-mail: olewis@troy.edu ORCID #0009-0009-5299-8662

⁶ Troy University, 204G Jones Hall, Troy, AL, 36082, USA, E-mail: acox114746@troy.edu ORCID #0009-0003-4609-8445

*Corresponding Author:

Javier F. Boyas, Ph.D., Professor, Troy University, 211A Jones Hall, Troy, AL, 36082, USA, E-mail: jboyas@troy.edu.

Abstract

Introduction: Formerly incarcerated individuals on parole burden a higher risk of suicidality compared to the general public. This study explored specific physical health, mental health, and substance use predictors contributing to suicidal ideation among individuals with parole involvement.

Methods: Pooled data from the National Survey on Drug Use and Health were analyzed through a CART analysis to uncover co-occurring interactions associated with suicidal ideation among a national sample of individuals with parole involvement (N=1,725).

Results: Total acute depression scores, both lower and higher, had a significant impact on suicidal ideation. Milder forms of depression were significant when they intersected with unaddressed mental health needs, ADL limitations, and pain reliever misuse. More severe depression symptoms compounded mental health challenges, particularly when they coincided with ADL limitations, a poorer perception of health, and the unique experiences of individuals at both ends of the adult spectrum, particularly those aged 18-20 and individuals aged 35 years or older. Results suggest that depression symptoms were the most influential variable associated with suicidal ideation.

Conclusion: Although considerable efforts have been made in research and practice to shed light on these issues, there has been a noticeable lack of focus on the provision of community resources and mental health treatment during and post incarceration. It is imperative to recognize that most people in the criminal justice system eventually reintegrate into our communities. Thus, it becomes vital to bridge the gap by offering treatment and resources during incarceration.

Take home message: This study demonstrates that data analytics can help uncover previously unknown risk factors linked to suicidal ideation among individuals with parole involvement. Lower and higher levels of depression showed adverse effects in promoting suicidal ideation when co-occurring with other risk factors.

Keywords: Suicidal ideation; prisoners; risk factors; mental health; data analytics.

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INTRODUCTION

It is widely recognized that suicidality overburdens individuals with parole involvement. Numerous studies have indicated that people involved in the criminal justice system, including individuals with parole involvement, face increased rates of suicidality compared to the general population [1,2]. Estimates of morbidity rates from suicidality among individuals with parole involvement have ranged anywhere from two to nine times higher compared to those without criminal justice system involvement [3,4]. Recent research has indicated that suicide risk among individuals with parole involvement was 62% higher compared to the general population [5, 6]. Recent research also suggests the potential for involvement in the criminal justice system leads to an increased likelihood of suicide to avoid jail time [7]. The stark difference underscores the pressing importance of investigating the correlates behind this increased susceptibility, particularly in the post-incarceration phase. Despite this recognition, less research has been directed toward understanding the complex web of factors associated with suicidality within this vulnerable population.

Suicidality is a nomenclature encompassing a continuum of thoughts, intentions, and behaviors such as suicidal ideation, plans, attempts, and completed suicides [8-10]. Although it is critical to address death by suicide among individuals with a parole history, it is also important to acknowledge the significance of suicidal ideation as they often lead to suicide attempts and deaths by suicide [11]. Boyas and colleagues maintain that suicide is not always a linear process and not all suicide attempts are preceded by suicidal ideation [8]. However, the presence of suicidal ideation can elevate the likelihood of developing suicidal thoughts and behaviors. Therefore, it is important to recognize the factors linked to contemplating suicide in individuals on parole, especially since thoughts of suicide may be higher among individuals who have been formerly imprisoned and released to a community setting, where surveillance decreases and access to lethal means increases [12,13]. One study revealed that the suicide rate among offenders in the community, regardless of age or gender, was higher than that in prisons (by a factor of 1.42) and the general population (by a factor of 8.67) [14].

While individuals with a parole history and probation are often analyzed collectively under the “community supervision” umbrella, the contextual experiences of individuals sentenced to one over the other may vary greatly. It should be noted that individuals with parole involvement must adhere to specific conditions to maintain their freedom, such as mandatory participation in mental health and/or substance use treatment programs, meeting financial obligations like legal fees and restitution, and regularly meeting with their assigned parole officer. Moreover, the experiences of trauma and the high prevalence of physical and mental health conditions among those incarcerated present a major challenge as these individuals transition from a prison environment to the community [15-18].

This transition introduces a multitude of stressors, including the need to secure stable housing, employment, transportation, and meet the demands of parole. This amalgamation of stressors significantly heightens the risk of suicidality within this population [19]. Acknowledging and addressing these distinctive stressors and mental health needs is paramount in promoting successful reintegration and well-being under community supervision. Unaddressed physical, psychological, and/or drug use disorders can hinder their ability to reintegrate effectively, potentially leading to reoffending, which is detrimental to public safety. While those sentenced to probation may face similar court mandates regarding treatment and fees, they typically remain in the community without having served any time in jail or prison, thus allowing them to maintain housing, employment, and other community ties. Therefore, we maintain that it is important to recognize the impact of incarceration on people with parole involvement compared to those on probation, underscoring the detrimental effects on their life trajectories. The purpose of this study was to use a CART analysis to uncover co-occurring interactions associated with suicidal ideation among a national sample of people with parole involvement.

Criminal justice populations have an elevated risk for suicide and display a high prevalence of traditional risk factors associated with suicide, which has been linked to a two-fold higher suicide risk in men and a three-fold higher suicide risk in women [20,21]. Compared with the general population, formerly incarcerated women are 15 times more likely to be at risk for suicidality [22]. Research suggests there are several factors related to suicidality among all racial and gender categories of people under criminal justice supervision in the community (e.g., parole): younger aged, being on disability or retirement, taking psychiatric medication, history of sexual or physical abuse, drug dependence and sexual minority status (e.g., lesbian, gay, bisexual, or transgender) [20,23]. For individuals with parole involvement, suicide attempts were most common among young unmarried Caucasian men who had committed violent crimes [3]. An analysis of longitudinal data related to suicide mortality among formerly incarcerated individuals provides additional support for these findings [24].

