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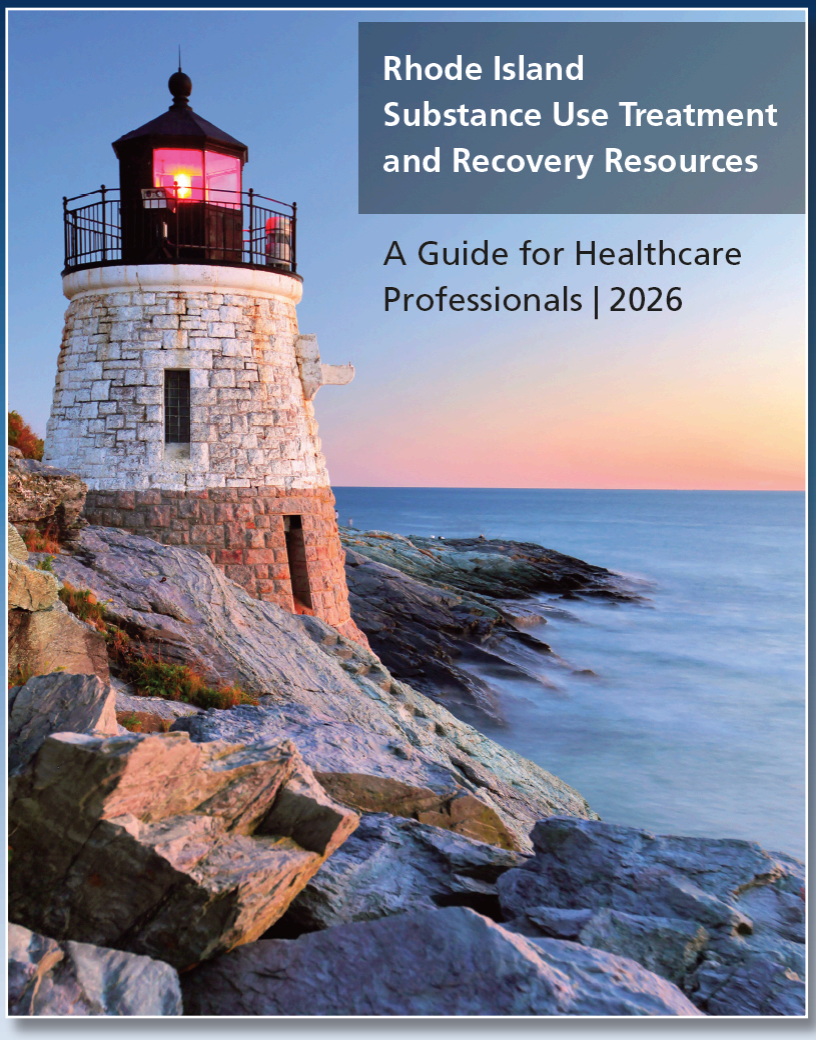


SPECIAL SECTION

BEHAVIORAL HEALTH, PART 2

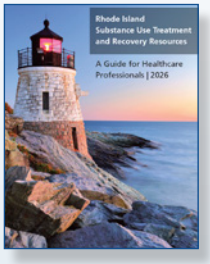
GUEST EDITORS: SUZANNE E. McLAUGHLIN, MD; NATALIE FENN, PhD; PAUL M. WALLACE, MD

SEPTEMBER 2026 VOLUME 109 • NUMBER 9 ISSN 2327-2228

RHODE ISLAND MEDICAL JOURNAL

September: National Recovery Month

September is National Recovery Month, an annual observance dedicated to raising awareness about substance use disorders, mental health conditions, and the reality that recovery is possible. The observance is coordinated by the Substance Abuse and Mental Health Services Administration (SAMHSA), the federal agency responsible for behavioral health programs in the United States. For more information, visit: https://www.samhsa.gov/about/digital-toolkits/recovery-month/toolkit



RI Substance Use Treatment and Recovery Resources

Rhode Island offers a variety of behavioral health resources and services for people experiencing mental health and/or substance use conditions. Healthcare professionals are encouraged to use this resource guide to refer patients and/or clients of all ages (from children to adults) to services ranging from immediate crisis management and harm reduction to treatment and recovery support services.

Additional resources are available via the Rhode Island Department of Behavioral Healthcare, Developmental Disabilities & Hospitals (BHDDH) and PreventOverdoseRI.org.

The resource guide is available at: https://health.ri.gov/sites/g/files/xkgbur1006/files/publications/guides/RI-Substance-Use-Treatment-and-Recovery-Resources.pdf

SPECIAL SECTION
Behavioral Health, Part 2

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GUEST EDITORS

(Part 1 was published in the May 2026 issue of RIMJ, available at: http://www.rimed.org/rimedicaljournal/2026/05/2026-05-01-bh-complete.pdf)

SEPTEMBER 2026
VOLUME 109 • NUMBER 9

RHODE ISLAND MEDICAL JOURNAL

RHODE ISLAND MEDICAL JOURNAL (USPS 464-820), a monthly publication, is owned and published by the Rhode Island Medical Society, 225 Dyer Street, 2nd Floor, Providence RI 02903, 401-331-3207. ISSN 2327-2228. Published articles represent opinions of the authors and do not necessarily reflect the official policy of the Rhode Island Medical Society, unless clearly specified. Advertisements do not imply sponsorship or endorsement by the Rhode Island Medical Society.

Biological Embedding of Adverse Childhood Experiences: Neurobiological and Immune Mechanisms Linking Early-Life Stress to Addiction Vulnerability

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ABSTRACT

Adverse childhood experiences (ACEs) are associated with elevated risk for substance use disorders (SUDs), yet prevailing accounts often emphasize psychosocial pathways and reward-circuit recalibration without fully articulating immunobiological mechanisms that may converge on these processes. This narrative review advances a biological embedding framework linking early adversity to SUD vulnerability through two partially overlapping pathways: 1) stress–reward neurodevelopmental recalibration and 2) immune embedding with downstream neuroimmune feedback. Drawing on epidemiologic and mechanistic studies across developmental psychopathology, addiction neuroscience, and psychoneuroimmunology, we synthesize evidence that ACE exposure can produce enduring alterations in stress-regulatory systems (e.g., hypothalamic-pituitary-adrenal axis and autonomic function) alongside low-grade inflammatory phenotypes characterized by altered cytokine signaling and glucocorticoid sensitivity. We then highlight convergent evidence that peripheral immune activation can influence central reward and affective processes via microglial priming, cytokine-mediated modulation of monoaminergic systems (particularly dopamine), and tryptophan-kynurenine metabolism, potentially contributing to anhedonia, negative affect, and craving-relevant reinforcement dynamics. Next, we describe limitations of the present review and of the broader evidence base, as well as priority research directions. We conclude by arguing that integrating immune embedding with stress-reward recalibration may clarify one pathway by which ACEs confer SUD vulnerability and may inform trauma-informed, neurobiologically grounded approaches to prevention and treatment.

KEYWORDS: Adverse childhood experiences; substance use disorder; alcohol use disorder; biological embedding; inflammation

INTRODUCTION

Substance use disorders (SUDs) emerge from complex, multilevel processes that begin long before substance use initiation. Among the early-life conditions that shape these trajectories, adverse childhood experiences (ACEs) stand out as particularly consequential. ACEs comprise 10 forms of household-level adversity—including abuse, neglect, and chronic family dysfunction—that capture recurrent disruptions in caregiving environments during formative periods of development.[1,2] Across epidemiologic studies, higher ACE burden is associated with earlier initiation,[3] more rapid escalation,[4] and more persistent, hazardous substance-use trajectories.[4-6] These associations extend to SUD onset[7] and severity[3,4,8] and typically show dose–response gradients.[3,4,8] Clinical data parallel these trends. Individuals entering SUD treatment commonly report substantial early adversity,[9] and higher ACE scores often coincide with more severe disorder presentations,10 greater psychiatric comorbidity,[11] and more limited improvement during treatment.[12,13] Such findings indicate that ACEs are not merely correlates of substance misuse but formative conditions that alter developmental risk architecture, shaping how individuals engage with stress and reward across the lifespan.

The developmental impact of ACEs is increasingly understood through the framework of biological embedding, whereby early adversity calibrates the developing brain and body in enduring ways, shaping the maturation and long-term functioning of key regulatory systems.[14] In particular, two partially overlapping pathways appear especially influential in shaping vulnerability to substance use: 1) a stress–reward neurodevelopmental pathway, in which chronic activation of stress physiology alters the maturation and connectivity of limbic–prefrontal circuits; and 2) an immune-embedding pathway, in which sustained inflammatory activity feeds back on the brain through neuroimmune signaling. Together, these alterations may operate both independently and in concert, establishing a biological milieu in which substance exposure more readily promotes maladaptive, self-reinforcing use patterns. The sections that follow review epidemiologic evidence linking ACEs to substance-use trajectories and then synthesize mechanistic findings that clarify how early adversity becomes biologically embedded through these two pathways. We conclude with a description of limitations and future research directions.

EPIDEMIOLOGICAL FINDINGS ON ACES AND SUBSTANCE USE

ACEs are notable for the consistency and magnitude of their association with substance-related outcomes. Across large cohort and survey studies, higher ACE scores are linked to characteristic alterations in substance-use trajectories, including earlier initiation,[3] more rapid transition from experimentation to regular use,[4] and greater persistence of high-risk patterns into adulthood.[4,5] These developmental shifts correspond with substantial increases in risk. Individual ACE categories are associated with roughly two- to four-fold higher odds of early initiation of illicit drug use, and risk increases in graded fashion with higher cumulative scores.[15] At the highest levels of adversity, this gradient steepens further, with individuals reporting four or more ACEs exhibiting approximately four- to twelve-fold higher odds of problematic alcohol or drug use compared with those reporting none.[16,17] Importantly, these associations broadly generalize across alcohol, opioids, stimulants, and polysubstance involvement,[8] suggesting that early adversity confers a broad liability toward dysregulated reinforcement rather than a narrow, drug-specific vulnerability.

NEUROBIOLOGICAL EMBEDDING OF ACES (PATHWAY 1)

Stress System Adaptations

One way early adversity may shape SUD risk is by recalibrating the developing stress-response system, particularly the hypothalamic-pituitary-adrenal (HPA) axis. In typical development, cortisol secretion follows a diurnal rhythm and is tightly regulated by glucocorticoid receptor (GR)-mediated negative feedback.[18] Chronic childhood adversity, however, can disrupt this calibration. Excessive or recurrent HPA activation during sensitive developmental periods can induce adaptive but ultimately dysregulating changes in HPA set points and responsivity.[19-22] Studies of children and adults with high ACE exposure frequently document altered diurnal cortisol patterns, including flattened slopes and elevated afternoon or evening cortisol, as well as atypical cortisol reactivity profiles, with either blunted or exaggerated responses to acute stress depending on the timing, chronicity, and severity of adversity exposure.[19-24] These findings align with widely cited stress-response models positing an initial phase of hyperreactivity followed by counter-regulatory hyporeactivity under sustained demand.[20]

A common thread across these endocrine phenotypes is diminished GR sensitivity. Evidence from peripheral and central studies suggests that chronic early stress weakens the body's ability to regulate the HPA axis through cortisol, its primary glucocorticoid hormone. Peripherally, adolescents with adversity histories show elevated cumulative cortisol output alongside reduced suppression of T-cell activation by dexamethasone, consistent with partial glucocorticoid resistance.[25] At the neural level, ACEs such as childhood maltreatment have been linked to increased methylation of the exon 1F NR3C1 promoter and reduced GR mRNA expression in hippocampal tissue.[26] Moreover, because GRs are densely expressed in the amygdala, hippocampus, and prefrontal cortex, weakened feedback can prolong or dysregulate cortisol signaling in these regions, increasing susceptibility to structural and functional alterations.[24,27]

Neuroimaging findings provide support for this mechanistic account. In some functional imaging studies, ACE exposure is associated with heightened amygdala reactivity to emotional or threatening cues and reduced recruitment of medial and lateral PFC regions during cognitive control or reappraisal tasks in both adolescents and adults.[28,29] Structural imaging work similarly reports reduced hippocampal and, in some samples, smaller medial PFC and amygdala volume among those with documented childhood trauma.[28,30] Diffusion tensor imaging extends evidence from regional effects to circuit integrity, documenting weaker white-matter connectivity in frontal-limbic pathways, including tracts linking the amygdala and PFC.[29] Collectively, these results suggest a developmental calibration toward a stress-sensitized phenotype, wherein rapid bottom-up threat detection is more readily engaged and prefrontal modulation and hippocampal contextualization are less effective.[28,29] This phenotype is clinically meaningful because heightened negative affect in the setting of diminished regulatory capacity can make the rapid affective relief produced by substances especially reinforcing, amplifying risk for escalation and compulsive patterns of use.[31]

Reward System Adaptations

ACEs may also shape the development of the brain's reward circuitry.[8,32] The mesocorticolimbic dopamine system—encompassing dopaminergic neurons in the ventral tegmental area (VTA) and projections to the PFC, nucleus accumbens (NAc), amygdala, and hippocampus—underlies motivation, pleasure, and reinforcement learning.[32] This system undergoes protracted maturation from childhood through adolescence, making it particularly sensitive to environmental input.[32] Converging evidence suggests that early adversity can recalibrate this circuit, often in the direction of reduced responsiveness to natural rewards.[8,32] At the behavioral level, children and adolescents exposed to maltreatment or neglect frequently show dampened responsiveness to positive outcomes and altered reward-based learning.[8,32] On tasks that require rapid responding to obtain incentives, maltreated youth may respond more slowly, earn fewer rewards, or fail to adjust behavior when contingencies change.[8,32] They also often display increased impulsivity and risk-taking, which may reflect attempts to compensate for a muted sense of reward or difficulty integrating feedback about long-term consequences.[8,32] Mechanistically, these behavioral patterns are consistent with a reward system that is less responsive to everyday reinforcers and more prone to seek intense or immediate stimulation.

Neuroimaging work also provides support for altered reward processing following ACE exposure. Functional MRI studies report reduced activation of the ventral striatum during anticipation or receipt of rewards in individuals with childhood trauma histories.[32] This blunted ventral striatal response has been observed across various types of rewards, including monetary gains and social approval, and in both adolescent and adult samples.[32] Longitudinal studies further suggest that reduced ventral striatal activation during adolescence may help explain associations between early adversity and later depressive symptoms,[32] which themselves are robustly associated with problematic substance use.[33,34] Studies also report altered functional connectivity between reward regions and prefrontal areas, potentially reflecting compensatory or maladaptive attempts at regulation.[32] Although molecular data in humans are more limited, animal models of early stress show enduring changes in dopamine receptor expression and firing patterns in mesolimbic pathways, consistent with a shift in the sensitivity and tuning of the reward system.[32,35]

The clinical implications of a hyporesponsive reward system are substantial. If typical sources of pleasure and motivation fail to produce adequate dopaminergic signaling, individuals may experience chronic anhedonia and low drive,[36] which can make the pharmacological effects of substances especially salient.[35] Psychoactive drugs provide a rapid and large-amplitude increase in dopaminergic activity in the NAc, temporarily overcoming endogenous reward deficits.[35] In this context, substances can function not only as tools for numbing negative affect,[31] but also as means of briefly normalizing a chronically blunted reward state. This dual role, i.e., relief of distress and enhancement of otherwise muted reward, provides a powerful learning signal that can set the stage for repeated use and, eventually, addiction.[8,31]

IMMUNE EMBEDDING OF ACES (PATHWAY 2)

In parallel with these neuroendocrine and neural alterations, early adversity is increasingly understood to leave a durable imprint on the immune system. These alterations can be understood in part through stress-related shifts in autonomic regulation. Repeated activation of the sympathetic branch—which mediates the "fight-or-flight" response—promotes sustained catecholamine release,[37] engaging transcriptional programs that bias immune cells toward proinflammatory gene expression, notably via nuclear factor κB (NF-κB)–mediated signaling.[25] Concurrently, chronic recruitment of the HPA axis can generate persistent elevations in glucocorticoids, fostering partial resistance across time.[25] As this resistance emerges, glucocorticoids lose their typical capacity to restrain inflammatory signaling pathways, including NF-κB, allowing proinflammatory activity to persist.[25] These pressures may help account for the increased basal levels of inflammatory mediators, including interleukin-6 (IL-6), tumor necrosis factor–α (TNF-α), and monocyte chemoattractant protein-1 (MCP-1), commonly observed in ACE-exposed individuals.[25,38-41]

Inflammation, in turn, communicates extensively with the brain. Circulating cytokines can access the central nervous system via humoral routes across the blood–brain barrier,[42] as well as through neural pathways such as vagal afferents.[43] Within the CNS, microglia and other glial cells respond to peripheral inflammatory signals by releasing additional cytokines, reactive oxygen species, and neuroactive metabolites that modulate synaptic plasticity and neurotransmission central to mood and motivation.[44] For example, inflammatory signaling can reduce dopamine synthesis by depleting tetrahydrobiopterin, an essential cofactor for tyrosine hydroxylase, and increase dopamine reuptake through upregulation of presynaptic transporters, effectively dampening dopaminergic tone in striatal regions.[45] In parallel, cytokine-induced activation of the kynurenine pathway can shift tryptophan metabolism toward neuroactive metabolites that influence glutamatergic transmission and neurotoxicity.[46] The net result is a neurochemical milieu characterized by anhedonia, fatigue, and motivational deficits—symptoms that overlap with both depression and early addiction vulnerability.[47]

Importantly, these immune processes may intersect directly with substance exposure. Alcohol, for example, increases intestinal permeability, facilitating translocation of bacterial lipopolysaccharide (LPS) into circulation.[48,49] LPS engages toll-like receptor 4 (TLR4) and stimulates NF-κB–mediated cytokine production, amplifying cytokine release and promoting systemic immune activation.[50] Preclinical models indicate that TLR4 activation enhances alcohol intake, raising the possibility that gut-derived inflammation may feed back to sustain some types of substance use.[51] Human studies similarly show that elevated inflammatory markers such as IL-6 and C-reactive protein are associated with heavier substance use and poorer treatment outcomes. For example, in opioid use disorder, higher circulating IL-6 predicts greater ongoing drug use, poorer methadone adherence, and increased risk of early dropout.[52] Parallel neuroimmune evidence for alcohol use disorder indicates that chronic heavy drinking elevates central cytokines, including MCP-1 and IL-6, and engages neuroinflammatory cascades linked to craving and negative affect.[53] From this perspective, inflammation functions not only as a downstream consequence of ACEs and substance use but may also serve as an active mechanistic contributor that shapes reward sensitivity, negative affect, and craving.

