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Perceived stigma and its role in substance use disorder treatment completion

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ABSTRACT

Background: Perceived Substance Use Disorder (SUD) stigma, defined as the awareness of negative societal attitudes toward individuals with SUDs, may discourage treatment-seeking and completion. Unlike self-stigma (negative beliefs about oneself), perceived stigma reflects individuals' perceptions of stigma from the public. While self-stigma has been widely studied, research on perceived stigma's role in shaping treatment outcomes remains limited.

Objectives: This study aimed to examine whether higher perceived stigma at treatment intake predicts premature treatment discontinuation and hypothesized that greater perceived stigma would be associated with increased rates of premature treatment discontinuation.

Methods: A total of 7,591 participants (70.2% male) from 75 SUD treatment facilities across the United States completed surveys at treatment intake and early in treatment. Perceived stigma was assessed using the Perceived Stigma of Addiction Scale (PSAS). Treatment completion, defined as standard discharge (recommended duration of care), served as the primary outcome. Mixed-effects models evaluated the relationship between perceived stigma and treatment discontinuation while adjusting for demographic, SUD, and mental health-related covariates.

Results: Higher perceived stigma significantly predicted an increased likelihood of premature discontinuation (adjusted odds ratio [AOR] = 0.97, 95% CI [0.95, 0.99], $p < .001$). For each one-unit increase in PSAS score, the odds of treatment completion decreased by 3%. This relationship persisted across all models, even after accounting for covariates.

Conclusion: These findings underscore the importance of addressing perceived stigma at treatment intake and its role in predicting treatment retention. Routine screening for stigma and implementing stigma-reduction interventions during care may contribute to better treatment outcomes for individuals with SUDs.

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Introduction

Substance use disorders (SUD) are a public health crisis, impacting approximately 48.5 million individuals aged 12 and older in the United States (U.S.) in 2023 (1). Despite the availability of evidence-based treatments, fewer than 25% of these individuals access care, contributing to over 100 thousand annual drug overdose mortalities (2) and substantial societal costs exceeding one trillion dollars (3).

Despite this, most people do not seek treatment (1). Further, oftentimes, those who enter treatment do not complete it; some treatment sites have premature discontinuation rates of over 70% (4). While there are many reasons people with SUDs may not seek treatment (4), stigma (defined within the context of mental health and SUD as "negative attitudes and/or negative behaviors toward individuals with mental illness") (5, 6) is a prominent one (7). In fact, SUDs are one of the most stigmatized health conditions (8).

Not only does stigma discourage seeking care (7) but it is also associated with negative consequences at all stages of treatment. Stigma is associated with a decline in help seeking behaviors and access to care (9–13), a decrease in quality and approach of care patients receive from healthcare providers (14) and an increase in cravings (15). Furthermore, stigma can affect sub-populations receiving treatment for SUD differently. For example, high levels of stigma have been reported in participants receiving supervised withdrawal treatment such as detoxification (16) and in people who use heroin (17).

Despite the consequences of stigma in SUD settings, literature surrounding SUD stigma is limited in several ways (11, 18). First, the literature about the relationship between stigma and treatment retention is mixed. For

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example, the results of Luoma et al. (19) show that people with increased self-stigma remain in treatment longer. The authors suggest that fear of leaving treatment and facing societal stigma may be at play. Conversely, other studies report a negative relationship between stigma and treatment adherence/length (20) or no significant relationship at all (21, 22). Additionally, previous research about the relationship between stigma and treatment motivation is mixed (23). Some studies suggest a positive correlation between stigma and commitment to sobriety (24, 25), while others suggest that increased stigma made patients less motivated to continue treatment (26). Finally, a 2018 review of the relationship between stigma and SUDs points out the limitations of previous studies, noting small sample size and inconsistencies in definitions of stigma (11).

To address these gaps, this study investigates the relationship between perceived stigma at treatment intake and treatment completion in a large, nationally representative sample of individuals receiving SUD care. This sample is notable in that it addresses several limitations in prior work: (1) the sample size is an order of magnitude larger, (2) it includes participants across multiple treatment sites, and (3) it is not limited to a single substance (11). We hypothesize that higher levels of perceived stigma will significantly predict premature treatment discontinuation, even after accounting for sociodemographic, clinical, and treatment-related variables. By leveraging data from 75 treatment centers and over 7,000 participants, this study aims to provide robust, generalizable evidence to inform stigma-reduction interventions and enhance treatment retention in SUD care.