Because of the lack of planning that may occur during the transition process, individuals with parole involvement may ultimately return to neighborhoods that are often characterized as disadvantaged and were often the setting for offenses that led them to prison in the first place [25]. While many such neighborhoods provide limited employment opportunities and avenues for seeking physical and mental health care, these areas may provide sources of social support, as individuals with parole involvement may return home to reside with friends and family [26,27]. Meanwhile, other people newly released from prison may reside in temporary forms of housing in such neighborhoods, including boarding homes, treatment facilities, and other transitional housing. These scenarios result in increased rates of residential mobility, and perhaps homelessness, among this population. While incarcerated, the ties that these individuals may have to their communities may become weakened or lost [25]. Formerly incarcerated females with lost relational ties are particularly impacted and thus more likely to experience suicidal ideation or attempt [21].

Recent research has indicated that individuals who were homeless following release from prison experienced higher rates of suicidal ideation compared to those with stable housing [21]. One study revealed that older individuals with parole involvement had weak family, employment, and residential ties [28]. These missing bonds were supplemented by heightened feelings of anxiety and isolation, which, in turn, have led to increased rates of suicidal ideation and attempts.

In addition to sociodemographic risk factors, substance use disorder has been strongly associated with an increased risk of suicide [29, 30]. Substance use, including alcohol, marijuana, and other illicit drugs, is prevalent among individuals with parole involvement, which also poses additional risks for crime and recidivism. One study compared people under community supervision with the general population and showed that people under community supervision showed higher rates of substance abuse and dependency than the general population [31]. Although this study does not differentiate between people sentenced to probation and those serving parole, it demonstrates the differences in proportions of substance use between people in the criminal justice system and the general population. Golder and colleagues further delineated these differences across gender based on being in a controlled environment [32]. Overall, research has indicated that rates of substance use are higher among individuals on parole compared to the general population.

When considering risk factors for suicide among individuals with parole involvement, it is important to assess mental health impacts since it has been documented that criminal justice involved individuals have higher rates of mental health diagnoses compared to the general population [33, 34]. The relationship between health-related barriers and suicidality have appeared most impactful for formerly incarcerated males in particular [21]. Rates of major psychiatric disorders were found to be higher among those individuals with repeated incarcerations [35]. Further, rates of suicidal ideation and attempts have also been found to be higher within this population [36]. One study showed that individuals with recent criminal justice involvement (i.e., parole, probation, and/or arrest in the past 12 months) were more likely to experience psychological distress, major depression, substance use disorder, and inpatient mental health admissions compared to those without recent involvement [37]. With mental health issues being identified as risk factors for suicide, it makes understanding these links an important endeavor in suicide prevention and prediction [38].

Understanding utilization of services can also play a role in suicide prevention and prediction for individuals with parole involvement. In comparison to the general population, people with recent criminal justice involvement experienced higher rates of hospitalization and emergency room visits, but lower rates of outpatient visits [39,40]. Lower rates of outpatient visits were associated with those who had multiple chronic conditions, but higher associations were found among those who had a mental illness or substance use disorder. Ongoing chronic pain conditions, however, have been linked to higher risks of suicidal ideations [41,42].

An added challenge is the lack of coordination between the prison system and mental health agencies, especially during a time when individuals are facing release from prison earlier than expected. As a result, the transition period between prison and the community is fraught with emotional distress related to the uncertainty of challenges related to housing, continued physical and mental health care, and knowledge related to potential risky behaviors [43]. Those who are released early from prison are likely to face poor planning regarding the transition process, including connections to physical and mental health resources upon release. The risk for mortality among individuals with parole involvement is elevated during the two weeks immediately following release from prison; causes of death include suicide, homicide, drug overdose, and cardiovascular disease [44,45].

A considerable gap in the existing literature concerning suicidality among individuals with parole involvement pertains to the thorough comprehension of concurrent risk factors that amplify the

propensity for suicidal ideation. Additionally, a need exists for methodologies grounded in empirical data analysis, utilizing existing datasets to reveal these co-occurring risk factors. While theories are helpful for understanding human behavior, they may not always capture the full, complex reality of individual experiences. By examining real-world, community-level data, we can uncover the different combinations of circumstances that tend to amplify suicidal thoughts for those with parole involvement. Thus, using a large data analytic technique, such as Classification and Regression Tree (CART), can be helpful in uncovering patterns and higher-order interactions that may not be evident through purely theory-driven analyses. Applying a CART data analysis approach also offers a solution to the constraints inherent in traditional linear regression techniques, which cannot identify meaningful patterns of co-occurring risks [46-48]. Moreover, decision trees offer a structured representation of predictor variables in a hierarchical manner, based on importance [47].

This data-driven method is highly advantageous as it can efficiently screen through large numbers of continuous and binary variables, uncovering previously hidden interactions between them. Additionally, the CART analysis remains robust even in the presence of missing data, a common challenge in large-scale studies, and is not impacted by outliers [47, 49]. The aim of this study was to uncover data-driven interactions associated with predicting suicide ideation among a sample of people with parole involvement. Ultimately, research utilizing data-driven methods is essential to inform prevention and intervention services that can improve the lives of individuals with a parole history, reduce suicide risk, and support their successful reintegration into society.

METHODS

Data source and sample

This cross-sectional study utilized pooled data from the National Survey on Drug Use and Health (NSDUH) spanning 2015 to 2019. The Substance Abuse and Mental Health Services Administration (SAMHSA) conducts an annual survey encompassing community-dwelling individuals in all 50 states and the District of Columbia. A nationally representative sample was derived through a stratified multistage sampling technique. Data collection involved approximately 1-hour audio-assisted computer interviews to ensure confidentiality, given the sensitive nature of drug and alcohol use information. Participants received a \$30 research honorarium for participating. The methods implemented within the current study were in accord with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Informed consent was obtained from all study participants. This study included adult participants aged 18 and older who responded “yes” to the question “Were you on parole, supervised release, or other conditional release from prison at any time during the past 12 months?”, resulting in a sample size of $N=1,725$.