LIMITATIONS OF PRESENT REVIEW

The account developed in this review is necessarily selective. For clarity and space, ACEs were treated as a cumulative exposure, and substance use outcomes were discussed

at an aggregate level, prioritizing shared biological pathways over fine-grained distinctions. Yet both domains are heterogeneous in ways that almost certainly matter for etiology. Different ACE constellations (e.g., threat-related versus deprivation-related exposures) likely engage partially distinct neurodevelopmental mechanisms,[28] even as they converge on overlapping stress, reward, and immune phenotypes. Likewise, alcohol, opioids, stimulants, cannabis, and polysubstance patterns differ in their pharmacology, social context, and temporal course. Collapsing across ACE categories and substances is useful for highlighting general liability but risks obscuring subtype-specific mechanisms and opportunities for tailored intervention. Future work that systematically compares dimensional representations of adversity and profiles of substance use, while simultaneously modeling socioeconomic hardship, community violence, and other socioecological stressors, will be critical for distinguishing what is common versus specific across these pathways.[8,28]

The mechanistic evidence reviewed here also rests on several important methodological constraints. Many of the most detailed biological data are derived from preclinical models that allow precise control of timing, dosage, and context of early stress and drug exposure but cannot fully capture the complexity of human adversity or the social meanings of substance use. Available human studies often rely on retrospective reports of ACEs, which are vulnerable to recall bias and are predominantly observational. Longitudinal cohorts with prospectively assessed adversity, repeated multimodal biomarkers, and careful attention to the timing and chronicity of exposures are relatively rare. Moreover, the present review focused exclusively on biological embedding and did not systematically address developmental processes (e.g., social learning, parental/peer modeling, cultural norms) that interact with biological vulnerabilities to shape real-world use trajectories. Resilience processes were also excluded from the present review. Yet emerging work suggests that supportive caregiving, stable relationships, and resource-rich environments can buffer or even recalibrate regulatory systems following adversity.[54,55] Moving forward, the most informative research will likely be explicitly translational and multilevel: integrating animal and human paradigms; combining neuroendocrine, immune, and neuroimaging measures with dense behavioral and contextual data; using quasi-experimental and causal inference methods where possible; and testing interventions that target stress regulation, reward engagement, and inflammatory processes as modifiable mechanisms. Such work is essential for moving beyond documenting risk to identifying levers that can alter developmental courses set in motion by early adversity.

CONCLUSION

ACEs may increase SUD vulnerability through biological embedding across stress, reward, and immune systems. Although this review focused primarily on ACE-related adaptations, rather than providing a comprehensive synthesis of neurobiology in established SUD, existing addiction research indicates that many of these same systems are perturbed in chronic substance use.[31] For some individuals, then, addiction may emerge in the context of a brain and body already calibrated toward high stress sensitivity, low natural reward, and elevated inflammatory tone, with substance exposure further exaggerating these patterns over time. Viewing SUD through this lens has important implications. Conceptually, it encourages integrated models that bridge developmental trauma research, addiction neuroscience, and psychoneuroimmunology, rather than treating these as siloed literatures. Clinically, it supports trauma-informed, neurobiologically grounded approaches to prevention and treatment.

For ACE-exposed youth at elevated risk, early prevention efforts and interventions that reduce ongoing stress exposure, support caregiving quality, and foster emotion regulation, reward engagement, and health-promoting behaviors may help recalibrate stress, reward, and immune systems before substance use begins. For treatment-seeking adults with significant adversity histories, incorporating strategies that directly target stress dysregulation, reward deficits, and inflammatory burden—alongside traditional substance-focused approaches—may improve outcomes beyond what is achievable with pharmacotherapy or psychosocial treatment alone. Finally, the concept of biological embedding underscores that while early adversity can have profound and lasting effects, these effects are not necessarily irreversible. The same plasticity that allows stress and inflammation to shape developing neural circuits also creates opportunities for repair and adaptation across the life course. Continued research into the mechanisms linking ACEs to SUD, and into interventions capable of modifying those mechanisms, holds promise for reducing the burden of addiction by addressing its developmental roots.

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Disclosures

Competing Interests: The authors declare they have no competing interests to disclose.

Funding Acknowledgment: Preparation of this report was supported by an Institutional Development Award from the National Institute of General Medical Sciences of the National Institutes of Health under grant P20GM130414 (PI: Monti) and the National Institute on Alcohol Abuse and Alcoholism grant R01AA031640 (PI: Monnig).

Disclaimer: The content is solely the responsibility of the authors and does not necessarily represent official views of the National Institutes of Health.

Ethical Approvals: Ethical approval, as would be obtained from an Institutional Review Board, was not applicable for this article.

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Impact of Maternal Smoking During Pregnancy on Fetal and Neonatal Neurobehavioral Development: A Narrative Review

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ABSTRACT

BACKGROUND: Maternal smoking during pregnancy (MSDP) remains a common source of prenatal drug exposure worldwide. MSDP has been shown to increase fetal health risks and interfere with fetal development. Although newborns prenatally exposed to other substances (e.g., opiates, benzodiazepines) have been shown to have increased stress and withdrawal symptoms, few studies have explored the effect of MSDP on the fetal and neonatal periods.

METHODS: We performed a comprehensive search for empirical research articles investigating the effects of MSDP on fetal and neonatal neurobehavior and signs of abstinence in PubMed and PsycINFO databases. Our search yielded 11 fetal and 14 neonatal empirical articles published between 1980 and 2025.

RESULTS: In the fetal period, MSDP-exposed fetuses showed decreased fetal heart rate variability, and fetal movement and reactivity vs unexposed fetuses. In the early neonatal period (birth to five days), MSDP-exposed newborns showed increased excitability, irritability, need for handling, arousal, and alertness. In the late neonatal period (10 to 35 days), studies found MSDP to have an effect on neonatal self-regulation, attention, quality of movement, abnormalities in reflexes, lethargy, need for handling, and stress signs.

CONCLUSIONS: Our review of the literature revealed that MSDP has been associated with alterations in behavior suggestive of potential abstinence symptoms, especially found for excitability, irritability, hypertonicity, attention, reflex abnormalities, and stress/abstinence signs. Additional rigorous research needs to delineate the impact of MSDP on fetal and neonatal signs of abstinence to improve infant health.

KEYWORDS: pregnancy; smoking; infant; fetal; behavior; neurodevelopment; tobacco

INTRODUCTION

Although prevalence of cigarette use in pregnancy has declined in the US (approximately 5% of live births), rates are disproportionately higher in poor, young, Indigenous and Non-Hispanic White, and underserved populations, and in studies involving biochemical verification of tobacco use.[1] Further, rates of prenatal use of other nicotine and tobacco products (e.g., electronic cigarettes, hookah) continue to increase, and cigarette exposure remains a relevant behavioral health concern and common prenatal drug exposure worldwide.[2] In contrast to recreational use of other substances, cigarette use most commonly represents a repeated, daily habit that leads to consistent nicotine exposure to fetuses. Although rates of spontaneous quitting are increasing, a recent systematic review suggests that pregnant women who continue to smoke during pregnancy will do so into the last trimester.[2] This behavior continues to represent a major behavioral and public health problem, yet limited literature exists examining fetal and neonatal outcomes of maternal smoking during pregnancy (MSDP).

MSDP has the potential to interfere with fetal development in several ways, including intrauterine growth restriction, neuronal development, and epigenetic programming of placenta.[3-5] Neurobehavioral development can also be disrupted. Neurobehavior can be defined as the bidirectional relationship between biological impacts of the nervous system and behavioral output, such that infant neurobehavior is the one of the earliest observations of the integration of neurological, cognitive, emotional, and behavioral functioning.[6] Our recent paper used a novel, fetal, neurobehavioral-assessment system (FENS) to examine the relationship between MSDP and fetal neurobehavior.[7] We found fetuses exposed to MSDP had heightened fetal activity and increases in isolated head and limb movements. For infant outcomes, MSDP has been known to cause neonatal morbidity, mortality, and sudden infant death syndrome.[8-10] A meta-analysis investigated the impact of MSDP on pregnancy outcomes in 28 birth cohorts, with findings suggesting that MSDP is associated with small gestational size and preterm birth.[11] This relationship has been well-demonstrated in the literature, and therefore our review will solely focus on neurobehavior and not gestational growth or birthweight.[11,35]

A systematic review from Frogratt and colleagues reviewed 17 peer-reviewed articles investigating prenatal tobacco exposure on infant neurobehavior and temperament within the first year of life.[12] Within their review and meta-analysis, findings indicate that exposed infants had medium effect sizes for negative affect, attention, excitability, irrita-

bility, and orientation and small effect sizes for muscle tone, regulation, and difficult temperament.[12] Reporting on infant neurobehavior in the first year is an important developmental milestone, yet literature cites that there are observable differences in neurobehavior during fetal and neonatal development that can suggest the earliest signs of fetal/neonatal stress and possible signs of nicotine abstinence.

The current narrative review expands on the work of Frogratt and colleagues to investigate the impact of MSDP on fetal and neonatal neurobehavioral development and to determine if we can observe any possible alterations in neurobehavioral development that could suggest stress/abstinence in utero or neonatal period.[12] Thus, the focus of the current narrative review expands the literature by characterizing associations between MSDP and fetal and neonatal neurobehavior, including stress/abstinence symptoms.

METHODS

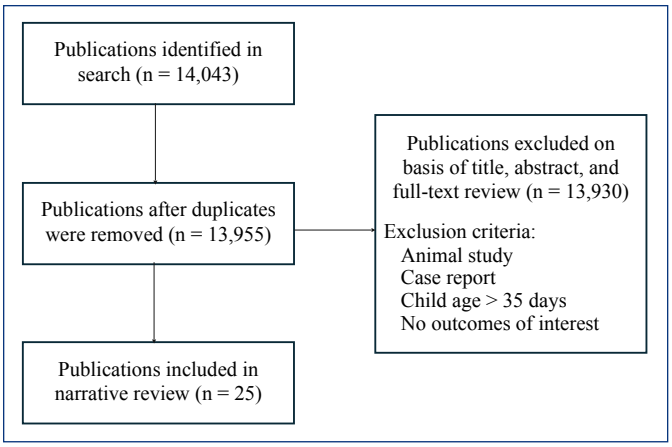
Eligibility Criteria and Search Strategy

A systematic review and meta-analysis on the impacts of maternal smoking during pregnancy and child neurobehavior within the first year of life was published in 2020. To extend findings to include the fetal and neonatal periods, the authors believed a narrative review with some systematic review methods would provide a thorough extension of the existing and niche literature.[12] Examining this specific window can provide insight into possible signs of neonatal abstinence to improve early detection and intervention. We performed a comprehensive literature search for empirical research articles investigating effects of MSDP on fetal and neonatal neurobehavior. We considered only peer-reviewed, original studies written in English published from 1980 to 2025. Two independent researchers screened studies for eligibility. PubMed and PsycINFO database searches used the search terms "pregnancy, maternal, and prenatal," "tobacco, cigarette, smoke, and smoking," and "neurobehavior, neurodevelopment, behavior, fetal, newborn, and neonatal," as well as backward searched of reference lists and forward searched of article citations. For the purposes of this narrative review, we define the early neonatal period as 0–5 days, and the late neonatal period as 10–35 days. Exclusion criteria included animal studies, case reports, infants over the age of five weeks, and studies that had intrauterine growth/birthweight as their only outcome. Our search yielded 25 empirical articles published between 1980 and 2025 for final analysis.

Selection and Data-Collection Process

Data collection was conducted by two independent researchers. The following information was extracted from each study: a) percentage of sample with MSDP exposure, b) average cotinine level for tobacco-exposed group (if reported), c) average cigarettes per day, d) number of neurobehavioral timepoints, e) type of tobacco, f) MSDP measurements, g) infant measurements, h) gestational or infant age, i) results, and j) study limitations.

Figure 1. Study Selection Diagram



Study Selection

The search resulted in 14,043 studies, and 13,955 were included after removal of duplicates. Broad terms were utilized to ensure research across disciplines, with varying terminology for pregnancy, smoking, and fetal/neonatal health, which resulted in a need to carefully review each study for relevance. After study titles and abstracts were reviewed, 13,930 studies were excluded for being animal studies, case reports, cohort studies about environmental or public health factors (e.g., pollution), examining outcomes outside of the fetal/neonatal window, examining fetal growth and birthweight as the sole outcome, and not being relevant to the goals of our review. Thus, 25 studies were given a full-text review [**Figure 1**].

Study Characteristics

The 25 studies included in the narrative review analyzed 2,850 infants and 419 fetuses with 1,408 of the infants/fetuses exposed to MSDP. Fourteen studies examined newborn neurobehavior outcomes and 11 studies examined fetal neurobehavioral outcomes. The neonatal studies were put into three categories: 1. Early Neonatal Outcomes (e.g., birth to five days postpartum), 2. Late Neonatal Outcomes (e.g., 10 to 35 days postpartum), and 3. Longitudinal Outcomes (e.g., any study with multiple measurement points between birth and 35 days postpartum). Fetal studies came from five countries and neonatal studies came from six countries.

RESULTS

Fetal Outcomes

Fetal neurobehavioral development was measured in 419 fetuses during 20- to 38-weeks' gestation. The primary constructs assessed were fetal heart rate variability and fetal

activity. Across 11 studies, 235 mothers engaged in smoking during pregnancy (56% of all pregnancies), and measured neurobehavioral outcomes using the Behavioral Reactivity Scale adapted from the Neonatal Behavioral Assessment Scale and Fetal Neurobehavioral Coding System. Fetal heart rate and motor activity was assessed using vibroacoustic stimuli, and maternal smoking during pregnancy was measured using salivary, carbon monoxide, and plasma samples, in addition to self-reporting cigarette use. Several studies reported decreased heart rate variability in fetuses with MSDP exposure, which can be a proxy for fetal distress.[13-15] Several studies also reported lower movement in fetuses with MSDP exposure, which included overall movements or solely trunk movements.[7,13,15,16] Some studies found differences in fetal activity such that fetuses with MSDP exposure had more small, isolated head and limb movements; whereas other studies found that fetuses were less reactive to stimuli or did not find any difference in fetal movements.[17-20] Cowperthwiate and colleagues found that fetuses exposed to MSDP had delayed recognition of maternal voice compared with non-exposed fetuses, and Thaler and colleagues (1980) reported increased breathing in MSDP-exposed fetuses.[21,16] Lastly, Gringas and colleagues did not report a significant difference in developmental or behavioral outcomes between exposed and non-exposed infants.[23]

Early Neonatal Outcomes

Early neonatal outcomes were measured from birth to five days postpartum in 1,868 infants. Across eight studies, 756 infants had MSDP exposure and their neurobehavioral outcomes were measured using NICU Network Neurobehavioral Scale, Finnegan scores, Graham-Rosenblith Behavioral Examination of the Neonate, Lipsitz score, Brazelton Neonatal Behavioral Assessment Scale, and Neonatal Temperament Assessment. Maternal smoking during pregnancy was measured using cotinine levels from saliva samples and maternal self-report. One of the key features noted across studies was increased excitability and irritability, and increased difficulty with regulation and consolability.[23-27] Several studies also document increased arousal as well as decreased alertness and attention.[23,7,27,28] Two studies reported the impact of withdrawal and abstinence on infants.[23,25] Interestingly, two studies had conflicting results related to muscle tone, such that Law and colleagues reported hypertonicity, and Godding and colleagues reported hypotonicity and decreased reflexes.[25,28] Lastly, there was a trend in the literature suggesting a dose-response relationship between cigarettes per day, cotinine levels, stress, and neurobehavioral functioning. Law and colleagues documented a dose-response relationship between more cigarettes per day/increased cotinine levels, and increased stress and signs of abstinence, such that as cigarette use and cotinine levels increased abstinence symptoms increased.[25] Godding and colleagues also observed a dose-response relationship between cotinine levels and reduced neurological functioning as measured by a neurological exam and Finnegan scores, such that increased cotinine levels have an inverse effect on neurological functioning in infants exposed to tobacco.[28]

Late Neonatal Outcomes

Late neonatal outcomes were measured from 10 to 35 days postpartum in 555 infants. Across four studies, 179 infants had MSDP exposure and their neurobehavioral outcomes were measured using NICU Network Neurobehavioral Scale and Neonatal Temperament Assessment. Maternal smoking during pregnancy was measured using cotinine levels from saliva samples and maternal self-report. Multiple studies both found decreased self-regulation.[29-31] Froggatt and colleagues also reported decreased motor quality and an increase in abnormal reflexes. Stroud and colleagues also reported that infants with MSDP exposure had an increased need for handling and increased arousal and excitability.[29,30] Yolton and colleagues reported both neurobehavioral and racial differences across infants with MSDP exposure.[31] MSDP-exposed infants demonstrated lower attention and quality of movement as well as increased stress and lethargy compared to infants without exposure.[31] Notably, racial differences between Black and White infants were observed across arousal, excitability, attention, and hypotonicity. Of particular significance, Wiebe and colleagues was the only study in the systematic review that reported there were not any differences between infants with and without exposure to tobacco across irritability, attention, and stress dysregulation.[32]

Longitudinal Neonatal Outcomes

Studies that included a longitudinal design for examining neonatal outcomes had multiple measurement points between birth and 35 days postpartum in 404 infants. These two studies included 196 infants with MSDP exposure, and their neurobehavioral outcomes were measured using Network Neurobehavioral Scale and Neonatal Temperament Assessment. Maternal smoking during pregnancy was measured using cotinine levels from saliva samples and maternal self-report. Only two studies have examined the longitudinal effects of MSDP with both assessing different neurobehavioral domains. Stroud and colleagues reported decreased attention and self-regulation across the first month of life, as well as increased lethargy and need for handling.[4] Epsy and colleagues found differences in attention at two days postpartum, yet those effects dissipate by four weeks postpartum. There also were not any significant differences in stress dysregulation and irritability across MSDP-exposed and non-exposed infants.[33]

DISCUSSION

This review aimed to synthesize the research on MSDP on fetal and neonatal neurobehavior to see if there could be early possible signs of stress or abstinence. Broadly, our review indicates that there are significant differences in fetal and neonatal neurobehavior as it relates to MSDP, which could suggest neonatal abstinence.