Materials and methods

Study design and participants

The survey was administered by Trac9, a third-party treatment-outcomes provider that partners with substance use treatment facilities to track patient symptoms and treatment outcomes. There were 75 treatment sites, which were located across 12 U.S. states: Arkansas, California, Colorado, Florida, Illinois, Indiana, Maryland, Massachusetts, Oklahoma, Pennsylvania, Tennessee, and Texas. Patients responded to surveys that were electronically delivered by text or e-mail upon treatment intake. Survey responses included in this analysis were from the first week of treatment.

Criteria for being included in our analyses were as follows: (1) self-reported stigma, (2) responded to all sociodemographics and mental health questionnaires, (3) were not enrolled in independent outpatient treatment, and (4) did not transfer to another facility. We excluded the participants enrolled in independent outpatient treatment due to the small sample size. Similarly, we also excluded all patients who transferred out of the facility, as we do not know the reason for their discharge. Finally, as for sex, we dropped participants who did not report this binary biological classification due to a small sample size. Out of the total 7,942 participants in the initial data set, $N = 7{,}265$ met all criteria. See Figure 1 for criteria flow chart.

Previous studies utilizing Trac9's survey administration studied patient attitudes toward naloxone dosage (27) and the use of xylazine (28), the role of age in the relationship between optimism and treatment outcomes (29), demoralization and anhedonia of SUD patients receiving treatment (30), and craving in populations co-using opioids and stimulants (31). Additionally, Trac9 survey data has been used to understand the role of sleep disruption, pain (32), and non-drug reinforcement (33) in SUD recovery, and the role of physical activity (34) in SUD recovery success.

Data were obtained through a transfer agreement between the Johns Hopkins School of Medicine and Trac9, in which data were de-identified. This study was acknowledged as not human subjects research by the Johns Hopkins School of Medicine Institutional Review Board, and patients consented to their data being used in clinical research.

Measurements

Perceived Stigma of Addiction Scale (PSAS)

Perceived stigma was measured using the PSAS (35) (derived from the devaluation-discrimination scale developed by Link et al. (36)). Participants responded to eight stigma-related items which asked them to evaluate perceptions toward people who use substances (PWUS) on a four-point Likert scale (from 1 = strongly disagree to 4 = strongly agree). Items in which a high score indicated low stigma were reverse scored. (See Supplement Materials for items of PSAS). Cronbach's alpha of 0.84 was calculated in this sample.

Treatment completion

Each patient's treatment completion was encoded based on their discharge: 1 for standard discharge (remaining in treatment for the recommended duration) or 0 otherwise. The reasons for discharge which fell into this latter category include administrative discharge (being asked to leave treatment by care team), discharge against staff advice, and elopement (leaving treatment prematurely without notification or return). Duration of stay (measured by number of days in treatment) was also used as a covariate in the models.