Study variables

Suicidal ideation was the dependent variable and was assessed using a single item: “Over the last 12 months, did you seriously think about killing yourself?” Responses to this item were categorized into ‘0’ (no) and ‘1’ (yes). The following demographic variables were assessed to measure suicidal ideation among individuals on parole: sex, age, race/ethnicity, sexual orientation, marital status, and number of times moved (last year). Sex was coded as ‘0’ (male) and ‘1’ (female). Age was divided into the following categories: ‘0’ (18-20 years old), ‘1’ (21-25 years old), ‘2’ (26-34 years old), and ‘3’ (35+ years old). While the NSDUH dataset included several breakdowns for age, we used this categorization scheme since many of the individuals within this sample fell into the younger age brackets. Race/ethnicity was broken down into the following categories: ‘1’ (non-Hispanic White), ‘2’ (Black/African American), ‘3’ (Latina/o/x), and ‘4’ (Other). The following categories were used for sexual orientation: ‘0’ (heterosexual), ‘1’ (bisexual), and ‘2’ (lesbian/gay). Marital status was coded as follows: ‘0’ (never married), ‘1’ (married), ‘2’ (widowed), and ‘3’ (divorced/separated). Number of moves was dichotomized in the following manner: ‘0’ (0-1 times) and ‘1’ (2 or more times).

The following physical health variables were analyzed: number of reported chronic health conditions, total activities of daily living (ADL) limitations score, and self-rated overall health. The number of reported chronic health conditions was the total number of such reported conditions in an individual, ranging from 0-5. Likewise, total ADL limitations score was based on the reported number of difficulties experienced with everyday physical activities, including hearing, seeing, walking, concentrating, bathing, and running errands independently. Self-rated overall health was a Likert scale measure ranging from ‘1’ (poor) to ‘5’ (excellent).

Several mental health variables were analyzed to determine their effects on suicidal ideation: total acute depression score, needed mental health treatment but did not receive it (last year), took prescription medication for mental health condition (last year), received outpatient mental health treatment (last year), stayed overnight in hospital for mental health treatment (last year), received prescription

medication for mental health treatment (last year), perceived unmet mental health need (last year), and received any mental health treatment (last year). Total acute depression score was the sum and reported frequency of the following symptoms during the prior 30-day period: feeling nervous, feeling hopeless, feeling restless/fidgety, feeling sad, feeling that everything was an effort, and feeling down/worthless/no good. The remaining mental health variables measured over the last year were dichotomous variables coded as '0' (no) and '1' (yes).

Substance use was measured by self-reported use of the following substances/paraphernalia: alcohol, marijuana, cocaine, crack, methamphetamine, pain relievers not prescribed, and needles. Each measure was coded as '0' (no) and '1' (yes).

Data analysis

Using the Statistical Package for the Social Sciences (SPSS) 25, descriptive statistics were utilized to examine the variables and establish the sociodemographic characteristics of the study sample (Table 1) [50]. Data exhibited minimal missing values (approximately 0.08%) for the dependent variable, suicidal ideation, and were addressed through pairwise deletion.

The principal analysis centered on conducting a CART analysis, a nonparametric technique tailored to categorize individuals with a parole history based on their responses to the suicidal ideation variable. CART analyses are recognized for their flexibility in handling data with various measurement levels and interpretability. Unlike conventional regression models, decision trees partition data to unveil connections between suicidal ideation and the independent variables. The hierarchy of nodes segments data into progressively homogenous subgroups, concluding when a fully pure tree is formed, or predetermined growth termination conditions are met. The assessment identifies the most influential independent variable for participant division, guided by preset branching criteria. Nodes are further separated based on their purity using the Gini impurity function.

The model was validated using a 10-fold cross-validation technique. During this process, ten equal-sized clusters of the dataset were randomly and carefully chosen, nine of which were utilized to develop a training set and one to set up a validation set. Each subset was used as the validation set once during the ten iterations of this process. Cross-validation error rates for the decision tree model were calculated by averaging the final classification results from the ten distinct testing groups. The predicted accuracy of the CART model led to its selection. The decision tree was configured to include a minimum of 20 cases for each child node and at least 40 cases for each parent node with a maximum depth of 10 layers. The Gini impurity gauge was used to improve branch splits, while prepruning was used to keep the CART model from overfitting. Performance indicators included sensitivity, specificity, and total accuracy.

This method produced a hierarchical classification structure that highlighted patterns of suicidal ideation risk based on sociodemographic characteristics, health status, mental health, treatment history to provide actionable insights into risk factors specific to individuals with parole involvement. The analysis was computed using the 2020 Salford System's CART software (<https://www.salford-systems.com>).

RESULTS

The demographic characteristics of the sample are displayed in Table 1 and summarized here. Given the predominance of male individuals involved in the criminal justice system, it is not surprising that this sample is also predominantly male (73.3%; *n* = 1,264). Taking the current age breakdowns into consideration, 10.2% of the sample fell within the 18-20 age category; 25.1% of the sample fell within the 21-25 age category; 28.1% of the sample fell within the 26-34 age category; and 36.6% of the sample fell within the 35 and over age category. This sample of individuals with parole involvement was primarily White, with approximately 47.1% falling into this category. Individuals within this sample identified mostly as heterosexual, with 89.4% identifying as such. Within this sample, most individuals (60.3%) reported never being married. Almost three quarters of individuals within this sample (73.9%) reported not moving or having moved only once over the past 12 months.

Table 1. Comparing individuals with parole involvement with and without self-reported suicidal ideation on sociodemographic characteristics (*N* = 1,725).