Further, fetal and neonatal neurobehaviors discussed in this review overlap with the clinical presentation of neonatal abstinence syndrome, including irritability, excessive crying, and difficulty soothing the baby.[34] Our review can expand on these findings by identifying early neurobehavioral patterns in utero and within the first month of life. With regards to fetal outcomes, the synthesis of our review yielded that fetuses with MSDP exposure had lower heart rate variability and, on the whole, lower fetal activity.[13-15,17-19] This finding comes with some nuance about the type and timing of fetal movement, such that MSDP may have increased isolated movements of their head and limbs (e.g., tremors) yet fewer trunk movements.[17] Taken together, these findings could suggest the presence of fetal distress as an immediate consequence of MSDP and, broadly, throughout gestation. However, further rigorous research is warranted as some studies did not find any significant differences across MSDP exposure.[20] For the early neonatal period, the literature suggests associations between MSDP exposure and hypertonicity, greater need for handling, more stress signs, and greater irritability within the first few days of life.[23-28] Two studies identified signs of stress, withdrawal, and abstinence.[23,25] In the late neonatal period, MSDP exposure was associated with worse self-regulation, increased need for handling, greater arousal and excitability, lower scores on attention, poor quality of movement, and increased stress signs.[29-31] For longitudinal studies, findings suggest that MSDP in the first month of life is associated with decreased attention and self-regulation, increased lethargy and need for handling, and no differences in irritability and stress dysregulation.[4,33] In sum, this review uniquely follows the trajectory of fetal and neonatal neurobehavioral development with alterations in behavior, suggestive of possible nicotine-abstinence symptoms. Decades of literature has documented the adult symptoms of nicotine withdrawal, including irritability, fatigue, and anxiety, and our review demonstrated a possible overlap with fetal and neonatal symptoms of withdrawal.[35]

From a clinical perspective, these findings can offer additional information about fetal and neonatal health to supplement smoking-cessation interventions. This information can be beneficial for both general smoking-cessation programs and prenatal smoking-cessation interventions to educate women on the immediate health impacts of prenatal smoking exposure. Similarly, our review can inform intergenerational behavioral-health interventions, as our findings could promote new postpartum and neonatal-care standards. For example, evidence-based protocols for neonatal abstinence syndrome, such as eat, sleep, console, could be useful for neonates with MSDP exposure.[36] Ultimately, our findings can further the scientific understanding of fetal and neonatal neurobehavioral development as it relates to nicotine abstinence and, in turn, inform behavioral-health i nterventions for mother and baby.

Although all of the studies in this review identify significant outcomes associated with MSDP, there are limitations. Many have a small sample size, low levels of smoking exposure, or used an unvalidated neurobehavior measure. Several studies did not include biochemical verification to measure nicotine exposure, which would have strengthened the ability to identify the impacts of MSDP. Furthermore, only two studies conducted assessments in the early neonatal period and repeated in the later neonatal period. Future research needs to delineate the impact of MSDP on fetal and newborn signs of abstinence to improve infant health.

CONCLUSIONS

MSDP is associated with poor infant outcomes, yet 5% of women continue to smoke during pregnancy.[1] Substantial research concludes that smoking during pregnancy has a causal effect on birthweight.[35,37] However, few studies have determined whether MSDP has an effect throughout gestation and into the neonatal period. MSDP exposure was associated with lower fetal heart rate variability, as well as hypertonicity, greater stress signs, and more need for handling in neonates. Neonatal studies, both in the first few days of life into the first month, suggest increased excitability, arousal, stress, and need for handling. These fetal and neonatal neurobehavioral alterations due to MSDP are suggestive of potential stress and abstinence symptoms. Given the known withdrawal effects of smoking cessation in adults and withdrawal symptoms caused by other drugs, we provide early evidence for possible fetal and neonatal abstinence from nicotine from observable differences in neurobehavioral development.

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Glucagon-Like Peptide-1 Receptor Agonists Therapy: The Biological Bridge Across Comorbidities in Behavioral Health

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KEYWORDS: addiction; behavioral health; collaborative care model; GLP-1 RA

INTRODUCTION

When providing comprehensive treatment to people with behavioral health conditions, comorbidity is the rule, rather than the exception. Approximately 50% of people with a mental illness also have a diagnosis of at least one additional chronic health problem, such as pulmonary, infectious, or cardiovascular diseases, with obesity and substance use disorders (SUDs) serving as significant predictors of individual health problem severity.[1] Patients with mental illnesses, including schizophrenia, major depression, and bipolar disorder, are known to exhibit a "mortality gap," with a reduced life expectancy compared to the general population.[2] Patients with schizophrenia, for example, exhibit a reduced life expectancy of 10–20 years.[3,4] Notably, despite the increased risk of suicide with severe mental illness, the primary cause of death in this group is cardiovascular disease. These findings reflect the importance of addressing comorbid physical health problems such as respiratory diseases, cancer and, most prevalently, cardiovascular disease resulting from obesity and hypertension.[5]

In this context, glucagon-like peptide-1 receptor agonists (GLP-1 RAs) represent an intriguing tool to potentially treat metabolic and mental health comorbidities simultaneously. Randomized clinical trials (RCTs) have established the efficacy of GLP-1 RAs in improving metabolic outcomes, and emerging preclinical and observational human data also suggest that GLP-1 RAs influence pathways relevant to stress[6] and reward processing[7,8] that could positively impact behavioral health outcomes, particularly in the realm of SUD. While these effects require further investigation using adequately powered RCTs with primary neuropsychiatric endpoints,[9] initial research suggests favorable impacts on mental health. As GLP-1 RAs become more widely available and are tested in a larger patient population, it is important to consider the current neuroscience and clinical evidence that shows how these tools may evolve for combined management of metabolic and mental health needs.

NEUROSCIENCE OF GLP-1 RECEPTOR AGONISM

GLP-1 is an endogenous peptide produced in the endocrine L cells of the intestine and the nucleus tractus solitarius of the brain, and its receptors are located in a host of regions throughout the gut and brain.[10] While early GLP-1 RA drugs were single-molecule therapies, the therapeutic landscape has since expanded to include dual-agonist approaches. Examples include FDA-approved tirzepatide, a GLP-1/Gastric Inhibitory Peptide (GIP) RA, and the investigational drug CagriSema, a combination of GLP-1/amylin analogue cagrilintide, which engage two pharmacologically distinct targets to maximize metabolic and behavioral outcomes. These dual agonists exert a powerful "double-hit" by operating simultaneously on receptors in the periphery and central nervous system. Peripherally, they enhance glycemic control and slow gastric emptying. With respect to alcohol, this blunts and delays the increase in blood alcohol concentration,[11] which can reduce immediate reinforcing effects.[12] Centrally, these medications penetrate the blood-brain barrier to target two distinct pathways: the GLP-1 component modulates dopamine signaling in the nucleus accumbens to dampen reward-seeking, and the second agonist (i.e. GIP or amylin) works synergistically in the hypothalamus and brainstem to increase satiety and further reduce the salience of addictive triggers. More recent Phase II and Phase III trials are systematically investigating this dual-target mechanism not only to improve metabolic dysfunction (weight loss and insulin sensitivity) but also to reduce behavioral responses, such as craving, that reinforce SUDs.

The more nuanced question that remains to be answered about GLP-1 RAs is: how exactly do they exert their effects on metabolic and reward pathways? A growing body of research suggests that the answer may lie in GLP-1 RAs modulating a shared biological substrate: chronic, systemic inflammation. Inflammation is a shared risk factor for metabolic and mental health disorders and can perpetuate comorbidity. For example, depression increases cortisol and inflammation, which can increase risk for type 2 diabetes.[13] Conversely, the physiological stress of chronic illnesses like diabetes or migraines promotes an inflammatory state that increases risk for major depressive episodes.[14] More recent clinical research is now also evaluating inflammation as a link between the development of PTSD[15] and comorbid alcohol use disorder (AUD).[16]

GLP-1 RA-mediated reduction of peripheral inflammation is well established, and its effect is greater than other FDA-approved anti-diabetic drugs.[17] They act as powerful anti-inflammatory agents, lowering circulating cytokines (e.g. IL-6),[18] C-reactive protein (CRP),[19] and inhibiting activation of microglia, the immune cells of the brain.[20] This attenuation of systemic and central inflammation is thought to help mood symptoms by alleviating the "fog" associated with depression,[21] and reduce the salience of rewarding stimuli, effectively quieting both, and substance-related craving in patients with SUD.[22] Importantly, real-world data obtained from patient electronic health records has shown that GLP-1 RAs are associated with a lower risk of suicidal ideation and self-harm compared to other diabetes medications,[23,24] though whether this can be attributed to decreased neuroinflammation remains to be tested. Future studies will need to examine possible anti-neuroinflammatory mechanisms of GLP-1 RAs more closely, ideally with a combination of biomarker and neuroimaging approaches to determine whether GLP-1 RAs decrease central inflammation in a manner that functionally alters reward or limbic circuits.

CLINICAL TRIAL HIGHLIGHTS

After early trials demonstrated the ability of GLP-1 RAs to reduce metabolic dysfunction, additional studies sought to investigate the effectiveness of GLP-1 RAs on a broader array of conditions spanning physical and behavioral health. In particular, the ability of GLP-1 RAs to reduce craving-like preoccupation with food (i.e., "food noise"),[25-27] along with GLP-1 receptor expression in addiction circuitry, and reports of incidental decreases in substance use while on GLP-1 RAs spurred interest in these medications as treatments for AUD[28] and other SUDs.[29] To date, GLP-1 RA effects on AUD have been the most studied, with encouraging initial results.

While the first GLP-1 RA RCT testing found no reduction in heavy drinking days with exenatide compared to placebo,[30] subanalysis identified decreased drinking among individuals with BMI >30, raising the question of whether GLP-1 RAs might be more effective at reducing drinking in obese individuals. Another RCT evaluating nicotine abstinence following smoking cessation found no difference in abstinence with dulaglutide due to a strong placebo effect.[31] However, a secondary analysis found that dulaglutide *was* associated with a significant decrease (29%) in weekly drinking.[32] Notably, the dulaglutide study population was predominantly obese, adding further support to GLP-1 RAs potentially exhibiting stronger effects in this population. GLP-1 RA mediated reduction in drinking is also supported by an RCT that found semaglutide reduced alcohol craving and drinks per drinking day.[33] Clinical trials for other SUDs remain in early stages but will also examine GLP-1 RAs for cocaine use disorder (NCT07227948),[34] cannabis use disorder (NCT07523633), and opioid use disorder (NCT04199728,[35] NCT06548490).

Clinical trials are also exploring the utility of GLP-1 RAs in other meaningful areas of mental health, particularly with respect to mitigating the metabolic side effects of antipsychotic use. A recent study in Denmark found that semaglutide significantly decreased blood glucose, decreased body weight, and increased physical quality of life among patients with schizophrenia, obesity, and prediabetes.[36] Additional work demonstrates similar effects in patients on clozapine without affecting clozapine concentration or worsening psychotic symptoms.[37] These findings are particularly meaningful, as the metabolic side effects of antipsychotics are a common reason for treatment discontinuation. While it remains to be seen whether GLP-1 RAs could be a primary treatment for conditions like bipolar disorder or psychotic disorders, they may indirectly improve mental health outcomes by mitigating antipsychotic-induced metabolic side effects and thereby increasing adherence to treatment. Clinical trials in the future should examine the impacts of GLP-1 RAs on antipsychotic initiation and adherence.

CONCLUSION

Overall, research suggests that there is great potential for GLP-1 RA therapies to address comorbid medical and mental health conditions, though additional studies are needed. GLP-1 RAs are currently approved for metabolic indications, and RCTs will need to specifically test GLP-1 RAs with a variety of mental health outcomes before these medications can be utilized for such purposes. If supported by the evidence, their use would be well-suited for collaborative care settings, particularly with respect to management of SUDs. Within an integrated care system, GLP-1 RAs could facilitate treatment by curbing dysregulated appetite, improving physical functioning, and/or reducing craving intensity, potentially allowing for more effective engagement with behavioral therapies. By addressing comorbid conditions through a shared mechanism of inflammation, GLP-1 RAs represent an exciting area of ongoing research with multiple potential disease applications.

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Disclosures

Funding: The research for this work was conducted in the Clinical Neuroscience Laboratory (National Institute on Alcohol Abuse and Alcoholism: R01 AA027760, R01 AA31963; R34 AA031589 to CLH-K). S.L.F. is supported by NIMH R25MH101075 "Promoting Research Training During Psychiatry Residency".

Disclaimers: The views expressed herein are those of the authors and do not reflect the official policy or position of the funding agencies. The funding sources were not involved in writing or the decision to submit this manuscript for publication.

Conflict of Interests: CLH-K holds two patents for the development of negative allosteric modulators targeting the stress system and one patent application on the development of a compound for noradrenergic blockade. All is unrelated to this work. CLH-K is also a Site PI in Eli Lilly and Altimmune-sponsored multisite clinical trials. The other author reports no conflict of interest.

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Implementing Mental Health and Substance Use Screening at a Sexual Health Clinic

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ABSTRACT

PURPOSE: Sexual and gender minority (SGM) individuals experience heightened mental health problems and substance misuse. Improved approaches to screening for behavioral health in this population are needed. We evaluated the implementation of a digital intake platform incorporating behavioral health screenings at a sexual health clinic serving SGM individuals.

METHODS: Patients presenting to a sexual health clinic March 2021 through April 2023 were screened for depression, hazardous drinking, and illicit substance use using a digital intake platform. To identify SGM subpopulations most in need of services, we evaluated relationships between demographic and sexual health factors and depression, hazardous drinking, and illicit substance use.

RESULTS: In total, *N*=1,277 people presented for care; 28% identified as gay/lesbian, 30% as bisexual+ (attracted to more than one gender), and 12% as transgender/gender diverse. Thirteen percent reported a sexually transmitted infection in the past 12 months, 11% screened positive for a depressive disorder, 50% for hazardous drinking, and 26% for illicit substance use. Individuals 18–39 years were more likely to be depressed than adults 40+, and transgender/gender diverse individuals had 1.93-fold greater odds of depression than cisgender men. Regarding substance use, cisgender men had 2.42-fold greater odds of use compared to cisgender women, and lesbian/gay individuals had 5.08-fold increased odds compared to heterosexual individuals.

CONCLUSION: A digital intake platform for behavioral health screening identified SGM at risk for depression and substance use challenges within a sexual health clinic. This protocol was able to identify subpopulations at higher risk for these disorders, increasing opportunities for recognition and response.

KEYWORDS: sexually transmitted infections; mental health; substance use; sexual and gender minorities

INTRODUCTION

Sexual and gender minority (SGM) groups experience a significant burden of mental health problems and substance misuse.[1-4] Meta-analytic data demonstrate that sexual minority individuals are 2.5 times more likely to have a lifetime history of a mental health condition and twice as likely to report a current mental health condition than their heterosexual counterparts.[5] These numbers are even higher among transgender adults, who have prevalence rates of depression between 28% and 64%.[6-8] SGM individuals also report higher rates of substance use than cisgender heterosexual individuals.[3,9,10] According to data from the 2021–2022 National Surveys on Drug Use and Health, about one-third of bisexual males, bisexual females, and gay males met criteria for a substance use disorder within the past year, and one-fourth of lesbian females met criteria.[11] Given the high disease burden of these conditions among SGM individuals, new approaches are needed to screen and implement behavioral health services for this population.

Screening, which results in early detection and treatment of behavioral health problems, can improve quality of life, help contain healthcare costs, and reduce complications from co-occurring behavioral health and medical comorbidities.[12] Major clinical organizations including the United States Preventive Services Task Force recommend screening in primary care settings specifically for mental health and substance use.[13,14] However, national surveys of mental health screenings by physicians have been found to be significantly low (<5%),[15] largely driven by a lack of adequate resources and infrastructure.[12] It is crucial to mitigate these gaps in screening, especially among SGM populations given the high burden of disease. In prior studies, SGM individuals reported greater difficulty accessing healthcare than heterosexual, cisgender individuals. In a study of N=2,031 SGM individuals, 18.8% reported healthcare denial or lower quality care within the past year for medical settings and 12.5% for mental health settings.[16] Novel approaches to engaging SGM for the purposes of behavioral health screening and treatment are needed.