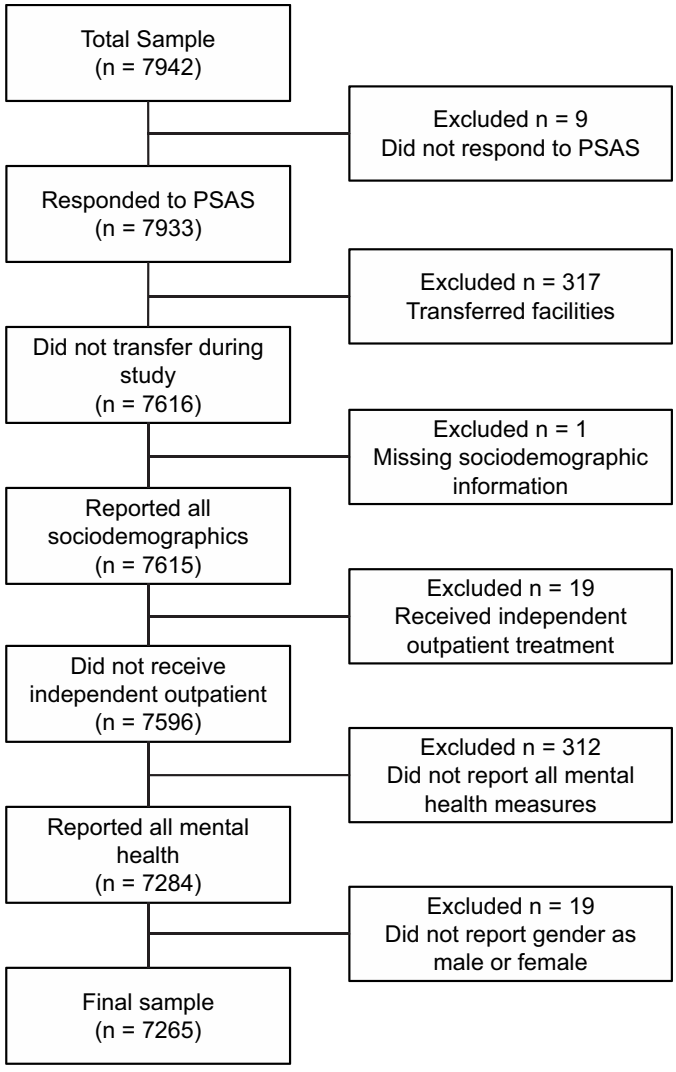

Figure 1. Criteria for participants to be included in the sample. PSAS = Perceived Stigma of Addiction Scale.

Controls

To measure stigma's role in treatment completion, we included additional control variables in our statistical analysis. These variables fall into four categories: sociodemographics, treatment type, mental health, and primary substance. These variables were collected on intake and first in-treatment assessment.

Sociodemographics. Age, sex, race, and employment were all collected upon intake to treatment. Age (in years) was integer valued. Participants indicated male or female. As noted above, individuals who did not indicate male or female are dropped from the dataset due to small sample size (19 participants). For race, they selected African American, Asian, Native American, Native Hawaiian/Pacific Islander, White, or other. Employment was a binary variable (either employed or unemployed).

Treatment type. Information was also collected from clinical records that denoted the type of treatment of each participant. Types of treatment included supervised withdrawal (detoxification), residential (treatment where patients live in a hospital or other treatment center), and intensive outpatient (treatment where patients do not reside at the treatment center but attend frequent appointments). Due to the small sample size, we excluded the 19 participants who were enrolled in independent outpatient treatment. Treatment type was operationalized using a series of binary variables where the reference group refers to all others in the sample (e.g., outpatient = 1, all other treatment types = 0).

Mental health. Mental health factors included anxiety, depression, and stress, measured with the Penn State Worry Questionnaire (37), the Center for Epidemiologic Studies Depression Scale (38), and the

Perceived Stress Scale (39), respectively. All measures were calculated as the average of the respective scales' items, after reverse scoring necessary items.

Primary substance. Participants were asked to report their "drug of choice" as one of the following: alcohol, benzodiazepines, cocaine, heroin, marijuana, methamphetamines, opioids, or stimulants. As it is stigmatizing to insinuate that SUD is a choice rather than a treatable health condition (40), we elect to use person-first, nonjudgmental language (41) and refer to this variable as "primary substance" in our analysis. Primary substance, a categorical variable, was converted into a series of binary variables, one for each substance, where the reference group refers to all others in the sample (e.g., opioids = 1, other substances = 0).

Statistical analysis

This study followed the Strengthening the Reporting of Observational studies in Epidemiology (STROBE) guidelines (42). For all analyses, we use the R version 4.3.2 and use the bobyqa optimizer with the lme4 package.

Mixed effects models

To explore the relationship between stigma and treatment completion, we used a series of logistic mixed effects models where stigma (PSAS) is the independent variable of interest (as a fixed effect), and treatment completion is the dependent variable. We successively added in groups of variables as fixed effects for each of our control categories (sociodemographics, treatment type, mental health, and primary substance). The use of single variables within control categories (i.e., age within sociodemographics) is dependent on whether their univariate association with stigma is significant. Thus, by adding these variables to the model as covariates, we were able to control for baseline relationships and see if the association between stigma and treatment completion holds over and above our controls. Duration of Stay and sociodemographics were included in each model.

We included duration of stay, age, sex, race, and employment as fixed effects since, using the correlational analysis (see Supplemental Materials Table S1), we saw that all factors were significantly associated with stigma. Since the African American participants reported significantly higher levels of stigma ($r = 0.03$, $p < 0.05$; see Table S1), we encode the race variable as 1 for African Americans and 0 otherwise. Similarly, all treatment types and mental health variables were significantly associated with stigma and were included as fixed effects. For treatment type, the reference group is supervised withdrawal as this type of treatment has been associated with higher stigma in previous studies (16). Since most of the primary substances (except marijuana and stimulants) were significantly correlated with perceived stigma (Table S1), we included each as a fixed effect.