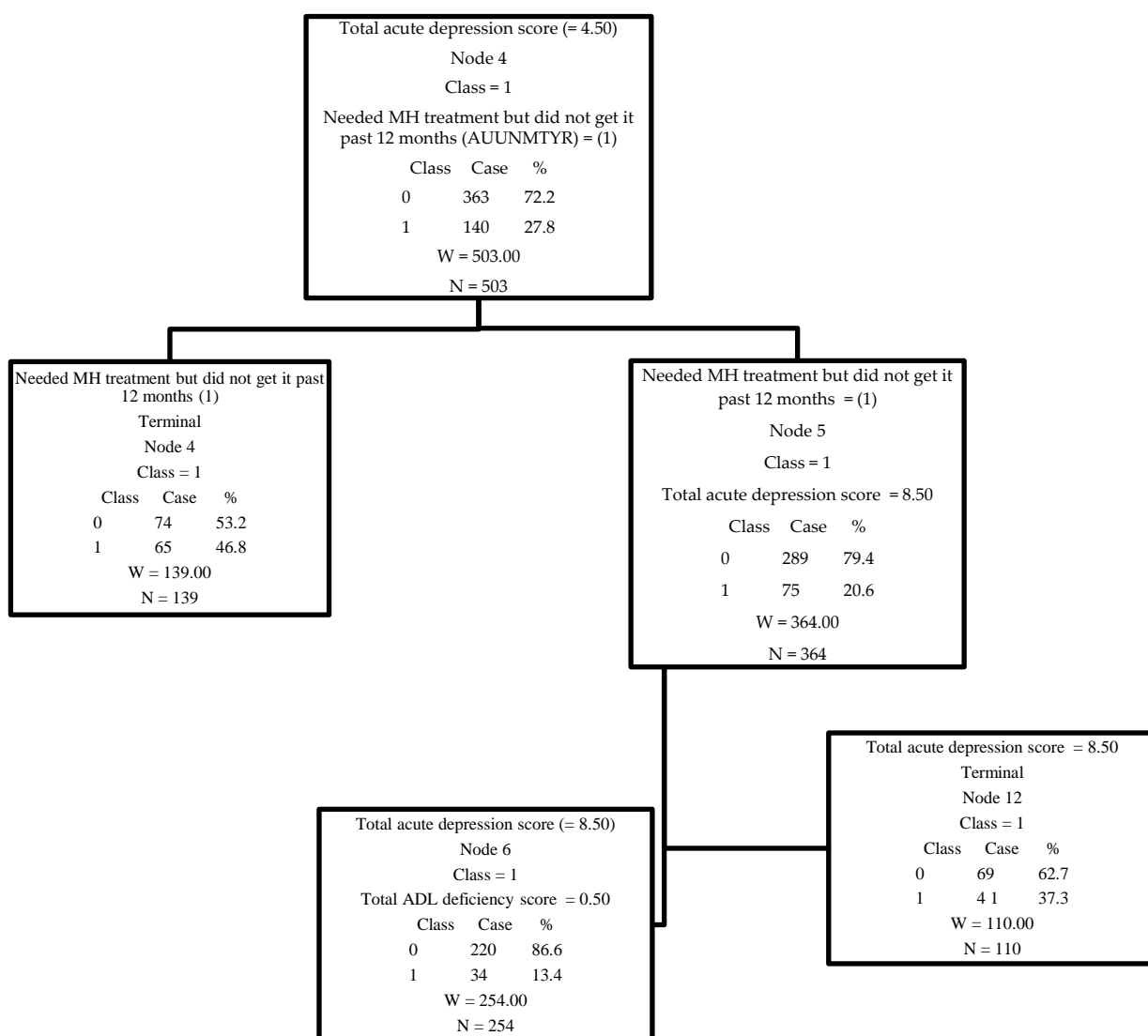
Variable	Without ideation (<i>n</i> = 1548)		With ideation (<i>n</i> = 177)	
	<i>n</i>	%	<i>n</i>	%
Sex				
Male	1154	74.5	110	62.1
Female	394	25.5	67	37.9

Age				
18-20	144	9.3	32	18.1
21-25	390	25.2	43	24.3
26-34	439	28.4	45	25.4
35+	575	37.1	57	32.2
Race/ethnicity				
White	709	45.8	104	58.8
Black	326	21.1	22	12.4
Latina/o/x	339	21.9	29	16.4
Other	174	11.2	22	12.4
Sexual orientation				
Heterosexual	1405	90.8	138	78.0
Bisexual	86	5.6	25	14.1
Lesbian/Gay	44	2.9	12	6.8
Marital status				
Never married	936	60.5	110	62.1
Married	328	21.2	24	13.6
Divorced/Separated	258	16.7	40	22.6
Widowed	26	1.7	3	1.7
Number of moves in the past 12 months				
0-1 times	1163	76.5	112	64.4
2 or more times	357	23.5	62	35.6

The results of the CART analysis are illustrated in Figure 1, 2, and 3 (please note the results were split into multiple figures for greater clarity). The CART model, which seeks to identify significant factors associated with suicidal ideation among individuals with parole involvement constructs a tree model by dividing the independent variable space into regions with similar response variables. The terminal nodes of the tree represent the final regions, with each node specifying conditions that partition an existing region. CART results suggest that the optimal tree sequence included 27 trees with 2 terminal nodes. The accuracy of the structure of suicide ideation classification was 80% correct. Moreover, results show that the CART structure achieved an 81.40% specificity, or correctly identified 81% of individuals with a history of parole who did not profess to having suicidal ideation but will misclassify 19% of such cases. In terms of sensitivity, the CART structure achieved a sensitivity score of 70.62%; it correctly identified people with parole involvement who endorsed suicidal ideations, but it will fail to identify roughly 30%. In Figure 1, the topmost rectangle represents the root node, encompassing 100% of the participants. Within this, 10.3% ($n = 177$) of individuals with parole involvement reported having suicidal ideation (“yes”), while 89.7% ($n = 1,548$) indicated “no suicidal ideation.”