Sexual health clinics may be ideal settings to screen and engage SGM populations for mental health conditions like depression, as well as alcohol and substance use disorders.[17–19] Sexually transmitted infections (STIs) frequently co-occur with mental health and substance use disorders.[20-23]

Compared to heterosexual and cisgender individuals, SGM individuals experience increased risk of these co-occurring conditions.[20] These intersectional epidemics of STIs, mental health and substance use disorders—or syndemics—occur at higher rates within SGM populations due to stressors associated with living beyond societal norms of heterosexuality and binary expressions of gender (e.g., man or woman). According to minority stress theory, SGM individuals experience unique and chronic stressors such as stigma and discrimination, which then require individuals to adapt to a hostile social environment in ways that negatively affect mental and physical health outcomes.[5,24,25] Moreover, holding multiple marginalized social identities (e.g., identifying as African American/Black and experiencing racism; living in a low-income household and experiencing classism) confers additional risk for STIs, mental health conditions, and substance use disorders.[26]

Screening for mental health conditions and substance use disorders at sexual health clinics presents a public health opportunity to identify and treat SGM populations experiencing a high burden of these conditions. However, little is understood about how to best identify, diagnose and connect SGM individuals to behavioral health services. In 2021, our sexual health clinic implemented a digital intake platform that systematically screens all individuals presenting for services. The current study explored this platform's ability to identify depression, hazardous drinking, and illicit substance use among those screened. To better understand SGM subgroups most in need of behavioral health services, we examined relationships between demographic and sexual health factors as independent variables, and depression, hazardous drinking, and illicit substance use as dependent variables.

METHODS

Participants and Procedures

We reviewed demographic and behavioral data of patients who presented to a sexual health clinic from March 2021 through April 2023. The community clinic is co-located with a primary care center serving predominantly SGM patients in an urban area of New England. The sexual health clinic offers screenings for all major STIs, including HIV, syphilis, gonorrhea, and chlamydia. Given the increased burden of mental health conditions and substance misuse in the SGM community, we developed a digital intake platform that leverages FileMaker (Developed by Claris International, a subsidiary of Apple, Inc.). Use of this HIPAA-compliant platform does not require additional consent from patients and is considered part of standard patient care within the sexual health clinic. All patients systematically complete a brief demographic and clinical survey during the intake process. This platform allows the clinic to create unique, adaptable, and integrated data systems and reporting tools, which includes the addition of validated clinical screening measures for mental health conditions, STI history, and substance use. Patients complete measures either at a kiosk system in the lobby or through their individual cellphones. The FileMaker system allows for bi-directional Application Programming Interface (API) communication and can push self-reported data into a patient's electronic medical record (EMR) in real-time to support clinical decision-making based on patient responses. FileMaker can also pull data from the EMR and organize it into a clean, functional data report with population health metrics, including mental health and substance use screening. The system also integrates with the clinical laboratory reporting system. This approach has allowed the clinic to easily pull reports that detail a patient's demographics, sexual health behaviors, mental health screening, substance use screening, clinical visit and laboratory results. As part of the current study, we de-identified demographic and behavioral health data collected from this system prior to analysis. Procedures for retrospective data analyses were approved by our institution's IRB and all research was completed in accordance with the Declaration of Helsinki.

Data and Measures

The digital intake platform contains questions on the following variables:

Demographic Data: Patients completed items regarding their age, gender, race, ethnicity, sexual orientation, and household income [**Table 1**]. To preserve statistical power in bivariate and multivariate analyses, researchers created new categories of gender, race, ethnicity, and sexual orientation as follows: Those who self-identified as transgender, gender queer, gender non-binary, and other identities existing beyond cisgender, binary definitions of gender (man, woman) were classified as transgender/gender diverse. Those who identified as a racial minority or Hispanic/Latino/a/x were classified as a person of color. Those who identified their sexual orientation as bisexual, queer, pansexual, and other identities for those attracted to more than one gender were classified as bisexual+.

Sexual Health: Patients reported their current HIV status (living with HIV Yes/No), and past 12-month STI acquisition (Yes/No).

Depression: Patients completed the Patient Health Questionnaire-2, a two-item measure that captures low mood and anhedonia within the past two weeks (e.g., Over the last 2 weeks, how often have you been bothered by the following problems? Little interest or pleasure in doing things. Not at all =0; Several days =1; More than half the days =2; Nearly every day =3).[27] Scores range from 0–6, and those scoring 3 or higher were coded as living with a depressive disorder.

Hazardous Drinking: Patients completed the Alcohol Use Disorder Identification Test–Consumption (AUDIT-C) to screen for hazardous drinking.[28] Participants responded to a set of three questions regarding alcohol use with responses summed to produce a total score (e.g., How often did you

have a drink containing alcohol in the past year? Never =0; Monthly or less =1; 2 to 4 times a month =2; 2 to 3 times per week =3; 4 or more times per week =4). The AUDIT-C uses sex-based cut-off values of 3 or higher for females and 4 or higher for males. For transgender adults, research has suggested using a universal cut-off score of 3 or higher.[29] For the purposes of this study, we used a universal cut-off score of 3 or greater to determine hazardous drinking given our focus on SGM individuals.

Illicit Substance Use: Patients completed an adapted version of the ASSIST to screen for past three-month illicit substance use.[30] Patients were asked to select if and how often they used the following drugs in the past three months: poppers, cocaine, prescription stimulants (not used as prescribed), methamphetamine, inhalants, sedatives or sleeping pills, hallucinogens, street opioids, prescription opioids, and other drugs. Individuals scoring 1 or greater (they endorsed using one or more substances) were coded as 'Yes' to having engaged in illicit substance use and those scoring 0 (they endorsed using zero substances) were coded as 'No'. Patients were also asked about cannabis use, which was evaluated as a separate category. Cannabis use was not incorporated into the illicit substance use scoring code, as cannabis had been legalized in the state at the time of analysis.

DATA ANALYSIS

Descriptive statistics including frequencies were calculated for demographic, sexual health, mental health, hazardous drinking, and substance use variables. We conducted initial chi-square and Fisher's exact tests to determine bivariable associations between each of our independent variables (age, gender, race, ethnicity, sexual orientation, household income, living with HIV, past 12-month STI) and our three dependent variables (depression, hazardous drinking, illicit substance use). We then conducted three logistic regressions to examine associations between demographics and sexual behaviors as independent variables and depression, hazardous drinking, and illicit substance use as dependent variables. Associations significant from our bivariable analyses were included into our regression models for multivariable analyses. For all regressions, we first examined whether an independent variable as a category was significantly associated with each dependent variable (e.g., is age associated with depression?). We next reviewed sub-levels for each independent variable to determine which groups significantly differed (e.g., do 18–29 year olds differ in depression levels from adults 50+?). For the depression model, we entered age, gender, and income as independent variables. For the hazardous drinking model, we utilized gender, sexual orientation, race, and income. For the illicit substance use model, we used gender, sexual orientation, race, income, and HIV status. Statistical significance was determined at $p<.05$ and analyses were performed using SPSS version 29.0.

RESULTS

A total of *N*=1277 individuals presented to the sexual health clinic during the study period. Of these, 37% identified as straight/heterosexual (30% bisexual+, 28% gay/lesbian); 63% cisgender man (24% cisgender woman, 12% transgender/gender diverse); 50% White (21% Black/African American); and 24% Hispanic/Latino/a/x. Approximately 2% reported living with HIV and 13% past 12-month STI acquisition. Regarding mental health and substance use, 11% met criteria for a depressive disorder, 50% met criteria for hazardous drinking, and 26% engaged in past three-month illicit substance use [**Table 1**]. Most commonly reported illicit drug use included poppers (16%), hallucinogens (9%), prescription stimulants (6%), and cocaine (5%), followed by

Table 1. Characteristics of Patients Presenting to a Sexual Health Clinic (N=1277)

Variable	Results (n, %)
Age	
18–29	681, 53%
30–39	393, 31%
40–49	117, 9%
50+	86, 7%
Household Income	
<$10,000	147, 12%
$10,001–20,000	127, 10%
$20,001–35,000	174, 14%
$35,001–50,000	155, 12%
$50,001–75,000	153, 12%
$75,001–100,000	99, 8%
$100,001+	111, 9%
Gender	
Cisgender Man	800, 63%
Cisgender Woman	301, 24%
Transgender/Gender Diverse	151, 12%
Race-Ethnicity	
White	634, 50%
Hispanic/Latino/a/x	300, 24%
Black/AA	271, 21%
Not listed	63, 5%
Multiracial	59, 5%
Asian	51, 4%
American Indian/Native Alaskan	17, 1%
Native Hawaiian/Pacific Islander	4, 0.3%
Sexual Orientation	
Gay/Lesbian	361, 28%
*Bisexual+	383, 30%
Straight	472, 37%
Sexual Health	
Living with HIV	28, 2%
Past 12-month STI	168, 13%
Behavioral Health	
Depression	142, 11%
Hazardous drinking	635, 50%
Illicit substance use	326, 26%

*Bisexual+ encompasses individuals identifying as bisexual, pansexual, queer, and other sexual identities for those attracted to more than one gender.

Table 2. Bivariable Relationships Between Characteristics and Behavioral Health Conditions

Characteristic	Depression			Hazardous Drinking			Illicit Substance Use		
	No (%)	Yes (%)	p	No (%)	Yes (%)	p	No (%)	Yes (%)	p
Age			<.001*			.075			**.126**
18–29	551 (85)	100 (15)	b	302 (47)	339 (53)	a	493 (76)	160 (25)	b
30–39	337 (93)	27 (7)	b	156 (43)	207 (57)	a	251 (69)	115 (31)	b
40–49	98 (92)	9 (8)	a	48 (45)	58 (55)	a	79 (73)	30 (28)	a
50+	70 (92)	6 (8)	a	45 (59)	31 (41)	b	55 (72)	21 (28)	a
Gender			**<.001***			**.026***			**<.001***
Cisgender Man	684 (91)	70 (9)	b	323 (43)	421 (57)	b	541 (72)	216 (29)	a
Cisgender Woman	252 (87)	39 (13)	a	149 (52)	138 (48)	b	251 (86)	42 (14)	b
Transgender/Gender Diverse	115 (78)	32 (22)	b	75 (51)	73 (49)	a	83 (56)	65 (44)	b
Race-Ethnicity			.779			**.001***			**<.001***
Person of Color	517 (89)	65 (11)	a	289 (51)	283 (50)	b	470 (81)	114 (20)	b
White non-Hispanic/Latino/a/x	476 (88)	64 (12)	a	220 (41)	320 (59)	b	344 (63)	200 (37)	b
Sexual Orientation			.133			**<.001***			**<.001***
Lesbian/Gay	308 (90)	33 (10)	a	121 (36)	214 (64)	b	203 (60)	138 (41)	b
Heterosexual/Straight	402 (90)	47 (10)	a	223 (51)	216 (49)	b	407 (90)	46 (10)	b
Bisexual+	317 (86)	52 (14)	b	175 (47)	199 (53)	a	232 (63)	138 (37)	b
Income			**.003***			**<.001***			**.049**
$10,000 or less	117 (85)	21 (15)	a	81 (61)	52 (39)	b	104 (75)	35 (25)	a
$10,0001–20,000	103 (83)	21 (17)	a	62 (51)	60 (49)	a	98 (78)	27 (22)	b
$20,001–35,000	143 (85)	25 (15)	a	74 (45)	92 (55)	a	123 (73)	45 (27)	a
$35,001–50,000	129 (84)	24 (16)	a	73 (48)	79 (52)	a	111 (73)	42 (28)	a
$50,001–75,000	138 (92)	12 (8)	a	57 (38)	92 (62)	b	94 (63)	55 (37)	b
$75,001–100,000	84 (90)	9 (10)	a	41 (43)	54 (57)	a	60 (64)	34 (36)	a
$100,001+	103 (98)	2 (2)	b	36 (34)	71 (66)	b	70 (67)	35 (33)	a
Living with HIV			.968			.711			**.021***
No	732 (89)	88 (11)	a	360 (44)	453 (56)	a	572 (70)	250 (30)	a
Yes	24 (88)	3 (12)	a	12 (43)	16 (57)	a	12 (44)	15 (56)	b
Choose not to disclose/Unknown	29 (91)	3 (9)	a	16 (52)	15 (48)	a	23 (70)	10 (30)	a
Past 12-month STI			1			.769			1
No	279 (89)	35 (11)	a	128 (41)	181 (59)	a	205 (65)	109 (35)	a
Yes	147 (89)	18 (11)	a	70 (43)	93 (57)	a	108 (66)	57 (35)	a

Post-hoc analyses: In the p value column, each letter denotes a subset of categories whose column proportions do not differ significantly from each other at the .05 level.

sedatives (4%), methamphetamine (2%), opioids (2%), and inhalants (1%). More than half the sample (55%) reported past three-month cannabis use. Chi Square and Fisher's exact test results are presented in **Table 2**. Logistic regression results are presented in **Table 3**.

The logistic regression model for depression found that age was significantly associated with depression (p=.022). While no sub-category levels of age differed significantly in regression results, chi-square analyses suggested that those 18–29 years old were more likely to exhibit depression than those 40+. Gender as a category was not significantly associated with depression in the regression model. However, sub-category results showed that identifying as transgender/gender diverse was associated with 1.93 times (95% confidence interval [CI] 1.13–3.32) greater odds of depression compared to cisgender men (p=.017). Income as a category was not significantly associated with depression in the regression model. However, sub-category results and chi square analyses revealed that those earning more than $100,000 had reduced odds of depression compared to those earning less than $10,000 (odds ratio [OR] = 0.17, 95% CI 0.04–0.77).

The logistic regression model for hazardous drinking found that compared to those earning less than $10,000,

Table 3. Logistic Regression Results of Factors Associated with Behavioral Health Conditions

Characteristics	Depression			Hazardous Drinking			Illicit Substance Use		
	OR	95% CI	p	OR	95% CI	p	OR	95% CI	p
Age									
18–29	ref	ref	**.022***						
30–39	2.91	.87–9.73	0.082						
40–49	1.4	.40–4.91	0.604						
50+	2.13	.54–8.37	0.28						
Gender									
Cisgender Man	ref	ref	0.057	ref	ref	0.576	ref	ref	**.004***
Cisgender Woman	1.23	.77–1.99	0.389	0.87	.61–1.24	0.426	0.41	.23–.75	**.004***
Transgender/Gender Diverse	1.93	1.13–3.32	**0.017***	0.8	.50–1.29	0.366	1.19	.69–2.06	0.54
Race-Ethnicity									
White non-Hispanic/Latino/a/x				ref	ref		ref	ref	
Person of Color				0.86	.64–1.15	0.306	0.61	.42–.89	**0.01***
Sexual Orientation									
Lesbian/Gay				ref	ref	0.409	ref	ref	**<.001***
Heterosexual/Straight				0.82	.56–1.18	0.281	0.2	.11–.36	**<.001***
Bisexual+				1.01	.68–1.51	0.953	1.3	.82–2.06	0.261
Income									
$10,000 or less	ref	ref	0.081	ref	ref	**.049***	ref	ref	0.359
$10,0001–$20,000	1.23	.63–2.43	0.548	1.36	.81–2.30	0.245	0.57	.27–1.24	0.156
$20,001–$35,000	0.99	.52–1.89	0.982	1.83	1.12–2.99	**.016***	0.89	.44–1.79	0.747
$35,001–$50,000	1.3	.67–2.53	0.432	1.67	1.01–2.77	**.045***	0.91	.45–1.81	0.78
$50,001–$75,000	0.6	.28–1.30	0.198	2.02	1.22–3.35	**.006***	1.11	.57–2.16	0.755
$75,001–$100,000	0.79	.34–1.87	0.596	1.49	.84–2.63	0.172	0.81	.39–1.71	0.585
$100,001+	0.17	.04–.77	**0.021***	2.39	1.34–4.24	**.003***	0.58	.28–1.20	0.143
Living with HIV									
No							ref	ref	0.141
Yes							2.44	.98–6.11	0.057
Choose not to disclose/Unknown							0.77	.25–2.38	0.654

*statistically significant at the .05 level

earning $20,001–75,000 or more than $100,000 was associated with 1.67–2.39 increased odds of hazardous drinking (p=.049). The logistic regression model for illicit substance use found that identifying as lesbian/gay was associated with 5.08 times greater odds of illicit substance use (95% CI 2.78–9.26) compared to straight individuals (p<.001). Cisgender men had 2.42 greater odds of use (95% CI 1.33–4.39) compared to cisgender women (p=.004). Identifying as a person of color was associated with reduced odds of illicit substance use compared to those identifying as white non-Hispanic/Latino/a/x (OR = 0.61, 95% CI .42–.89).

DISCUSSION

The current study evaluated the impacts of using a digital intake platform to screen individuals for depression, hazardous drinking, and substance misuse at an urban sexual health clinic. The platform enabled the clinic to successfully screen individuals who might not have been identified otherwise and found high rates of people screening positive for a depressive disorder (11%), hazardous drinking (50%), and illicit substance use (26%). In the year prior to implementing this digital intake platform, screening was conducted only if provider requested. Out of 368 sexual health visits conducted between March 2020 through February 2021, the PHQ-2 was completed three times while the AUDIT-C was completed once. Thus, the clinic recognized the need for a more systematic approach, especially given the clinic opened in March 2020 at the height of the COVID-19 pandemic.

This also mirrors the experience of several New York City sexual health clinics that saw an increase from 17% to 51% of those screening positive for a substance use disorder after they implemented an evidence-based early intervention model.[31] In the current study, younger adults 18–29 were more likely to report depression compared to older adults 40+ ($p<.001$), and transgender individuals had 1.93 increased odds of depression compared to cisgender men. Rates of hazardous drinking were high across all populations with half of the sample reporting problematic drinking. Finally, lesbian and gay individuals had 5x increased odds of illicit substance use compared to straight individuals, and cisgender men had approximately 2x increased odds of illicit substance use compared to cisgender women.