Treatment sites were included as random effects, nesting patients within their respective treatment sites and allowing for each site to have its own intercept. This allowed every site to have its own mean estimates for treatment completion, controlling for differences in variance between sites which may not be attributable to the fixed effects.

All continuous variables were mean-centered and normalized by the standard deviation (i.e., z-scored). Models were fit using all default parameters, except that models were fit using maximum likelihood. While our objective was not to maximize model fit, we report model fit statistics of AIC, BIC, and log-likelihood and compare differences in model fit using a likelihood ratio test with a significance threshold of 0.05. This allowed us to determine which set of covariates is predictive of treatment completion over and above sociodemographics.

Assessing risk of premature treatment discontinuation

Next, we investigated the utility of measuring stigma at treatment intake as a way of assessing a person's risk of premature treatment discontinuation. To assign risk scores, we built a mixed effect model (as described above) using stigma to predict treatment completion (no other covariates are included in the model, to isolate the impact of stigma on treatment completion). To simulate a situation where risk is automatically assigned at treatment intake, we built the model using stratified 10-fold cross validation. In stratified 10-fold cross validation, the dataset was broken up into 10 chunks (or folds), where each fold had roughly the same distribution of treatment completion/discontinuation. For each fold, we trained a model on the other nine folds and predicted on the remaining, held-out fold. Thus, each fold (and thus each participant) was in the prediction set exactly once and was assigned a risk score from a model which had not been trained using the participant data (i.e., out of sample). The risk score was calculated as one minus the probability predicted by the model, since the model was predicting the probability of treatment completion.

Once all participants had risk scores, we created quartiles of the risk scores. We then looked at the proportion of participants (in each quartile) who were still in treatment as function of treatment time (day of treatment). If stigma can assign a useful risk score, then we would

expect to see higher rates of premature discontinuation (i.e., lower proportion of people in treatment) in the high-risk quartile than the low-risk quartile. For each day, we removed people who (1) had completed treatment and (2) their duration of stay was less than the current day (since these people should not have been considered as "in treatment"). For example, when calculating the proportion of participants in treatment on day 10, we removed anyone who completed treatment on or before day 9 and then used the remaining people in the quartile to calculate this proportion.

Results

Descriptive characteristics

The sample was comprised of 7,265 SUD patients who were receiving treatment (Mage = 39.0, SDage = 12.4) at 75 treatment sites across the U.S. The sample had 5,098 males (70.2%), and 2,167 females (29.8%). Most participants were White (N = 5,874; 80.9%). Three different types of treatments were reported (supervised withdrawal, 3,763 [51.8%]; residential, 2,985 [41.1%]; outpatient, 517 [7.1%]). Eight primary substances were reported (alcohol, 3,585 [49.3%]; benzodiazepines, 213 [2.9%]; cocaine, 509 [7.0%]; heroin, 1,064 [14.6%]; marijuana, 239 [3.3%]; methamphetamine, 719 [9.9%]; opioids, 841 [11.6%]; and stimulants, 95 [1.3%]). Complete demographic information is available in Table 1.

Table 1. Demographic characteristics of study sample (N = 7,265).

	Mean (SD)/No. (%)	PSAS (mean, SD)
Age	39.03 (12.4)	
Race		
African American	783 (10.8)	20.72 (4.01)
Asian	44 (0.6)	20.50 (5.03)
Native American	60 (0.8)	20.70 (3.47)
Native Hawaiian/Pacific Islander	20 (0.3)	19.05 (4.59)
White	5,874 (80.9)	20.38 (4.05)
Other	484 (6.7)	20.50 (4.22)
Sex		
Male	5,098 (70.2)	20.26 (4.04)
Female	2,167 (29.8)	20.81 (4.12)
Employed	3,350 (46.1)	19.99 (4.01)
Treatment Type		
Supervised Withdrawal	3,763 (51.8)	20.70 (4.21)
Residential	2,985 (41.1)	20.22 (3.89)
Intensive Outpatient	517 (7.1)	19.64 (3.82)
Primary Substance		
Alcohol	3,585 (49.3)	19.69 (3.86)
Benzodiazepine	213 (2.9)	21.37 (4.01)
Cocaine	509 (7.0)	20.97 (3.77)
Heroin	1,064 (14.6)	21.93 (4.32)
Marijuana	239 (3.3)	20.19 (4.26)
Methamphetamine	719 (9.9)	20.88 (4.03)
Opioids	841 (11.6)	20.82 (4.04)
Stimulants	95 (1.3)	20.07 (3.63)