The initial split of the participant group was based on their acute depression score, which was a sum of how many depressive symptoms (out of 9 possible symptoms) were positively affirmed by respondents (TOTALACDEP), using a threshold of 4.5 to partition the data. Those participants who reported less than 4.5 depressive symptoms ($n=1,222$) were directed to the left and downward, forming a child node. Within this subgroup, 10% of individuals who responded “yes” to the question about needing mental health treatment within the past 12 months but not receiving it (AUUNMTYR) reported experiencing suicidal ideation. In contrast, among those who answered “no” to the same question, only 2.6% reported having suicidal ideation.

Figure 1. Classification and regression tree results; root node.



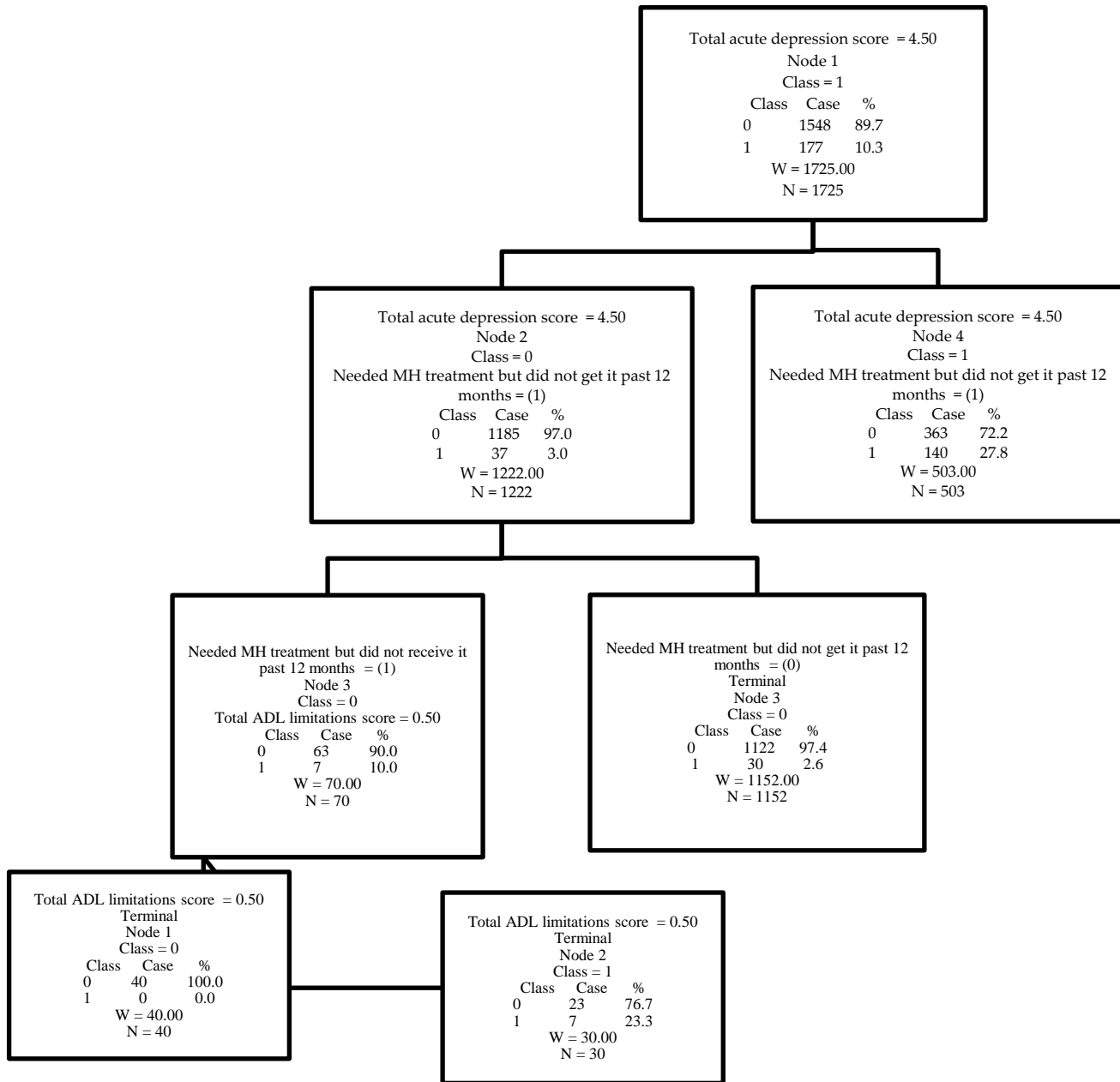
The next split consisted of participants who indicated “yes” on needing mental health treatment within the past 12 months but did not receive it underwent further branching into a child node. Interestingly, within this node, 23.3% of participants with an “activities of daily living limitations” (TOTALADL) score greater than 0.5 also expressed experiencing suicidal ideation. Notably, none of the participants with a score less than 0.5 for depression symptoms reported having suicidal ideation.

Following the initial split based on depression symptoms, participants who reported more than 4.5 depressive symptoms ($n=503$) branched rightward and downward to a child node (see Figure 2). In this subgroup, 46.8% of those who responded “yes” to “needed mental health treatment but did not get it past 12 months” reported having suicidal ideation, while 20.6% of those who answered “no” on “needing mental health treatment but did not get it in the past 12 months” reported suicidal ideation. Participants who reported not “needing mental health treatment but did not get it in the past 12 months” were further split based on the level of depression symptoms, where 37.3% of those who reported more than 8.5 symptoms expressed suicidal ideation, compared to 13.4% of those who reported less than 8.5 symptoms (see Figure 3).