Our findings regarding depression are consistent with prior research demonstrating that younger adults are struggling to a greater extent with their mental health compared to older adults.[32] Given 90% of the sample was 18–29 years old, this finding highlights the importance of ongoing mental health screening within STI clinics to readily identify young adults in need of mental health services. These findings also corroborate prior studies documenting higher rates of depression among transgender/gender diverse populations compared to cisgender individuals.[6,8] The medical literature has documented associations between socio-political stress, anti-transgender legislation, and depression.[33] A 2023 survey study investigating the effects of anti-trans policies on transgender mental health showed that those who were scared about their rights being taken away had 1.66 higher odds of experiencing depression, while those with knowledge of local state-level protections had 0.44 reduced odds.[33] Data for the current study were collected from 2021–2023 at the cusp of over 533 national anti-transgender legislative proposals, which may have contributed to higher levels of depression experienced among transgender/gender diverse patients in this sample.[34] In the midst of ongoing political turmoil, sexual health clinics are poised to identify depression and other mental health problems to serve this diverse population.

Rates of hazardous drinking were high across multiple demographic groups, with 50% of the sample meeting criteria for hazardous drinking. This is consistent with data showing increased rates of alcohol use following peak COVID-19 transmission in the United States from 2020–2021.[1] Incomes above $20,000 were associated with 1.67–2.39 greater odds of hazardous drinking compared to those earning less than $10,000. However, it is important to note that hazardous drinking is not synonymous with alcohol use disorder. We chose to utilize a more conservative cut-score of 3 on the AUDIT-C to determine hazardous drinking, so it is possible that those screening positive would not meet criteria for alcohol use disorder. It is important for clinicians to further assess the role of alcohol use in a patient's life and whether an individual desires to change their use.

Approximately a quarter of patients (26%) reported past three-month illicit substance use. Consistent with prior research, identifying as lesbian or gay was associated with increased odds of illicit substance use, as was identifying as a cisgender man. There are many stressors that contribute to substance use behavior, including mood-related challenges, interpersonal stressors, and trauma histories.[35] SGM populations may experience additional unique, chronic stressors related to experiences of marginalization such as discrimination that contribute to substance use.[5,25] Given the rise of fentanyl and other synthetic opioids contaminating the drug supply contributing to over 70% of overdose deaths, it is essential to educate patients using substances about safe drug use practices.[36] Given the high prevalence of substance use in the sample, sexual health clinics may be an ideal setting for medication-based treatment as well as harm reduction education programs.

This study has several limitations. First, it should be noted that this study employed a cross-sectional survey design, and thus we cannot determine causal relationships between demographics, sexual behaviors, and behavioral health conditions. We also utilized demographics as proxies for marginalization (e.g., race as a proxy for racism). Future studies might consider using measures that capture discrimination as independent variables, and then link experiences of discrimination (e.g., heterosexism, racism) as risk factors to health outcomes rather than demographics.[37] Additionally, this study focuses on depression as one dimension of mental health, which is known to disproportionately impact SGM individuals. Clinics might also consider implementing the GAD-2, given current medical recommendations to screen for anxiety. As with most screening tools, healthcare professionals trained in culturally competent care with SGM individuals should assess patients further to determine the appropriate level of care. And while screening is an important first step, future studies should evaluate treatment uptake after referrals are made in order to assess care coordination across the full healthcare delivery spectrum.

CONCLUSION

Implementing a digital intake platform can enhance screening for mental health conditions and substance misuse among SGM presenting for sexual health services. This screening protocol was able to identify specific subpopulations at higher risk for these disorders and facilitate opportunities for care.

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Disclosures

Acknowledgments: We thank our patients and community members for their participation in this study.

Declaration of Interest: PAC serves as a consultant at the Rhode Island Department of Health. PAC and AN are on staff at the Rhode Island Public Health Institute.

Funding: This work was supported by the National Institute of Mental Health under Grant RF1MH132348. NF's time was supported by Advance Rhode Island – Clinical Translational Research (U54GM115677) and the National Institute of Mental Health (T32MH078788). DZ was supported by the National Institute on Alcohol Abuse and Alcoholism (K23AA030339). DZ and AN were supported by the National Institute of Mental Health (5R25MH083620-14).

Disclaimer: The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

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Distinct Patterns of Intentional and Unintentional Overdose Among Psychiatric Patients With Bipolar and Substance Use Disorders

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ABSTRACT

BACKGROUND: Co-occurrence of Bipolar Disorder (BD) and Substance Use Disorder (SUD) increases the risk of negative mental health outcomes, including both intentional (i.e., suicide self-poisoning) and unintentional overdose (i.e., accidental). While it is clear that both forms of overdose are a relevant concern, less is understood about the differences in phenomenology between intentional and unintentional overdose among this high-risk group.

METHODS: Demographic and clinical characteristics were drawn from a sample of patients at a Rhode Island hospital during their baseline session of a larger psychosocial intervention clinical trial.

RESULTS: Among 171 participants with co-occurring BD-SUD, 77% reported a history of any type of overdose, 48% reported a history of unintentional overdose, 56% reported a lifetime suicide attempt via intentional overdose, and 28% reported experiencing both intentional and unintentional overdose. Collectively, antidepressant/antipsychotic/mood-stabilizing medications were the most frequently reported substances for intentional overdose, followed by sedating medications and alcohol. Opioids were the most frequently reported substance for accidental overdose, followed by alcohol and stimulants. Polysubstance use was indicated for 62% of intentional overdose events and 43% of accidental overdose events. Compared to participants with a history of intentional overdose only, those who have experienced both types of overdose were significantly younger and more likely to have co-occurring alcohol use disorder and drug use disorder.

CONCLUSIONS: Our findings suggest that psychotropic medications traditionally used to treat BD and other psychiatric disorders are often implicated in intentional overdose. Additionally, our results highlight the need for a focus on prevention of polysubstance overdose across the intentionality spectrum.

KEYWORDS: Bipolar Disorder; Substance Use Disorder; overdose; suicide

INTRODUCTION

Bipolar Disorder (BD), involving extreme fluctuations in mood, energy, and activity levels (known as manic/hypomanic and depressive episodes),[1] is characterized by a profoundly elevated risk of premature mortality, largely driven by high rates of suicide and intentional self-harm.[2,3] Individuals with BD face a suicide risk approximately 20–30x higher than the general population,[4] and estimates suggest up to 50% of individuals with the diagnosis attempt suicide at least once in their lifetime.[5] While suicide methods vary, intentional self-poisoning is a predominant mechanism of lethality for this group, particularly among women.[6] These intentional overdoses are often characterized by use of prescribed medications, rather than illicit substances,[6,7] possibly related to increased access to psychiatric medications in the context of complex treatment regimes.[8,9]

In parallel, people diagnosed with Substance Use Disorders (SUD) are at high risk of unintentional overdose death, fueling an epidemic in the United States (U.S.) that has claimed more than 800,000 lives over the past decade.[10] Unlike the intentional overdoses prevalent in BD, overdose deaths in the context of SUDs are overwhelmingly classified as accidental.[11] Mortality in this context is heavily predicted by the presence of opioids, along with the proliferation of illicitly manufactured fentanyl and physiological vulnerability following periods of abstinence.[12] Overdose deaths from substances other than opioids are also on the rise in the U.S.[13]

BD and SUDs are commonly co-occurring psychiatric disorders. In fact, the National Epidemiologic Survey on Alcohol and Related Conditions indicates that approximately 40–70% of U.S. adults with BD will experience a co-occurring SUD in their lifetime.[14] This comorbidity fosters an environment that elevates risk for both intentional and unintentional overdose.[15] Consequently, patients with co-occurring BD and SUD face a substantial increase in overdose death risk, such that the risk is significantly higher than for those with either disorder alone.

The Rhode Island (RI) population experiences increased risk for negative outcomes at the intersection of BD and SUD. Recently, the state ranked 16th in the nation for rates of illicit drug use and opioid-related fatalities,[16] creating a high-risk context for individuals with mood disorders. While overdose death rates have been declining since 2022, 329 Rhode Islanders died from accidental drug overdose in

2024.[17] Similarly, the latest confirmed data from the Centers for Disease Control and Prevention found 126 suicide deaths in RI in 2022,[18] and provisional estimates of suicide-related emergency department visits in 2025 suggest increasing rates since 2024.[19]

The overdose crisis in RI has traditionally been segmented into intentional suicide vs. accidental overdose fatalities; however, local data suggest a different picture for these dual-diagnosis individuals (i.e., those who meet diagnostic criteria for a SUD and co-occurring psychiatric disorder). A recent analysis of state overdose deaths revealed that while individuals with a history of intentional overdose were significantly more likely to have a known mental health diagnosis (77.9%), about 15% of unintentional overdose victims also had a documented diagnosis of BD.[20] This finding underscores a critical vulnerability in that RI patients with BD are not only at heightened risk for intentional self-poisoning, but they are also disproportionately represented in accidental drug-related deaths.[20,21]

The Current Study

While overdoses are clearly a serious public health concern in RI, less is understood about the differences in phenomenology between intentional and unintentional overdose for dual-diagnosis individuals. The current study sought to address gaps in the literature by characterizing intentional and unintentional overdose patterns among BD-SUD patients in a hospital in RI. While the general RI population has an accidental overdose event rate of <1% annually, we hypothesized that (1) our hospital sample would report rates exceeding 40%. This estimate is based on recent literature indicating 36–49% of individuals with severe SUDs experience a lifetime non-fatal accidental overdose.[22,23] Similarly, given estimates that 32–36% of individuals with BD attempt suicide (with self-poisoning a predominant method),[24] we hypothesized that (2) rates of intentional overdose in our sample would exceed 20%. We also hypothesized that (3) antidepressant/antipsychotic/mood-stabilizing medications would be more frequently implicated in intentional self-poisoning events, while opioids would be more frequently reported for unintentional overdoses. Lastly, we sought to explore how participants who report a history of both types of overdose compare on demographic variables to those with intentional overdose alone and accidental overdose alone.

METHODS

Data for this analysis were drawn from the baseline assessment of a larger randomized controlled trial designed to evaluate the efficacy of a specialized psychosocial intervention for English-speaking adults with co-occurring bipolar and substance use disorders taking at least one mood-stabilizing medication (ClinicalTrials.gov Identifier: NCT04202393). The parent study recruited adult hospital patients meeting DSM-5 criteria for BD (I, II, or unspecified) and a current co-occurring SUD (alcohol and/or drug). Following recruitment during acute hospitalization, participants were randomized to receive either a multicomponent psychosocial intervention involving individual and family sessions, or an enhanced treatment as usual condition with additional assessment and care coordination. Only baseline overdose history and sample characteristics were analyzed in the current report. Patients were recruited from 2020–2025.

Measures

All participants completed a brief demographics questionnaire at baseline.

Eligibility Criteria: BD and SUD diagnoses were determined using the Mini-International Neuropsychiatric Interview (MINI),[25] which is a brief, structured diagnostic interview for DSM-5 disorders, designed for use in clinical practice and research settings. Extensive validation studies have demonstrated that the MINI possesses high reliability and validity when compared to established gold-standard measures.[26] Medication use was measured through the Brief Adherence Rating Scale (BARS),[27] which is a clinician-administered instrument consisting of questions regarding the patient's knowledge of their medication regimen and missed doses. The BARS has demonstrated reliability and validity.[28]

Intentional Overdose: The Columbia Suicide Severity Rating Scale (C-SSRS)[29] is a well-validated measure of suicidal ideation and behavior in clinical samples.[30] After assessing for a history of suicide attempt, the C-SSRS interviewer obtains information regarding the suicide method. If a participant endorsed lifetime history of intentional overdose on the C-SSRS, they were asked to identify and answer descriptive questions (including which substances were involved) about their most recent intentional overdose on the Overdose Interview (see below).

Accidental Overdose: The Overdose Interview (ODI) was developed by the authors and used in prior studies (e.g., Johnson et al., 2020). Participants were asked if they had ever in their lifetime experienced an accidental overdose, described as, "…taking too much of a substance or a combination (including medications, alcohol, and/or drugs) that causes immediate negative health effects without ANY intention to die or wish to die." Participants provided descriptive details regarding their most recent accidental overdose event, including which substances were involved.

Substance Categorization: Substances were categorized according to their primary central nervous system effects, with an emphasis on pharmacologic mechanisms and behavioral outcomes relevant to acute risk states (e.g., disinhibition, perceptual alteration, or sedation). This approach is consistent with established frameworks (e.g., DSM-5[31]) that group substances based on shared neurobiological effects rather than legal status or route of administration. See **Table 1** for additional details regarding substances included in each category.

Data Analysis Plan

Analyses were conducted using SPSS version 31. Prevalence estimates were obtained to identify the percentage of the sample reporting a history of intentional overdose, accidental overdose, and both types of overdose. These groups were then compared on demographics and the participant reported substance types using independent-samples *t* tests and χ^2 tests, as appropriate. Among the 176 participants with baseline data, 5 were missing the full ODI measure and were therefore excluded from analyses, leaving a final sample of $n = 171$.

RESULTS

Hypotheses 1 & 2

We hypothesized that our hospital sample would report (1) rates of accidental overdose exceeding 40% and (2) rates of intentional overdose exceeding 20%.

Among 171 participants with co-occurring BD-SUD, 77% ($n = 131$) reported a history of any type of overdose, 48% ($n = 82$) reported a history of unintentional overdose, 56% ($n = 96$) reported a lifetime suicide attempt via intentional overdose, and 28% ($n = 47$) reported experiencing *both* intentional and unintentional overdose.

Hypothesis 3

We hypothesized that antidepressant/antipsychotic/mood-stabilizing medications would be more frequently implicated in intentional self-poisoning events, while opioids would be more frequently reported for unintentional overdoses.

Among those who reported an intentional overdose ($n = 96$), antidepressant/antipsychotic/mood-stabilizing medications were the most frequently reported substance (42%), followed by sedating medications (38%) and alcohol (34%). A majority of participants (62%) noted their intentional overdose event involved use of more than one substance (i.e., polysubstance overdose). For participants who reported an accidental overdose ($n = 82$), opioids were the most frequently reported substance (59%), followed by alcohol (33%), and stimulants (24%). Just under half of the participants (43%) indicated polysubstance use during their accidental overdose event. See **Table 1** for additional substance frequencies.

Table 1. Substances Involved in Overdose Events

Substance	Intentional Overdose ($n = 96$)	Accidental Overdose ($n = 82$)
Alcohol	33 (34%)	27 (33%)
Opioid	23 (24%)	48 (59%)
Sedative	36 (38%)	12 (15%)
Stimulant	13 (14%)	20 (24%)
Antidepressant/Antipsychotic/ Mood-stabilizing medications	40 (42%)	6 (7%)
Over-the-counter medication	13 (14%)	3 (4%)
Cannabis and related plant-based psychoactives	6 (6%)	8 (10%)
Perceptual-altering substances	2 (2%)	4 (5%)
Polysubstance	59 (62%)	35 (43%)

Note: Opioid category is inclusive of both prescribed (e.g., Percocet) and illicit (e.g., heroin) opioids; Sedative category is inclusive of medications that are primarily sedating (e.g., benzodiazepines, sedative-hypnotics); Stimulant category is inclusive of primary stimulant agent, both prescribed (e.g., Adderall) and illicit (e.g., cocaine); Antidepressant/Antipsychotic/Mood-stabilizing medications category is inclusive of the listed traditional therapeutic psychiatric medications; Over-the-counter medications category is inclusive of non-prescription medications (e.g., Benadryl); Cannabis and related plant-based psychoactives category is inclusive of THC, CBD, and Kratom; Perceptual-altering substances category is inclusive of recreational drugs with hallucinogenic qualities (e.g., ecstasy, LSD); Polysubstance category is inclusive of any overdose event that involved more than 1 substance (e.g., alcohol + opioids, sedative + antidepressant medication, etc.).

Exploratory Analyses

How do participants who report history of both types of overdose compare on demographic variables to those with intentional overdose alone or accidental overdose alone?

When compared to participants in the intentional overdose only group, those who reported both types of overdose were significantly younger (36.9 years vs. 41.4 years, $p = .02$) and significantly more likely to have co-occurring alcohol and drug use disorder (rather than either disorder alone; 87.9% vs. 65.6%, adjusted residual = 2.1). There were no significant differences in demographic characteristics between participants in the accidental overdose-only group and those who reported both types of overdose.

DISCUSSION

In support of Hypotheses 1 and 2, baseline data from a larger clinical trial indicate a concerning prevalence of overdose history among patients admitted to a psychiatric hospital with co-occurring bipolar and substance use disorders, with 77% reporting at least one lifetime overdose event. The fact that 28% of this sample reported a history of both intentional and unintentional overdose is notable. This overlap suggests that for many dual-diagnosis patients, the distinction between a "suicide attempt" and an "accidental overdose" may be fluid or possess similar underlying pathology, such as mood instability and tendency to self-medicate (i.e., using non-prescribed substances with the intent to alleviate psychological distress or manage symptoms of a mental health condition). While we can theorize that these rates may be driven by the convergence of mood instability, acute distress, and intoxication-related impairment, it is important to recognize the other ways in which mental health comorbidities increase overdose risk.

Specifically, there is a paradox in that the multiple medications sometimes used to treat co-occurring BD and SUD can introduce significant risks by complicating medication regimens, which increases the likelihood of treatment

non-adherence, and by providing increased access to lethal means via medications. Because these dual-diagnosis patients are often prescribed complex polypharmacy medication regimens (e.g., a combination of mood stabilizers and adjunctive anxiolytics to manage symptom severity),[32] they are routinely in possession of large quantities of medication that carry significant risk of toxicity.[33] Agents used in standard care, such as lithium, possess narrow therapeutic indices, meaning that a standard quantity prescribed can easily constitute a fatal dose if ingested impulsively as an intentional overdose during a crisis.[34] Furthermore, the risk of unintentional toxicity is amplified when sedating medications like benzodiazepines or sedating antipsychotics are combined with use of alcohol or opioids, which can significantly lower the threshold for accidental overdose death through synergistic depression of the central nervous system.[35] Consequently, clinicians must weigh the stabilization benefits of pharmacotherapy against the reality that the very medications prescribed to prevent clinical deterioration may, without rigorous safeguards, facilitate overdose events.