Predicting treatment completion

Without controlling for covariates, we found that lower stigma predicted treatment completion (β = −0.12, 95% CI [−0.18, −0.05], p < 0.001). Table 2 shows the results of our mixed effects models with various sets of covariates, with low stigma predicting treatment completion in each model (odds ratios are reported in Table S2). Here, stigma was negatively associated with treatment completion across all four models (i.e., lower stigma predicts completion). This held when controlling for sociodemographics (β = −0.12, 95% CI [−0.19, −0.04]), treatment type (β = −0.14, 95% CI [−0.21, −0.07]), mental health (β = −0.13 [−0.20, −0.05]), and primary substance (β = −0.08, 95% CI [−0.15, 0.003]). Converting the effect size to an odds ratio (using the unstandardized stigma coefficient in the sociodemographics model), we got an adjusted odds ratio of 0.97 (95% CI [0.95, 0.99]). This suggests that a one unit increase in the PSAS scale (i.e., a one unit increase on any of the eight 4-point likert scale items) decreases the odds of completing treatment by 3%.

Across all models, we saw significant relationships between treatment completion and the following factors: duration of stay (longer duration predicts completion; β ranging from 1.38 to 2.06), age (older age predicts completion; β ranging from 0.11 to 0.25), and employment (being employed predicts completion except when controlling for primary substance; β ranging from 0.18 to 0.20). These results dovetailed with previous studies that have shown that SUD treatment discontinuation is more common in younger individuals (43, 44) and those who are unemployed (45). In the Treatment Type model, both intensive outpatient (β = −3.96, 95% CI [−4.42,−3.51]) and residential (β = −1.87, 95% CI [−1.87,−1.16]) treatment significantly predicted premature treatment discontinuation. This finding is partially in agreement with existing literature, as outpatient treatment for SUD tends to be associated with premature discontinuation (4). The associations between treatment type, stigma, and treatment completion were further explored via post hoc tests (see Supplemental Materials).

Notably, in the mental health model, the three mental health measures (anxiety, depression, and stress) were not predictive of treatment completion. Additionally, even though depression, anxiety, and stress were all significantly associated with both stigma and treatment completion (univariate correlations in Table S1), the likelihood ratio test between the mental health model and the sociodemographic model was not significant. While psychiatric comorbidities are known to be associated with treatment retention (46), our results suggest that stigma may be more important for treatment completion.

Table 2. Mixed effects models with perceived stigma predicting treatment completion.

	Treatment Completion			
	Sociodemographics	Treatment Type	Mental Health	Primary Substance
Fixed Effects				
Stigma	−0.12*** (0.04)	−0.14*** (0.04)	−0.13*** (0.04)	−0.08* (0.04)
Duration of Stay	1.38*** (0.07)	2.06*** (0.09)	1.38*** (0.07)	1.42*** (0.08)
Sociodemographics				
Age	0.25*** (0.04)	0.21*** (0.04)	0.25*** (0.04)	0.11** (0.04)
Sex	0.06 (0.07)	0.06 (0.08)	0.04 (0.08)	0.02 (0.08)
Race	−1.15 (0.11)	−0.11 (0.08)	−0.14 (0.11)	−0.08 (0.12)
Employment	0.20** (0.07)	0.18* (0.08)	0.20* (0.07)	0.09 (0.08)
Treatment Type				
Intensive Outpatient	–	−3.96*** (0.23)	–	–
Residential	–	−1.87*** (0.11)	–	–
Mental Health				
Anxiety	–	–	0.03 (0.04)	–
Depression	–	–	−0.03 (0.05)	–
Stress	–	–	0.04 (0.05)	–
Primary Substance				
Benzodiazepine	–	–	–	−0.60**(0.20)
Cocaine	–	–	–	−0.83*** (0.15)
Heroin	–	–	–	−0.73*** (0.11)
Marijuana	–	–	–	−1.13*** (0.19)
Methamphetamine	–	–	–	−1.19*** (0.12)
Opioids	–	–	–	−0.66*** (0.12)
Stimulants	–	–	–	−0.53 (0.33)
Intercept	0.97*** (0.26)	2.70*** (0.24)	0.98*** (0.26)	1.46*** (0.27)
Random Effects				
Treatment site | (Intercept)	4.24	3.17	4.22	4.53
Model Fit				
AIC	5625.5	5164.9	5629.9	5515.5
BIC	5680.6	5233.8	5705.7	5618.9
Log-likelihood	−2804.7	−2572.4***	−2804.0	−2742.8***
Observations				
People	7,265	7,265	7,265	7,265
Treatment sites	75	75	75	75