Subsequently, participants who reported less than 8.5 depression symptoms split based on 0.05 of “total activities of daily living limitations”, with those having less than 0.05 of “total activities of daily living limitations” influenced by the interactions of “ever used pain reliever not directed by a doctor” (PNRNMLIF) and “ever used cocaine” (COCEVER). Of those individuals with a history of parole with more than 0.05 of “TOTALADL” were affected by the interactions of “self-rated health” (HEALTH), “Age” (CATAG7), and “Total ADL limitations score” (TOTALADL). More specifically, for persons with parole involvement, interactions exist between reporting less than 8.50 depressive symptoms, reporting more than .50 ADL limitations, reporting fair to poor health, being ages 18-20 years old and 35 years and

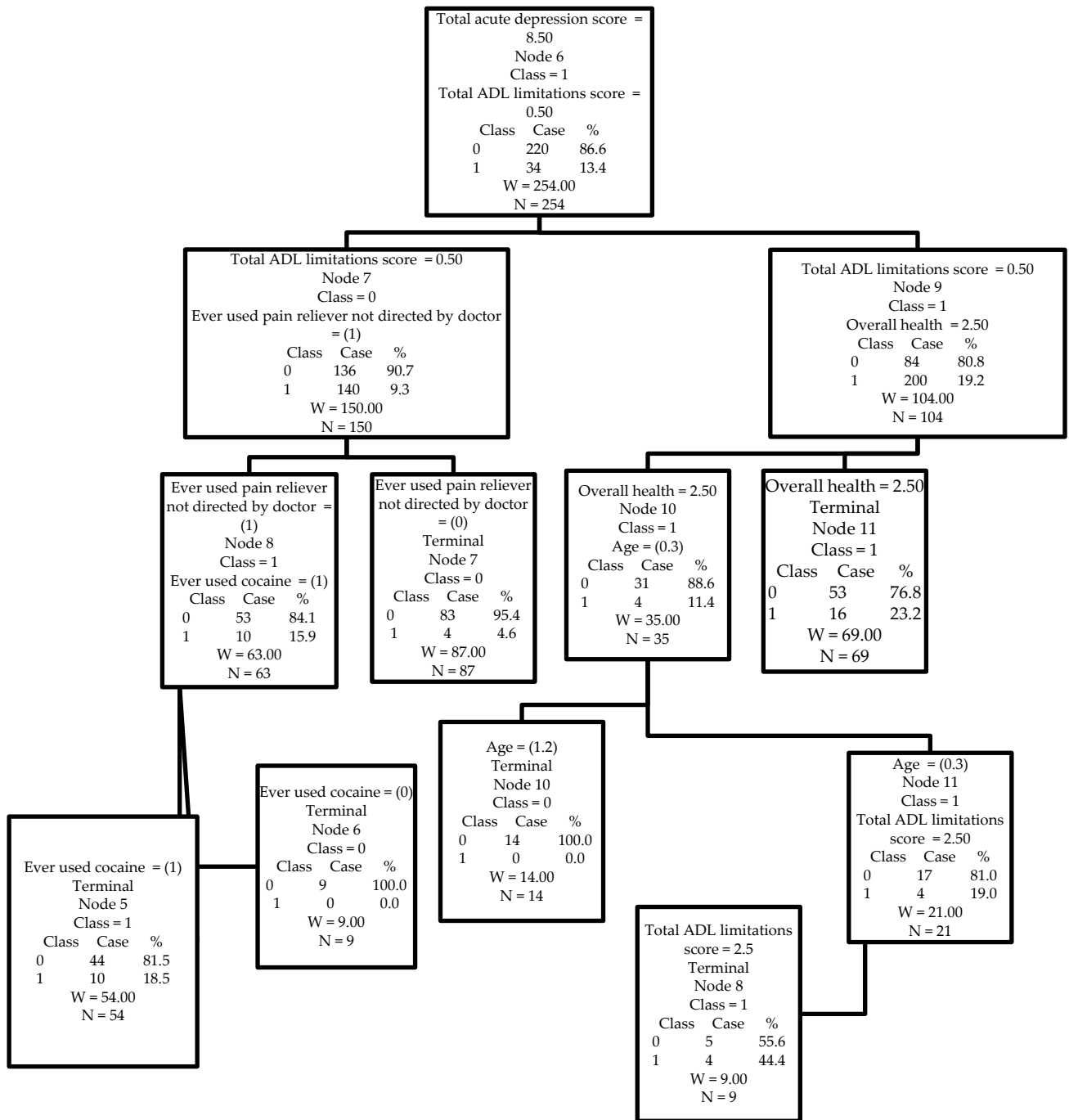
older, and reporting less than less than 2.50 ADL limitations corresponded with reporting suicidal ideation.

Figure 2. Classification and regression tree results; child nodes.



For each class, the highest prediction accuracy was observed for suicidal ideation (70.62%), followed by no suicidal ideation (81.40%). The CART software provides “variable importance scores,” (see Figure 4) with the variable receiving a score of 100 indicating the most influential independent variable for predicting suicidal ideation. Based on these scores, depression symptoms was the most influential variable (100%), followed by needed MH treatment but did not receive it in the past 12 months (50.08%), total ADL limitations score (48.96%), took any prescription medication for MH condition past 12 months (32.12%), received outpatient MH treatment past 12 months (24.86%), stayed overnight in hospital for MH treatment past 12 months (22.01%), sexual identity (11.53%), and ever used pain reliever not directed by doctor (10.68%). Other variables such as ever used crack, ever used cocaine, participant sex, ever used marijuana, race/ethnicity, ever used needle to inject drugs, age, and residential stability ranged between 10% to 5%, while health, number of chronic conditions, ever used alcohol, and ever used methamphetamines had importance scores of less than 5%.

Figure 3. Classification and regression tree results; terminal nodes.



DISCUSSION

The present study contributes to addressing a significant knowledge gap concerning the co-occurrence of suicidal ideation among individuals with parole involvement. We used a CART analysis to identify the co-occurrence of multiple risk factors associated with this vulnerable population. Among those on parole who reported experiencing suicidal ideation, our CART model revealed several influential factors contributing to this complex issue. The identified factors encompassed a wide range of aspects, including depression, unmet mental health treatment needs within the past 12 months, activities of daily living (ADL) limitations, the use of prescription medication for mental health conditions within the past year, participation in outpatient mental health treatment within the past year, hospitalization for mental health treatment within the past year, sexual identity, misuse of pain relievers, crack/cocaine use, participant gender, marijuana use, race/ethnicity, needle use for drug injection, age, and residential stability.