Historically, many overdose prevention efforts have prioritized addressing opioid use to mitigate accidental overdose; however, in line with Hypothesis 3, we found that collectively antidepressant/antipsychotic/mood-stabilizing medications were the substances most frequently identified in intentional self-poisoning events, followed by alcohol and sedating medications. Furthermore, 62% of intentional overdoses involved polysubstance use, often combining medications with alcohol, which highlights a critical area for clinical intervention. Conversely, opioids remained the primary driver of unintentional overdoses, followed by alcohol and stimulants. This reflects broader national and local trends, where the proliferation of illicit substances, including fentanyl, increases mortality. However, the high prevalence of alcohol consumption across both overdose categories suggests that alcohol remains a ubiquitous catalyst for overdose, possibly by exacerbating the impulsivity and cognitive disinhibition inherent in both BD and SUD. Therefore, it is important to focus on preventing psychiatric medication overdoses among individuals at higher risk of suicide in this community, as well as reducing the practice of mixing medications with alcohol.

Regarding exploratory analyses of group comparisons [**Table 2**], we found that participants in the group reporting both types of overdose were significantly younger and more likely to have co-occurring alcohol and drug use disorder than those reporting only intentional overdose. This finding highlights an important group to be targeting in overdose prevention efforts across the full intentionality spectrum. Mainly, it appears that the BD-SUD overlap is compounded even further when considering polysubstance use and co-occurring SUDs. As providers assess for comorbid conditions, it may be helpful to flag those with multiple SUDs as potential beneficiaries of additional overdose risk management.

Table 2. Between Group Comparisons

	Both Types of OD (n = 47)	Intentional OD only (n = 49)	Comparison Both vs. Intentional only	Accidental OD only (n = 35)	Comparison Both vs. Accidental only
Variable	**m (SD)**	**m (SD)**	**p-value (t)**	**m (SD)**	**p-value (t)**
Age	36.9 (*9.4*)	41.4 (*12.0*)	.02	39.0 (*12.1*)	ns
Variable	**n (%)**	**n (%)**	**p-value (χ^2)**	**n (%)**	**p-value (χ^2)**
Birth Sex			ns		ns
Male	24 (*51.1*)	22 (*44.9*)		24 (*68.6*)	
Female	23 (*48.9*)	27 (55.1)		11 (*31.4*)	
Race/Ethnicity			ns		ns
White	34 (*72.3*)	40 (*81.6*)		28 (*80.0*)	
Black	4 (*8.5*)	3 (*6.1*)		0 (*0.0*)	
Multiracial	6 (*12.8*)	4 (*8.2*)		5 (*14.3*)	
Hispanic	8 (*17.0*)	3 (*6.1*)		2 (*5.9*)	
Marital Status			ns		ns
Single	36 (*76.6*)	28 (*57.1*)		24 (*68.6*)	
Married/ Domestic partner	3 (*6.4*)	4 (*8.2*)		8 (*22.9*)	
Separated/Divorced/ Widowed	8 (*17.0*)	17 (*34.7*)		3 (*8.6*)	
Household Income			ns		ns
Under $20,000	27 (*60.0*)	32 (*65.3*)		22 (*64.7*)	
Over $20,000	18 (*40.0*)	12 (*34.7*)		12 (*35.3*)	
Employment Status			ns		ns
Full or part time	20 (*42.6*)	26 (*53.1*)		13 (*37.1*)	
Unemployed	11 (*23.4*)	7 (*14.3*)		9 (*25.7*)	
Disabled	12 (*25.5*)	15 (*30.6*)		13 (*37.1*)	
Substance Use Disorder			.03		ns
Alcohol Use	2 (*6.1*)	10 (*31.3*)	*	3 (*11.1*)	
Non-alcohol	2 (*6.1*)	1 (*3.1*)		2 (*7.4*)	
Both alcohol and non-alcohol	29 (*87.9*)	21 (*65.6*)	*	22 (*81.5*)	

Note: m (*SD*) indicates variables for which means and standard deviations are depicted; n (%) indicates number and percentage. OD = overdose. Comparisons were not made between intentional and accidental overdose. *Adjusted residual > ±1.96.

CLINICAL AND PUBLIC HEALTH IMPLICATIONS

In light of these results, several clinical shifts are recommended:

Integrated Prevention: Providers should avoid siloing intentional and unintentional overdose interventions into mutually exclusive categories; rather, we recommend that for patients with co-occurring BD and SUD, screening for suicide risk be paired with harm reduction strategies (e.g., naloxone distribution), even for patients who outwardly appear to be low risk for intentional or unintentional overdose.

Medication Management: Given the role of psychiatric medications in intentional overdose, clinicians should emphasize lethal means counseling and consider the safety of prescribing patterns for high-risk individuals. Through de-prescribing (i.e., discontinuing inappropriate or excessive medications), prescribers can reduce overdose rates by mitigating access to medications with higher risk profiles.[36]

Polysubstance Awareness: Public health campaigns in RI and beyond should focus on the high rates of polysubstance use, particularly the combination of medications with alcohol, which was prevalent across the intentionality spectrum in our sample. There is a need to increase education regarding the ways in which the chemical effects of one substance can compound the effects of another. For example, the depressant effects of alcohol may exacerbate the depressant effects of benzodiazepines, leading to higher overdose risk. Alternatively, the mood-altering effects of alcohol may lead to impulsive decisions to take higher doses of a medication, also increasing overdose risk. Similar to public health campaigns that have educated consumers about the impact of fentanyl in the RI drug supply (e.g., the *Assume Fentanyl* campaign and the *No Matter Why You Use* campaign), we hope to reduce both intentional and unintentional overdose rates by highlighting dangers of mixing substances.

CONCLUSION

This study highlights a critical vulnerability among psychiatric patients with dual diagnoses. While accidental opioid overdose is understandably a major public health priority, this study identifies intentional self-poisoning with antidepressants, antipsychotics, and mood-stabilizing medications as another prominent area of concern among patients with BD and SUD. Our data highlight a need to integrate the management of psychiatric medications with efforts to reduce the risks associated with illicit substance use, as well as the need for a focus on prevention of polysubstance overdose across the intentionality spectrum.

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Disclosures

Funding: This research was funded by R01MH122870.

Ethical approval: Obtained from the Butler Hospital Institutional Review Board.

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Disclosure of Suicidal Thoughts and Behaviors Among Adolescent Psychiatric Inpatients: Differences by Sexual and Gender Minority Status

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ABSTRACT

Rates of adolescent suicide have risen over the last 10 years, creating a public health crisis. Disclosure of suicidal thoughts and behaviors (STBs) is one help-seeking strategy available to adolescents. Estimates from prior studies on the frequency of youth STB disclosure vary considerably. It is crucial to understand patterns and rates of STB disclosure for youth at elevated risk for suicide, including those who have been psychiatrically hospitalized or who hold sexual and gender minority (SGM) status. To examine STB disclosure in this high-risk population, the current study examined self-report of STB disclosure behaviors, including to whom, how, and when disclosure occurred, as well as the outcome of the disclosure in a sample of psychiatrically hospitalized youth with prior STBs (N=163).

Data showed that the most common recipients of disclosures were caregivers, health professionals, and in-person friends. The most frequently endorsed method of disclosure was doing so in person, and there were no significant differences in when adolescents disclosed STBs (before, during, or after the experience). SGM adolescents were half as likely as non-SGM adolescents to disclose to parents or caregivers, and SGM adolescents disclosed more often during the STB than non-SGM youth. These findings can inform future interventions targeted at reducing STBs in youth or increasing help-seeking behaviors for psychiatrically hospitalized adolescents.

KEYWORDS: suicide; disclosure; adolescent; sexual and gender minority

INTRODUCTION

Suicide is a leading cause of death in adolescents, and close to 12% of adolescents report lifetime suicidal ideation (SI).[1] Assessment of suicidal thoughts and behaviors (STBs) is central to suicide prevention, and disclosure of STBs is a critical pathway for youth to seek and receive support. A 2024 scoping review of rates of STB disclosure found that among both adolescents who endorsed SI and general samples, rates of disclosure have ranged widely from 23% to 70%.[2] This review also found that adolescents disclosed most frequently to parents, friends, and mental health professionals. Disclosure may be especially consequential for psychiatrically hospitalized adolescents at elevated risk for hospital readmission and suicide attempts after discharge.[3] A 2018 study found that 53.1% of adolescents admitted to a psychiatric hospital were admitted due to STBs.[4] Further, in a sample of psychiatrically hospitalized adolescents, lower rates of disclosure were associated with more intense reports of SI.[5] This suggests that STB disclosure can serve as a protective factor for youth experiencing SI. A better understanding of rates of STB disclosure, recipients of disclosure, and outcomes of disclosure could inform interventions and treatment.

Understanding STB disclosures is especially important for youth at higher risk for suicide, including sexual and gender minority (SGM) adolescents. SGM youth report higher rates of suicidal thoughts and non-suicidal self-injury, as well as greater risk for attempting suicide during their lifetime compared to non-SGM youth.[6,7] Reported STB disclosure rates among SGM adolescents who died by suicide range from 28–40%.[8] Research has demonstrated differences in disclosure among SGM youth and non-SGM youth, with some studies finding more frequent disclosure among SGM youth, but others reporting greater reluctance to disclose to parents among SGM teens.[9] Higher levels of minority stress are also associated with greater reluctance among SGM to disclose STBs.[10]

The current study examined psychiatrically hospitalized adolescents' history of disclosure, using descriptive analyses to explore factors such as the recipient of disclosure, the means of communication, the timing of the disclosure, and the adolescents' feelings after the disclosure. A secondary aim of this study was to explore the differences in STB disclosure among SGM adolescents versus non-SGM adolescents.

MATERIALS AND METHODS

The study was part of an IRB-approved retrospective chart review of adolescents (N=322, M_{age}=14.98 (1.66) years old, range=11–18) admitted to Bradley Hospital's adolescent inpatient psychiatric unit between September 2024 and May 2025 who endorsed either a lifetime history of SI or suicide attempt(s).

Measures

At intake to the psychiatric unit, adolescents completed self-report measures, including items capturing age, sex, race, sexual orientation, and gender identity. STBs were measured using the *Self-Injurious Thoughts and Behaviors Interview-SITBI*.[11] The SITBI is a semi-structured interview that gathers information about SI, suicide plans, suicide attempts, and non-suicidal self-injury. The SITBI measure demonstrated strong inter-rater and test-retest reliability and concurrent validity in adolescents and young adults. Because there are no validated measures surrounding STB disclosure in adolescents, disclosure was assessed through five self-report questions created by the research team: 1) has the youth disclosed a STB to someone, 2) the relationship of the disclosure recipient, 3) the method of disclosure, 4) the timing of disclosure (participants could select any combination of "before the STB", "during the STB", or "after the STB"), and 5) the emotional response following disclosure (feeling better, the same, or worse). Items were not specific to one STB event but rather to any incident of STB prior to admission. Therefore, adolescents could select multiple recipients, methods, and timings of disclosure.

Data Analysis

Participants who did not endorse prior STBs were excluded from the dataset. SGM teens were defined as those who responded "no" to either cisgender gender identity or heterosexual sexual identity. Logistic regression models were used to examine the association between SGM (vs. non-SGM) identity and disclosure behaviors, controlling for prior suicide attempts.

RESULTS

Of the 322 adolescents psychiatrically hospitalized during the study period, 282 (87.6%) reported STBs. Seven adolescents selected either "prefer not to answer" or "other" for both gender and sexual orientation questions and were excluded from the analyses, yielding an analytical cohort of 275 adolescents who reported any STB. Of those who reported STBs, 52% (N=143) were SGM adolescents, and 48% (N=132) were non-SGM adolescents. **Table 1** provides details on participant demographics, including gender identity, sexual orientation, and race.

Of the 275 adolescents who reported STBs, 169 (61.4%) reported disclosing an STB before admission. Of the youth who reported disclosing their STBs, the majority disclosed to a parent or caregiver (45%), to a doctor or mental health worker (42%), or to an in-person (rather than online) friend (42.6%) [**Table 2**]; 80.5% of adolescents disclosed by telling the recipient verbally. The timing of disclosure was evenly split: 47% of all participants reported at least one instance of disclosure before suicidal behaviors; 46% of all participants reported at least one instance of disclosure during STBs; and 44% of all participants reported at least one instance of disclosure after STBs. Most participants felt better (39.6%) or the same (40%) after their STB disclosure, but 20.4% of participants endorsed feeling worse after STB disclosure.

Contrary to the secondary hypothesis, STB disclosure did not differ significantly by SGM status: 67.8% of SGM youth disclosed STBs (97 of 143), compared to 55.3% of non-SGM youth (73 of 132). Of those who made a disclosure, SGM adolescents disclosed 1.89 times more often during the behavior than non-SGM adolescents, but 0.48 times as often to parents or primary caregivers than their non-SGM adolescent peers [**Table 3**]. There were no significant differences in the method of disclosure or emotional responses after disclosure between SGM and non-SGM youth. The differences in disclosure during the STB and to primary caregivers remained statistically significant when controlling for lifetime instances of suicide attempts.

Table 1. Participant Demographics (N=169)

	N (%)
Sexual Orientation (select all that apply)	
Heterosexual	71 (42%)
Asexual	12 (7.1%)
Bisexual or Pansexual	56 (33.1%)
Gay or Lesbian	13 (7.7%)
Questioning or Unsure	17 (10.1%)
Sex Assigned at Birth	
Male	51 (30.2%)
Female	118 (69.8%)
Gender Orientation (select all that apply)	
Cisgender Male	51 (30.2%)
Cisgender Female	103 (60.1%)
Transgender Female	1 (0.01%)
Transgender Male	3 (1.7%)
Nonbinary	3 (1.7%)
Gender Fluid	11 (6.5%)
Unsure	7 (4.1%)
Racial Identity (select all that apply)	
American Indian or Alaskan	10 (5.9%)
Asian	8 (4.7%)
Black or African American	33 (19.5%)
Hispanic, Latino, or Spanish Origin	54 (31.9%)
Native Hawaiian or other Pacific Islander	3 (1.8%)
White	105 (62.1%)
Middle Eastern	2 (1.2%)
Other	8 (4.7%)

Table 2. Descriptives of psychiatrically hospitalized adolescents endorsing disclosure behaviors (N=169)

	N (%)
Who the adolescent disclosed to	
Primary caregiver	76 (45%)
Adult family member	27 (16%)
Sibling	22 (13%)
Doctor or Mental Health Worker	71 (42%)
Teacher or adult at school	38 (22.5%)
In-person friend	72 (42.6%)
Online friend	31 (18%)
Somebody else	21 (12%)
How the adolescent disclosed	
By telling them directly	136 (80.5%)
Through social media	23 (13.6%)
Through text or email	58 (34%)
Through a note	14 (8%)
Another way	18 (10.7%)
When the adolescent disclosed	
Before STB	80 (47%)
During STB	78 (46%)
After STB	75 (44%)
How the adolescent felt after disclosure	
Better	67 (39.6%)
The same as before	68 (40%)
Worse	34 (20.4%)

Note: For questions asking about the recipient of disclosure, the method of disclosure, and the timing of disclosure, participants were able to select multiple options.

DISCUSSION

This study contributes to the literature examining STB disclosure in a sample of psychiatrically hospitalized adolescents by exploring the recipients, method, timing, and emotional response to disclosure. Adolescents disclosed most often to their parents or caregivers, a mental health professional, or an in-person friend. This aligns with previous research that found hospitalized adolescents often disclose STBs to parents or friends.[9] Previous research supports parent-child connection and parental support as a protective factor against suicide in adolescents.[14] Understanding common recipients of disclosure may inform future interventions for adolescents in a psychiatric hospital, improve relationships, and enhance skills in responding to STBs among individuals to whom youth frequently disclose STBs. This could include facilitating conversations about STBs in family therapy and providing guidance to parents and peers to support youth safety in the context of STBs. Given the balanced distribution in the timing of disclosure, which included before, during, and after the behavior, clinicians may want to consider ways to proactively facilitate disclosure in patients at risk for STBs.

The study also provided insight into the timing of disclosure and found unexpected differences in disclosure behaviors between SGM and non-SGM adolescents. Whereas there was no difference in disclosure frequency before or after the STB, SGM adolescents were approximately twice as likely to disclose during the STB as non-SGM adolescents. Previous literature has not examined the timing of disclosure among SGM adolescents, nor has it examined it in comparison to non-SGM adolescents. Future work should examine the underlying motivation for SGM adolescents in disclosing during an STB.

Most participants reported that they felt the same or better than before the disclosure, suggesting that disclosure may have a buffering effect for youth exhibiting STBs. This finding is consistent with prior research which found that adolescents who disclosed non-suicidal self-injury or STBs reported higher self-esteem and future optimism than those who did not disclose.[12] While prior research has not thoroughly explored how previous disclosure experiences impact future disclosure experiences; one study showed that adolescents who disclosed a suicide attempt were more likely to seek professional help after disclosing, and that disclosures were regarded as helpful.[13] This suggests that disclosures may promote safety and encourage help- and treatment-seeking behaviors. While most adolescents reported feeling the same or better after disclosure, a minority of participants reported feeling worse. Due to the limitations of the chart review format of the present study, the exact reasons for the worsening of mood cannot be determined. Potential factors include an invalidating response to the disclosure, or that the disclosure led to the present hospitalization that the adolescent may find distressing at this stage of their treatment and recovery. This finding reinforces the need for close monitoring and follow-up after disclosures.

There were no significant differences between SGM and non-SGM adolescents in the frequency of disclosure of STBs. Although this study did not find differences in the likelihood of disclosure between SGM and non-SGM youth, it found that SGM teens were about half as likely as their non-SGM peers to disclose to primary caregivers. SGM youth reported disclosing to a caregiver about 37% of the time, less than previously reported for psychiatrically hospitalized SGM youth who endorsed STBs (>50%).[9] It remains unclear which factors, including the strength of the relationship between SGM adolescents and their primary caregivers, influence the likelihood of disclosure, highlighting the need for future research on this topic.

When analyzing differences between SGM and non-SGM adolescents, it was hypothesized that if rates of disclosure were analyzed without considering severity of STBs, there may be more STB disclosures due to more frequencies of STB, and therefore more opportunities to disclose, rather

Table 3. Descriptives and logistic regressions estimating odds of SGM adolescents endorsing disclosure behaviors (relative to non-SGM), including controlling for frequency of prior suicide attempts

	SGM N=143; N=97 for disclosure details N(%)	Non-SGM N=132; N=73 for disclosure details N(%)	Odds–ratio (OR) of disclosure behavior (95% CI)	OR controlling for lifetime instances of suicide attempts (95% CI)
Disclosed STB	97 (68%)	73 (55%)	1.62 (0.99–2.67)	1.54 (.93–2.56)
Who the adolescent disclosed to				
Primary caregiver	36 (37%)	41 (56%)	**0.48 (0.26–0.89)***	**0.43 (0.23–0.82)***
Adult family member	14 (14%)	13 (18%)	0.80 (0.35–1.82)	0.81 (0.35–1.87)
Sibling	12 (12%)	10 (14%)	0.91 (0.37–2.24)	0.86 (0.34–2.15)
Doctor or Mental Health Worker	46 (47%)	26 (36%)	1.56 (0.83–2.91)	1.61 (0.86–3.06)
Teacher or adult at school	24 (25%)	15 (21%)	1.31 (0.63–2.72)	1.33 (0.63–2.80)
In-person friend	48 (49%)	26 (36%)	1.70 (0.91–3.17)	1.86 (0.98–3.53)
Online friend	20 (21%)	11 (15%)	1.41 (0.62–3.18)	1.50 (0.65–3.45)
Somebody else	12 (12%)	9 (12%)	1.03 (0.41–2.59)	1.03 (0.40–2.62)
How the adolescent disclosed				
By telling them directly	78 (80%)	60 (82%)	0.87 (0.40–1.90)	0.95 (0.43–2.12)
Through social media	17 (18%)	6 (8%)	2.43 (0.91–6.53)	2.54 (0.93–6.95)
Through text or email	38 (39%)	20 (27%)	1.69 (0.87–3.27)	1.70 (0.87–3.33)
Through a note	10 (10%)	4 (5%)	2.03 (0.61–6.75)	2.08 (0.61–7.02)
Another way	13 (13%)	6 (8%)	1.77 (0.64–4.91)	1.68 (0.60–4.71)
When the adolescent disclosed				
Before STB	45 (46%)	36 (49%)	0.89 (0.48–1.63)	0.90 (0.48–1.67)
During STB	51 (53%)	27 (37%)	**1.89 (1.02–3.53)***	**2.07 (1.09–3.92)***
After STB	44 (45%)	32 (44%)	1.11 (0.60–2.04)	1.05 (0.56–1.96)
How the adolescent felt after disclosure				
Better compared to the same	33 (34%) compared to 41 (42%)	34 (47%) compared to 28 (39%)	1.51 (0.77–2.97)	0.73 (0.48–1.09)
Better compared to worse	33 (34%) compared to 23 (23%)	34 (47%) compared to 11 (15%)	2.15 (0.91–5.11)	0.71 (0.43–1.19)
The same compared to worse	41 (42%) compared to 23 (23%)	28 (39%) compared to 11 (15%)	1.43 (0.60–3.39)	0.98 (0.59–1.64)

Note: * p<0.05. SGM= Sexual and/or Gender Minority identity. OR=odds ratios from logistic regressions predicting disclosure behavior from SGM identity (vs non-SGM), without covariates and covarying, lifetime, suicide-attempt frequency, as assessed with the SITBI.11 After removing those who did not disclose STBs, a sample size of 170 adolescents remained for further analysis. The last question, which assessed how adolescents felt after disclosure, was analyzed using a multinomial logistic regression, instead of a logistic regression.

than differences in SGM status. Therefore, in analyses, lifetime instances of suicide attempts were controlled in order to control for the severity of STBs. However, as seen in **Table 3**, the odds ratios were similar between analyses without controlling for lifetime instances of suicidal thoughts, and analyses controlling for those with lifetime instances of suicidal thoughts.

Limitations

Findings should be considered in the context of the study's limitations. First, the sample consisted of adolescents hospitalized at a psychiatric hospital in the Northeast United States. The adolescents in the study may present with more severe psychopathology and STBs than a community-based sample, thus impacting the generalizability of the findings. Additionally, the sample was predominantly White, so the

results may not be generalizable to other cultures and races. Culture can influence help-seeking and STB disclosure, with some cultural groups showing fewer help-seeking behaviors for STBs than others, so future research should address how different cultures engage in help-seeking behaviors, such as disclosure of STBs.[15] The cross-sectional nature of this study is also a limitation. Due to the nature of data collection, no longitudinal data were collected. Therefore, it was not possible to track participants' disclosure behavior over time, to assess how emotional response to disclosure trends over time, or to assess how others' response to disclosure impacts future disclosure behavior or treatment-seeking behavior. Finally, due to limited power, gender and sexual minority status could not be analyzed separately; future studies with larger samples should examine them independently.

CONCLUSIONS

Future work should examine the effect of responses to STB disclosure on the likelihood of disclosing in the future, and how the severity of STBs impacts disclosure behavior. Clinicians may also explore how to increase adolescents' access to and comfort with help-seeking behaviors, including disclosure. This is particularly important for youth at higher risk for suicide, such as those psychiatrically hospitalized or marginalized based on sexual or gender identity. This may include creating future opportunities for disclosure of STBs to family members or treatment providers following discharge from the psychiatric hospital.

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Disclosures

Acknowledgment: We want to thank the adolescents whose data were used in this study, as well as the research staff who helped support this study.

Funding: This study was supported by Grant P20GM139743, The Pediatric Biopsychology Core, NIH, National Institute of General Medical Sciences to Jennifer Wolff.

Ethical approval: Obtained from Brown University's Institutional Review Board.

Disclaimer: The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH.

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Triple Vulnerability: Suicidal Ideation, Elevated Anxiety, and Alcohol Consumption and Treatment Engagement in a Partial Hospital Setting

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ABSTRACT

OBJECTIVE: Partial hospitalization programs (PHP) are acute psychiatric settings that commonly treat patients with active suicidal ideation (SI), anxiety, and alcohol use. Alcohol use is common among patients with SI and anxiety, and this triple vulnerability may negatively impact treatment engagement and outcomes in PHP. This study examined whether patients presenting with SI, elevated anxiety, and alcohol use ("triple vulnerability") demonstrated differences in PHP treatment outcomes (completing treatment, number of days attended, number of absences) compared to patients without the vulnerability.

METHODS: Participants were 493 patients admitted to an Acceptance and Commitment Therapy-based PHP program in the United States between 2014-2020. Triple vulnerability was defined as reporting (1) active SI, (2) clinically elevated anxiety (CUXOS-D ≥ 20), and (3) consuming ≥ 1 alcoholic drink on a typical drinking day within the past year. Binary and linear regressions were used to assess differences in treatment completion status, number of days attended, and number of absences.

RESULTS: The triple vulnerability was not significantly associated with treatment completion status or with the number of absences; it was, however, positively associated with the number of days attended at PHP.

CONCLUSION: People who experience SI, clinically elevated anxiety, and who consume at least one alcoholic beverage on a typical drinking day are more likely to attend PHP for a longer duration of time, but are not any more susceptible to not finishing treatment, relative to people who do not have the triple vulnerability. Future work can benefit from exploring additional treatment outcomes that may be impacted by patients with the triple vulnerability.

KEYWORDS: partial hospitalization program; treatment outcomes; suicidal ideation; anxiety; alcohol use

INTRODUCTION

Suicide was the 12th leading cause of death in 2023,[1] with approximately 49,300 suicide deaths. These rates represent a 35% increase over the past two decades.[2] In addition, about 12.8 million people seriously thought about suicide in 2023.[1] Partial hospitalization programs (PHP) are acute psychiatric settings that commonly treat patients with active suicidal ideation, offering daily intensive group therapy, individual psychotherapy, and psychiatry visits with medication management, while allowing patients to return home each evening. Nearly half of PHP patients report active suicidal ideation on intake.[3] The integration of intensive and multimodal therapy distinguishes PHPs as a valuable and common treatment setting for patients with suicidal ideation. Yet, PHPs and their treatment outcomes remain relatively understudied.[4,5]

Anxiety is prevalent among patients in PHPs and is associated with increased suicidal ideation[6] and suicide attempts[7] even when controlling for other mood disorders.[6] In population-based studies, the presence of anxiety disorders increased the odds of experiencing suicidal ideation and suicide attempts by 2.29 and by 2.48.[6]

Alcohol use is common in patients with suicidal ideation and anxiety. Comorbid alcohol use and anxiety symptoms have been associated with poorer treatment outcomes, less engagement in alcohol use-reduction behaviors, and overall less willingness to participate in treatment.[8-11] These intersecting symptoms may elevate the risk of incomplete treatment within the PHP setting, which relies heavily on daily attendance, group engagement, and participation. Therefore, patients with this triple vulnerability may struggle with less willingness to participate in PHP treatment, putting them at greater risk for early drop-out, missed absences, and increased risk for suicide and rehospitalization. Given that patients with this triple vulnerability do not necessarily have to meet diagnostic criteria for depression, alcohol use disorder, or another anxiety disorder, they may be clinically overlooked due to their lack of comorbid conditions. Despite the fact that they may not meet diagnostic criteria for all three disorders, when all their symptoms are taken together, these three factors may result in a clinical picture that is more difficult to treat than any in isolation. Patients with the triple vulnerability are a vulnerable group, and this exploration is a worthy endeavor given that it might help build awareness into how the triple vulnerability impacts treatment.

The Current Study

The current study aimed to examine whether patients presenting with the co-occurrence of suicidal ideation, clinically elevated anxiety, and recent alcohol use ("triple vulnerability") differed in treatment engagement outcomes in a PHP compared to those without this triple vulnerability. Specifically, we evaluated treatment-completion status, number of days attended, and number of absences. We hypothesized that patients meeting criteria for the triple vulnerability would demonstrate lower rates of treatment completion and reduced program attendance compared to patients without the full triple vulnerability.

METHODS

Treatment Setting/Procedure

Data were collected from consented patients presenting to an Acceptance and Mindfulness-based PHP between April 2014 and March 2020. Treatment was primarily based on Acceptance and Commitment Therapy (ACT) with elements of Cognitive Behavior Therapy and Dialectical Behavior Therapy incorporated as clinically indicated. Patients attended four to five group therapy sessions daily, as well as individual sessions with their therapist and psychiatrist. All patients completed standardized intake measures on their first day of treatment. Patients met daily with their individual therapist, psychiatrist, and attended 3-5 groups. Further treatment schedule details can be found in Terrill, Hubert, Yun, Ingram, Dalrymple.[12]

Participants

Participants were 493 adults admitted to the PHP for treatment who had complete data for all of the study variables. Participants' mean age was 34.76 years (*SD* = 12.88), and 70.8% identified their biological sex as female, 26.4% as male, and 2.8% as "other". Participants reported their race/ethnicity as 74.6% White, 11% Hispanic, 5.1% Black, 1.6% Asian, 1.8% Portuguese, and 5.9% Other. In terms of education, 7.7% did not graduate high school, 18.3% graduated from high school or received a GED, 35.3% completed some college, 23.3% graduated from a 2- or 4-year college program, 5.7% completed some graduate or professional school, and 9.7% completed graduate or professional school. Patients with missing alcohol use, anxiety, or suicidal ideation data were excluded from analyses.

Measures

Suicidal Ideation: Suicidal ideation was measured using a single item from the Remission from Depression Questionnaire (RDQ).[13] The item asked, "I had thoughts about killing myself" and was rated on a three-point scale (0 = "not at all or rarely true", 1 = "sometimes true", 2 = "often or almost always true") during the past week. Any non-zero endorsement (1 or 2) was coded as "active suicidal ideation."

Anxiety: Anxiety was measured using the Clinically Useful Anxiety Outcome Scale - Daily (CUXOS-D),[14] a 20-item self-reported measure of daily psychic and somatic symptoms of anxiety. Daily symptoms varied from 0 ("not at all") to 4 ("extremely"), with total scores ≥20 indicating at least mild anxiety. Scores of 20 or higher on intake or on day 1 of treatment (whichever was available) were coded as "clinically elevated anxiety." The daily version of the CUXOS has strong internal consistency (Cronbach's alpha = .93 at intake), test-retest reliability (r = .95 at intake), and high correlation with another measure assessing symptoms of anxiety.[14]

Alcohol Use: A single item from the Alcohol Use Disorders Identification Test - Consumption (AUDIT-C)[15] was used to establish the frequency of alcohol use. The item asked, "How many drinks do you have on a typical day when you were drinking in the past year?" and is rated on a Likert scale of "0" = 0 drinks to "5" = 10 or more drinks. This item was only used to identify people with regular alcohol exposure.

Triple Vulnerability: A dichotomous variable was created to represent the presence or absence of the triple vulnerability. Participants were coded as meeting triple vulnerability if they endorsed (1) active suicidal ideation, (2) criteria for clinically elevated anxiety (CUXOS-D >= 20), and (3) having 1+ drinks during a typical day of drinking during the past year (AUDIT-C ≥1). A total of 143 participants (29%) met triple vulnerability criteria, and 350 did not.

Number of days attended: A continuous variable was created to represent the total number of days of PHP attendance.

Completion status: Patients' completion status was determined by their primary provider (PhD, PsyD or MD), and included the following categories: (1) treatment complete, (2) treatment nearly complete, (3) insurance no longer covering, (4) nonattendance, (5) referred to another program, (6) transferred to inpatient care, (7) withdrew due to external limitations, (8) reported dissatisfaction and withdrew against medical advice, and (9) other. For interpretability, the treatment complete category was renamed to 'completed, ' and all other 8 categories (treatment nearly complete, insurance no longer covering, nonattendance, referred to another program, transferred to inpatient care, withdrew due to external limitation, reported dissatisfaction, and other) were collapsed into 'not completed.'

Number of absences: A continuous variable was created representing the total number of days patients were absent from PHP.

Data Analysis Plan

All analyses were conducted using IBM SPSS (Version 31.0). A binary logistic regression was conducted, with triple-vulnerability status as the predictor and treatment completion status (yes/no) as the dependent variable. Additionally, two linear regressions were conducted with triple-vulnerability

status as the predictor and number of days attended at PHP and number of absences as the respective dependent variables. Age and sex were entered as covariates. Descriptive statistics for all study variables among the triple-vulnerability groups vs. people without the triple vulnerability are presented in **Table 1**.

RESULTS

First, a binary logistic regression with treatment-completion status as the dependent variable showed that the model significantly predicted the outcome, (3) = 9.24, p = .026, explaining 3% of the variance (Nagelkerke R^2= .03) and correctly classifying 67% of cases. In the adjusted logistic regression model, only age was associated with higher odds of treatment completion (OR = 1.02, 95% CI [1.01, 1.04], p = .009). Triple vulnerability and sex were not significantly associated with treatment completion. Second, the linear regression with the number of days attended at PHP as the dependent variable showed the model was significant, F(3,492) = 4.13, p = .007. The results showed that the triple-vulnerability status was a significant predictor of the number of days attended (β=0.11, t= 2.40, 95% CI [0.21, 2.20], p = .017). Third, the linear regression with number of absences as the dependent variable showed the model was significant, F(3,492) = 7.13, p <.001. The results showed that the triple-vulnerability status was not a significant predictor of the number of absences (β=0.03, t= 0.68, 95% CI [–0.21, 0.44], p = .499). Only sex was a significant negative predictor in this model, p <.001. Sex was coded as 0 = female and 1 =male, indicating that males are less likely to have absences.

DISCUSSION

To our knowledge, this is the first study to examine treatment outcomes (i.e., treatment completion, number of days attended at PHP, number of absences) among patients engaging in a PHP in the Northern United States who reported suicidal ideation, clinically elevated anxiety, and consumed at least 1+ drink on a typical drinking day in the last year. Findings showed that patients who experience the triple vulnerability are more likely to remain longer in treatment relative to patients without the triple vulnerability. Patients did not differ based on treatment completion or number of absences. This study is an important step towards understanding how to improve treatment engagement and outcomes among patients who are at risk for suicidal ideation, elevated anxiety, and alcohol use.

The goal of PHPs is to help stabilize symptoms and improve functioning to help patients transition to a lower level of care. Prior research has indicated that comorbid alcohol use and anxiety symptoms are associated with less willingness to participate in treatment.[8-11] By identifying patients who have these characteristics that may put them at risk for premature discharge from PHP or worse treatment outcomes, additional support can be provided to reduce suicidal ideation, anxiety, and alcohol consumption to increase engagement in treatment, and therefore increase the likelihood of positive treatment outcomes. Among patients who did not have the triple vulnerability, approximately 78% did not report active suicidal ideation, which may speak to why those patients attended PHP treatment for a shorter duration. Additionally, it may be worthwhile to explore in more depth why men with the triple vulnerability, in particular, were less likely to have absences from PHP treatment compared to women.