These factors were integrated into a comprehensive 27-stage tree structure to provide insights into the multifaceted nature of suicidal ideation among individuals with parole involvement. The findings

revealed that depression symptoms carried the highest variable importance score of 100% in predicting suicidal ideation within this population. This finding highlights the critical importance of addressing mental health concerns among individuals with parole involvement, particularly those suffering from depression symptoms, to mitigate the risk of suicidal ideation and provide targeted interventions.

Figure 4. Variable importance scores in the prediction of suicidal ideation among individuals with parole involvement.

Variable	Score	
TOTALACDEP	100.00	
AUUNMYR	50.08	
TOTALADL	48.96	
AURXYR	32.12	
AUOPTYR	24.86	
AUNPYR	22.01	
SEXIDENT	11.53	
PNRNMLIF	10.68	
CRKEVER	9.74	
COCEVER	9.05	
IRSEX	8.41	
MJEVER	8.21	
RACE4	8.05	
ANYNEEDL	6.80	
CATAG7	5.98	
MOVEDDUMMY	5.18	
HEALTH	4.77	
CHRONCOND	4.44	
ALCEVER	3.78	
METHAMEVR	1.42	

Our findings highlight the relationships among individuals with parole involvement; participants who professed less than 4.50 depressive symptoms, in conjunction with unmet mental health treatment needs, play a pivotal role in predicting the presence of suicidal ideation. This finding emphasizes that even mild depression symptoms can play a significant role in driving thoughts of suicide in individuals with a parole history who need mental health treatment but did not receive it. This result highlights the importance of directing greater attention to individuals with parole involvement who show lower levels of depressive symptoms, particularly among those who need mental health treatment but remain underserved. This finding is consistent with numerous studies highlighting these relationships, especially since depression and not receiving mental health services though needing them are consistently one of the strongest predictors of suicidal thoughts [51-53]. This co-occurrence is notable since individuals experiencing depression often have a sense of hopelessness, which can lead to thoughts of self-harm or suicide. When one recognizes the need for mental health services but does not receive them, their depression remains untreated, and the risk of suicidal ideation persists. Moreover, the experience of needing mental health services but being unable to access them can cause significant psychological pain. This pain may intensify depressive symptoms and contribute to suicidal ideation to escape the suffering [54, 55]. It is important to underscore the urgency of ensuring that individuals with parole involvement who require these potentially life-saving services receive them without delay.

Findings reveal a noteworthy interaction among several factors: the demand for mental health services without corresponding access to treatment, the presence of more than .50 impairment in ADL, lower forms of depressive symptoms, misuse of pain relievers, and endorsement of suicidal ideation. Previous research has already shown the connections between ADL limitations and depression and suicidal ideation [42,56-59]. Misuse of prescription pain relievers has been identified as a predictor of suicidal ideation [60,61].

These associations are well-documented within various age groups but are novel findings for individuals with parole involvement. It is plausible that, among individuals with parole involvement, the convergence of ADL limitations and depressive symptoms promotes a compounded sense of suffering. Furthermore, individuals with parole involvement, contending with ADL limitations, may confront considerable barriers when seeking support services designed to address their physical and mental health requirements. This hindrance can result in unmet needs, making emotional distress even harder to bear. Moreover, this lack of self-sufficiency may engender feelings of frustration and inadequacy, consequently elevating the risk of experiencing thoughts of suicide.

Given this backdrop, it is not surprising that an interaction exists between these variables and use of prescription pain relievers without a doctor authorization. It is plausible that these individuals turn to pain relievers as a means of self-medicating and coping with their depression, physical limitations,

unmet mental health needs, addiction, and the difficulties they face when reintegrating into the community [62]. They may also be self-medicating because they want to avoid seeking professional mental health services because of concerns about being judged or stigmatized [63].

The findings also indicate that the presence of suicidal ideation was associated with several factors, such as total depression scores exceeding 8.50, increased limitations in ADL, poorer perception of health, and individuals at both ends of the adult spectrum, particularly those aged 18-20 and individuals aged 35 years or older who are on parole. There is research that supports these relationships independently, but this is the first study that has identified a link between these co-occurring variables and suicidal ideation.

Research also indicates that suicidal ideation is predicted by poorer self-perceived health, living with multiple ADL limitations, young adults between the ages of 18-29 years old [55, 64-68]. Struggling with poor health can intensify levels of vulnerability and emotional distress, increasing the likelihood of experiencing suicidal ideation. When individuals live with increased ADL limitations, it becomes challenging for them to carry out essential self-care tasks, which, in turn, heightens their reliance on family members or caregivers. This growing dependence can lead to feelings of being a burden on those providing care, subsequently raising the risk of suicidal thoughts. This finding lends credence to Joiner's interpersonal theory of suicide, which suggests that perceived burdensome, or perceiving oneself as a source of strain and liability for family or friends may influence an individual's decision to contemplate suicide [69].

Moreover, unique stressors affect different age groups, particularly younger (aged 18-20) and older individuals (aged 35 and older) with parole involvement. Younger individuals may find themselves under immense pressure while navigating the complexities of transitioning into adulthood, including facing the consequences of their previous actions that landed them in prison. In contrast, older individuals with parole involvement may encounter the daunting task of reintegrating into society after enduring the challenges of incarceration, and the aging process. These life adjustments, accompanied by their associated complexities, can significantly contribute to the development of suicidal ideation within these specific age groups. Thus, it is important to recognize that these factors often interact and exacerbate one another, increasing the risk of suicidal ideation.

Limitations

Several limitations should be acknowledged that are associated with this study. First, the cross-sectional design does not allow for the examination of variables over time, which prevents making causal inferences. A longitudinal design would be necessary to understand the causal relationships and temporal order between health, mental health, substance use, and suicidality. Second, while the sample participants reported being on parole in the past year, the duration of their parole status or whether they were still on parole during the completion of the survey is unknown. Moreover, the length of time an individual has been on parole is important since previous research indicates that the threat of suicide is elevated in the immediate period following release [44,45,70]. Controlling for a length of time on parole variable could have altered the results. Third, the reliance on participants' self-reports introduces the potential for under- or over-reporting, particularly when responding to sensitive questions. For example, questions gauging levels of substance use are prone to underreporting, particularly in the context of race/ethnicity and the presence of co-occurring disorders [71,72].