Surprisingly, the triple vulnerability did not impact treatment completion and instead only resulted in patients with the triple vulnerability being more likely to attend for more days relative to those without the vulnerability. The clinical relevance of identifying the triple vulnerability is highlighted by the fact that the patients required a longer PHP course of treatment, even when not meeting full diagnostic criteria for any single disorder. Although the difference between an average of 8.13 versus 7.24 days [**Table 1**] may be modest, and cannot alone establish clinical significance in terms of symptom stabilization, it is important to note that each additional day in an intensive treatment environment, such as PHP, may carry clinical relevance as it relates to readiness for step-down to outpatient care. Specifically,

Table 1. Descriptive Statistics for all Study Variables

	Triple Vulnerability N = 143	Control Group N = 350
	N (%)	N (%)
Suicidality		
Not at all or rarely true	0 (0%)	273 (78%)
Sometimes true	64 (44.8%)	43 (12.3%)
Often or almost always true	79 (55.2%)	34 (9.7%)
Alcohol Use		
0 drinks	0 (0%)	143 (40.9%)
1 to 2 drinks	71 (49.7%)	123 (35.1%)
3 to 4 drinks	44 (30.8%)	46 (13.1%)
5 to 6 drinks	17 (11.9%)	21 (1.1%)
7 to 9 drinks	6 (4.2%)	9 (2.6%)
10 or more drinks	5 (3.5%)	8 (2.3%)
Treatment Completion		
Completed	89 (62.2%)	240 (68.6%)
Not completed	54 (37.8%)	110 (31.4%)
	M (SD)	**M (SD)**
Anxiety	60.31 (19.72)	51.40 (22.84)
Number of Days Attended	8.13 (6.46)	7.24 (4.29)
Number of Absences	1.44 (1.67)	1.41 (1.67)

a longer stay in PHP can indicate that a patient has not yet reached the clinical stability that affords a safe step-down to outpatient care, as this threshold is examined on a daily basis by clinicians in order to help patients return to a lower level of care as soon as possible. This also has practical implications for discharge planning, in terms of identifying an outpatient care team, which can take time, communicating with an existing care team, and ensuring appropriate outpatient supports. Patients with the triple vulnerability may benefit from initiating discharge-planning discussions earlier in their admissions to ensure timeliness before discharge. PHP and its treatment outcomes remain relatively understudied,[4,5] and future research in this treatment setting is indicated to determine what each additional treatment day confers in terms of post-discharge functioning.

There may be several other reasons why patients with the triple vulnerability had a longer treatment duration (by an average of about one day), and these reasons are speculative as they were not directly tested in this study. Possible explanations could be that they needed it due to increased severity, that their clinicians recommended a longer duration of treatment, that the PHP did not specifically address their alcohol use, or that they were more willing to remain in treatment until they completed their treatment. It is also possible that due to the triple vulnerability, day-to-day engagement was less, resulting in the need for more total days to complete the treatment. Clinicians may benefit from awareness that patients with the triple vulnerability may stay longer in PHP treatment. They may also encourage patients to make efforts to increase their engagement, which could make their treatment stay more efficient (i.e., resulting in a shorter length of stay that is optimized by having fewer absences during the length of stay). Clinicians may also consider discussing treatment engagement generally with patients and making adjustments to the patient's treatment plan based on the patient's needs. For example, if a patient with the triple vulnerability is reporting that they are having a difficult time engaging in group therapy, the clinician can work with them to approach engagement using emotion regulation, self-compassion, and distress-tolerance skills, instead of disengaging and avoiding others and the group leader. Clinicians may also benefit from revisiting the patients' values and goals in seeking treatment, and aim to increase their motivation to commit to action and change.

Future work may benefit from conducting PHP exit interviews with patients to examine their perspectives on treatment duration, and whether they may benefit from changes to help increase engagement. Although not directly assessed in the study, it would be worthwhile to explore why their treatment duration was statistically significantly longer. Interviews could also examine what motivated patients with the triple vulnerability to remain in treatment until completion. Findings could have important implications for policy. For example, if findings suggest that patients are engaged with treatment and they are still having longer PHP stays, this would support that people who carry this vulnerability may require a longer treatment duration (and this work can be cited in support of the need to request longer treatment to insurance companies if they are declining extended time at PHPs). Additionally, future work can also examine whether patients who have the triple vulnerability will have improved treatment outcomes if they participate in a PHP 'co-occurring track' that is specific to people who are also consuming substances, vs the general PHP track, which is not specific to substance use. Co-occurring mental health and substance use tracks at PHP specifically aim to address issues specific to substance use and may be better suited for patients with the triple vulnerability.

The current study highlights a higher-risk population that may benefit from additional targeted psychoeducation related to the manner in which symptoms maintain one another. Because patients with the triple vulnerability do not necessarily meet full diagnostic criteria for a DSM-5 disorder, they are more likely to fall through the cracks clinically, and may not be flagged as higher risk with traditional screening tools. The current study findings suggest that this combination, even when sub-diagnostic threshold, warrants clinical attention, given that it is associated with a longer treatment course. If PHP patients are screened for the triple vulnerability, clinicians may monitor their treatment adherence closely. They can also assess treatment engagement as well as their tendency to practice acquired ACT-based skills after program hours. A potential lower-cost method for accomplishing this could be through the use of digital interventions to assess these variables in a non-obtrusive and private manner, and provide additional skills' practice outside of program hours.

Limitations

The treatment setting of this study is a major strength. However, this study is not without limitations. First, alcohol-use measures were not collected from the entire sample (since PHP started), and as such, our sample size was significantly reduced due to a lack of AUDIT-C information for many PHP patients. Relatedly, we did not explicitly assess for daily alcohol use or for alcohol-related consequences, which would provide rich data for understanding alcohol use frequency and risk for serious consequences. Second, the study was conducted among patients in a PHP setting and thus may not generalize to less acute patient populations, such as outpatient treatment settings. Third, many of the independent variables, such as suicidality, anxiety, and alcohol use, are based on self-report and thus are subject to social desirability (e.g., underreporting or overreporting). It is possible that patients did not fully report their symptom severity due to social desirability. Lastly, suicidal ideation was assessed using a single self-report item, which may limit the ability to capture variability in ideation severity over time.

CONCLUSIONS AND FUTURE DIRECTIONS

Study findings indicate that patients who report active suicidal ideation, elevated symptoms of anxiety, and consume 1–10+ drinks on a typical drinking day in the last year are more likely to remain in treatment longer relative to patients who do not have this vulnerability. Future research may benefit from continuing to examine this triple vulnerability longitudinally, to further understand how PHP treatment duration impacts patients' symptoms after discharge (longer term). Whereas the triple vulnerability did not have an impact on two treatment outcomes observed in this study (treatment completion, number of days absent), it is possible that it can have an impact on other treatment outcomes, such as engagement in outpatient therapy, changes in suicidal-ideation severity, and inpatient hospitalization or PHP readmission. Longitudinal work would be an ideal methodology to track patients who discharge from PHP care, and assess their symptom trajectory following the completion/termination of their care.

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Disclosures

Funding: Dr. López's efforts on this publication were supported by the National Institute on General Medical Sciences (P20GM130414, PI Monti).

Author Note: Study procedures were approved by the Rhode Island Hospital IRB. Study participants consented to the study protocol. Participants did not consent to data sharing. As such, authors elected not to share data.

Conflicts of interest: Authors have no conflicts of interest to disclose.

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Firearm Violence, Digital Amplification, and the Case for Mental Health Literacy

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KEYWORDS: firearm violence; resilience; mental health; education; health policy; community

THE ALARM ENDS BUT THE EXPOSURE DOES NOT

The emergency alert eventually stopped buzzing. Classes resumed. Emails reassured everyone that resources were available. Yet for many at Brown University and the surrounding communities, the danger did not end when the shooter was neutralized. Fear does not follow institutional timelines. It lingers in the body: in hypervigilance, disrupted sleep, irritability, withdrawal, and a recalibration of feeling safe.

The December 2025 Brown shooting was not only a campus crisis; it was a community-level exposure event. Individuals and communities who were never physically near the scene nonetheless absorbed the shock. In this way, firearm violence functions less like a discrete incident and more like a public health exposure—diffused, cumulative, and unequally distributed.

PRACTICING THE DRILL, NEGLECTING THE AFTERMATH

Schools and universities have become increasingly adept at preparing for the *moment* of violence. Lockdown drills, shelter-in-place protocols, and trauma-informed language are now routine.[1,2] These measures are not misguided; they save lives. What remains largely unaddressed is the mental health crisis fueling and following these events.

In 1963, Rhode Island (RI) established a vision for school health centered on education, services, and a healthy environment. For decades, "school safety" was synonymous with fire drills and Cold War-era simulations. Today, the landscape has shifted fundamentally; firearm violence is now the leading cause of death for American youth.[3,4] RI law mandates that students in grades 1–12 receive about 20 minutes per day of health and physical education, including mental health and emotional well-being.[5] This mandate has been operationalized primarily through standardized physical education and emergency preparedness, while relegating mental health education to episodic, reactive, and inconsistent instruction.[2,6] As early as grade school, we are drilling the body for survival and leaving the mind to recover on its own. This imbalance reflects a broader systems failure: preparedness without recovery, protection without processing.

FIREARM VIOLENCE AS AMBIENT EXPOSURE

Firearm violence is not a rare experience of RI residents. Nearly one in four young adults reports exposure to firearm violence during childhood or adolescence.[4,7] Exposure to firearm violence, a form of adversity associated with increased risk of mental health problems later in life, is not limited to direct victimization.[4,7] Witnessing violence, knowing someone who was harmed, or repeatedly experiencing lockdowns and alerts all contribute to cumulative psychological load.

The Brown shooting fits squarely within this pattern. Even for those not in immediate danger, the event added to an existing archive of exposure—one that many Brown students and community members have been building for years. Unlike traditional adverse childhood experiences, exposure to firearm violence often extends into young adulthood and higher education yet remains largely absent from prevention frameworks that focus narrowly on K–12 populations.

THE AMPLIFICATION ENVIRONMENT: COVID-19, SOCIAL MEDIA, AND ARTIFICIAL INTELLIGENCE (AI)

The psychological impact of firearm violence unfolds within an amplifying environment shaped by the COVID-19 pandemic, ubiquitous social media, and rapidly expanding AI technologies. This environment does not create violence, but it intensifies its reach and prolongs its effects.

Adults and youth experienced profound social isolation during the pandemic, alongside disrupted routines, loss, and uncertainty. Although the lockdown eventually ended, life never fully returned to the way it was, and youth development never quite caught up. Simultaneously, distress is no longer episodic, and the learning environment is no longer just the classroom; both are available 24/7, in virtual landscapes designed to hijack dopamine and amygdala pathways. We inhabit a digital ecosystem of algorithms and a never-ending stream of distressing media, such that platforms

constantly deliver streams of alerts, videos, speculation, and graphic content, often before context or support is provided. Violent events are replayed, analyzed, and algorithmically resurfaced, transforming acute incidents into chronic psychological exposure. Moreover, emerging reliance on AI-based companionship and mental health tools reflects systemic gaps in care.[8,9] Technologies are increasingly used not as supplements to traditional psychological services, but as substitutes—filling voids created by insurance barriers, provider shortages, and persistent stigma.[7,10] Like students, faculty, teachers, healthcare workers, parents, and community members are embedded in this digital and social ecosystem. Exposure is collective, even when risk is uneven.

THE RESILIENCE TRAP

In the aftermath of gunfire violence, resilience is praised. Youth and young adults are commended for returning to their academic settings. Communities are applauded for "bouncing back." While well-intentioned, this framing quietly shifts responsibility from systems to individuals.

Repeated exposure to violence without corresponding investment in skills, language, and access to care is not resilience; it is endurance. Expecting individuals to continually adapt to environments characterized by fear and instability—without structural support—risks normalizing psychological injury as a personal failing rather than a predictable response to chronic stress.

Public health research increasingly emphasizes that recovery depends not only on individual coping, but on protective factors embedded at the community and policy levels.[4,11] This includes education that equips individuals to recognize stress responses, seek help early, and understand when distress is a rational reaction to an unsafe environment.[11,12]

MENTAL HEALTH LITERACY

Mental health literacy is not built with a one-time assembly or a worksheet distributed after a tragedy. However, it comes from a standardized, developmentally appropriate curriculum that is taught longitudinally and reinforced. Mental health literacy includes understanding how stress and trauma affect the brain and body, recognizing early distress signs, navigating coping behaviors, and knowing how to access care.

Evidence suggests that improving mental health literacy increases help-seeking, reduces stigma, and strengthens early intervention—outcomes that are critical in environments marked by exposure to violence.[12] Mental health literacy facilitates skill-building that is as routine as physical health. If K–12 schools can mandate standardized health screenings and physical health, they can also require formalized mental health literacy to promote mental health and wellbeing.

WHEN FEAR DISRUPTS MENTAL HEALTH EDUCATION

During Fall 2025, our team delivered a series of mental health workshops at a RI high school. Following the Brown shooting, the final workshop was canceled because our team was too overwhelmed. That cancellation was instructive. It demonstrated that fear disrupts learning. Sleep education cannot land when individuals are hypervigilant. Nutrition lessons falter when cortisol remains elevated. Mental health is not an adjunct to physical health education; it is the foundation that enables individuals to function at their best.

STEWARDSHIP AND THE PATH FORWARD

Stewardship is a core obligation of public institutions: the responsibility to create conditions for healthy populations. In the context of firearm violence, stewardship must extend beyond drills and security measures to include literacy, prevention, and recovery. We call for the RI Department of Education to rebalance the implementation of the 20-minute daily health mandate to explicitly require recurring, standardized mental health education to facilitate mental health literacy. Mental health should be treated as a core priority introduced early and reinforced across developmental stages.

We cannot predict every act of violence, but we can decide whether individuals are left alone with its psychological aftermath. Preparing bodies to survive without teaching minds how to recover is an incomplete form of safety. Moving beyond the drill requires acknowledging exposure, adapting to changing environments, and committing to mental health literacy as essential education for students, especially K–12.

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Disclosures

Ethical Approval: Ethical approval is not applicable for this commentary.

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Every Step Counts: Honoring Recovery in All Its Forms

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For a child, reaching a milestone is a sign of their development. For a student, receiving a diploma marks the culmination of a significant stage in their life. Parents and educators are acquainted with these pivotal moments. They witness them, celebrate them, and preserve them. Many of life's milestones are remembered through tangible items: a child's first tooth, a marathon medal, a photo, a certificate, a small keepsake. Each item tells a story. These objects anchor us to our growth and remind us of what we've endured and achieved, treasured reminders of progress and resilience.

In the field of addiction recovery, sobriety coins have long served a similar purpose. They are a small but powerful recognition of the challenges faced and overcome, symbols that quietly honor the courage required to begin again and continue forward.

As an addiction medicine provider (LCR), I have been privileged to be part of many patients' recovery journeys. I witness the courage it takes to return each week, despite trauma, stigma, and instability. I've had patients say, "Can I come every week? Showing up helps," and they keep on showing up, again and again. Their persistence, vulnerability, and openness are a testament to how deeply personal and nonlinear their recovery is. This has allowed me to better appreciate each patient's unique path—a path defined not only by setbacks but by small victories, moments of clarity, and acts of self-compassion that are often invisible to the outside world.

Mutual help organizations provide a regular structure to daily living, along with a supportive community.[1] The coins distributed at meetings become personal badges of honor. While many patients benefit from the solidarity, accountability, and encouragement provided in this setting, not all feel safe or ready to participate. Some share sentiments like: "Socializing is stressful right now," "Groups are emotionally triggering," "I'm an introvert and feel drained after the meetings," or, "I'm not ready to share my story with others." These reflections revealed an important truth: the traditional group-based approach, while transformative for many, is not a one-size-fits-all solution. Recovery looks different for everyone. For some individuals, the sense of community offered in these spaces is not accessible or helpful at certain stages of their healing, and honoring that difference is essential.

That realization sparked a question: How can we honor the milestones of those pursuing recovery outside of mutual help groups and 12-step programs? How do we make sure their progress is seen, validated, and celebrated, even if their path does not include the structure of group meetings?

This question led to a simple yet meaningful initiative: the introduction of wooden recovery coins into the outpatient practice. Wood is a symbol of strength and represents growth, grounding, and connection to the earth. Each wooden coin marks a specific month in the patient's recovery journey, whether it's one week or one year. In the clinic, when a patient achieves a milestone, we dig through our cloth bag of coins to find the right one. We hand them the coin, accompanied by words of encouragement and supported by objective evidence of their progress. We don't imply that one setback erases the journey; instead, we emphasize that progress is cumulative. Many ultimately "fall off the wagon," but we choose to celebrate what's going right and take pride in those steps together.

From the beginning, patients responded to this unexpected gesture with deep appreciation. It strengthened the bond between them and the recovery team while boosting their motivation and morale. The coins, though simple, seem to say: *we see you, and we care*. They become a tangible reminder that someone believes in them—even on the days they struggle to believe in themselves.

Research consistently supports the combination of behavioral and pharmacological interventions as the most effective approach for treating substance use disorders. A 2020 Cochrane review found that 12-step interventions can be as effective and more cost-effective than professionally delivered behavioral therapies.[2,3] As healthcare providers, advocating for accessible and individualized resources may be one of the most meaningful ways we can support recovery. The best treatment is always the one that meets a patient where they are.[1] That might be pharmacological management. It might be trauma-focused therapy. It might be harm reduction. And sometimes, it is a small, unassuming wooden coin placed in the right hands at the right moment.

The coins became part of a combined approach in our clinic, serving as a tangible recognition of progress, tailored to each patient's path and pace. Whether a patient has years of sobriety or is trying again for the first time in months, we want them to know: we're still here, still rooting for them as members of their fan club. Because no matter how recovery unfolds, every step forward deserves to be seen, honored, and remembered.

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Disclosures

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