It is plausible that sample participants may have felt inclined to adjust their responses to conform to societal expectations based on their parole status. Enhancing the objectivity and accuracy of the data could be achieved by incorporating diverse assessment methods, such as in-depth individual interviews or documented medical histories. Third, the suicide ideation measure was a single item and focused on suicide thoughts, which may not fully capture the intricacies of this concept. Future studies would benefit from using validated multi-item instruments that capture the broader suicidality spectrum, such as suicide severity and persistence. Last, the focus of this study was to examine the risk of suicide ideation among individuals with parole involvement. The analysis did not assess for other salient aspects of the suicidality spectrum such as suicide planning, intensity of suicidal thoughts, or suicide attempts. Future research should focus on the specific areas of mental health needs that were not received to draw a connection between individuals with parole involvement moving from suicidal ideation to suicide attempts. For example, factors that contribute to anxiety may contribute to people with parole involvement moving from suicidal ideation to an attempt [20].

Implications

The findings from this research may have significant implications for early detection of risk factors among individuals with parole involvement before suicidal ideation progresses to an attempt. The finding that depression symptoms were the most influential variable, followed by needed mental health

treatment but did not get it in the past year lends support to the notion that early detection before release and intervention in the community could be beneficial to prevent suicidality among individuals with parole involvement. Early detection and intervention have been shown to be effective in reducing psychopathology and improving long-term mental health outcomes [73]. Research suggests early detection screening is feasible in a prison setting and is effective at identifying individuals meeting the criteria for self-harm, depression, anxiety, and psychological distress [74]. It is recommended that when individuals on parole are identified as being at high risk for self-harm, whether in a prison setting or in the community, individual intervention plans should be developed to address their specific mental health needs before any attempts are made. Providing targeted support and assistance can potentially prevent the escalation of moving from suicidal thoughts to behaviors.

In the sampled population, it was observed that ADL limitations often coexisted with both physical and psychological ailments. Among these limitations, cognitive impairment emerged as the most prevalent, resulting in challenges related to concentration, memory, and decision-making for individuals with parole involvement. Therefore, it is prudent for professionals working with individuals with parole involvement to refer them to integrated primary care facilities that endorse and practice psychosomatic treatments. The implementation of integrated treatment yields the most favorable outcomes for addressing co-occurring concerns [75].

These comprehensive treatment plans may encompass medication regimens for managing specific disorders, complemented by a variety of behavioral therapies. This holistic approach ensures that comorbid conditions do not go unnoticed. Moreover, it is important to recognize that comorbidity transcends the mere coexistence of two distinct diseases following their natural courses. Instead, it has the potential to exacerbate the prognosis of all concurrent conditions, heighten the probability and severity of complications, and add layers of complexity to the treatment of each condition, ultimately diminishing its effectiveness [76,77].

An additional measure for combatting mental health issues and suicidality among individuals with a parole history that should be considered is knowledge. Mental health literacy (MHL) refers to someone's understanding and beliefs about mental disorders regarding their identification, handling, and prevention [78]. Increasing MHL for individuals with parole involvement could assist in addressing the issues identified in this study as it relates to not only identifying the symptoms of depression but also knowing how to seek help and thus reducing the rates of unmet needs for seeking mental health treatment. Individuals with increased levels of MHL can be more conscious of mental health issues and know where to seek assistance; however, those with poor MHL are less likely to seek treatment and perpetuate stigmas related to mental health. In a study of the general population during the COVID-19 pandemic, it was noted that overall MHL is poor and that poor levels of MHL were linked to symptoms of depression and anxiety, higher levels of stress, stigmas related to mental health as well as a barrier to seeking treatment [78].

Studying the impacts of providing MHL with this population would be an important endeavor for not only reducing rates of suicidality but also empowering individuals with a parole history to confidently navigate their mental health needs [79-84]. A caveat to consider is that MHL should also include officials within the criminal justice system. A study of approximately 300 probation officers who were provided mental health education found that it not only increased the officers' knowledge of mental health concerns but also decreased any stigmas related to mental health, which can be of benefit to not only their well-being but the well-being of those they serve [85].

CONCLUSION

The study utilized a data driven approach, which may complement those studied that are theory driven. Data analytics, such as the one used in this study, has the potential to move the science of suicide research forward since it can uncover hidden patterns, identify high-risk subgroups, and uncover higher order interactions based on influence. The findings reveal that total acute depression scores, lower and higher, had a significant impact on suicide ideation among individuals within the current sample. Among individuals with parole involvement, even milder forms of depression can become significant issues when they intersect with unaddressed mental health needs, ADL limitations, and the misuse of pain relievers without proper medical oversight.

Findings also show that among persons on parole, more severe forms of depression symptoms can compound mental health challenges, particularly when they coincide with heightened ADL limitations, a poorer perception of health, and the unique experiences of individuals at both ends of the adult spectrum, particularly those aged 18-20 and individuals aged 35 years or older. These combinations of factors create a complex and potentially dangerous environment that elevates the risk of suicidal ideation, underscoring the critical need for comprehensive support and intervention strategies within

this population. Although considerable efforts have been made in both research and practice to shed light on these issues, there has been a noticeable lack of focus on the provision of community resources and mental health treatment during and post incarceration.

It is imperative to recognize that people in the criminal justice system eventually reintegrate into our communities. Thus, it becomes vital to bridge the gap by beginning to offer treatment and resources during their incarceration but also creating a comprehensive discharge plan when these individuals prepare to reenter the community setting. This approach not only mitigates the barriers to accessing care but also contributes to enhancing their overall physical and mental well-being. Ultimately, addressing mental health concerns within the criminal justice system is a critical step towards holistic community well-being and successful community reintegration.

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