Finally, the initial association between stigma and treatment completion was attenuated (though still significant) after adjusting for the primary substance. The univariate correlations in Table S1 show that primary substances (in particular, alcohol, heroin, and methamphetamine) were associated with both stigma and treatment completion, more-so than many of the other variables. Thus, one may expect some shared variance between stigma and primary substance when predicting treatment completion. We further examined this with multiple post hoc tests (see Supplemental Materials).

Premature treatment discontinuation risk

Figure 2 shows the results of our risk assessment, where discontinuation risk was assigned from stigma reported at intake. We again note that risk was assessed both at treatment intake and out-of-sample, thus simulating a situation where discontinuation risk could be assigned at intake. Earlier in treatment, the high-risk quartile (red) had a lower proportion of participants in treatment than the other three lower risk quartiles; approximately 40% of participants who were labeled as high risk discontinued treatment by 20 days, compared to 10% of those labeled as low risk. By day 50 all four quartiles showed roughly the same proportion of participants remaining in treatment.

Discussion

This study demonstrates that perceived stigma predicts premature discontinuation from SUD treatment across different settings. Specifically, for every one-unit increase in stigma, there was a 3% decrease in the odds of completing. These results were robust across models controlling for sociodemographic factors, treatment type, mental health comorbidities, and primary substance. Interestingly, while stigma was a significant predictor of treatment completion, mental health variables were not. This finding underscores the unique and dominant role of perceived stigma in predicting premature treatment discontinuation, independent of mental health comorbidities. Clinically, this highlights the need to prioritize detecting high levels of stigma early in treatment in addition to screening for mental health conditions and symptoms.

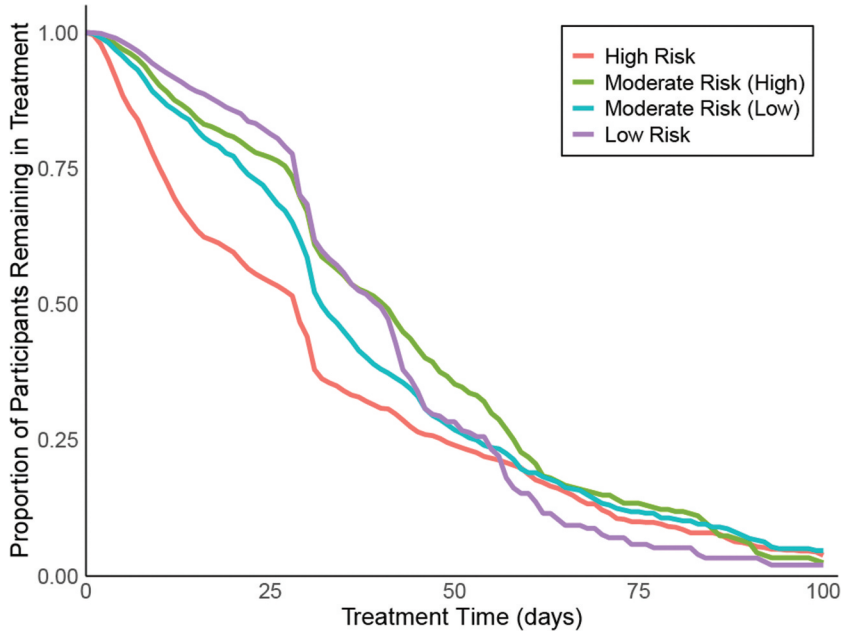

Figure 2. Treatment completion over time across risk quartiles, where risk is assigned via a stigma model at treatment intake. The high-risk quartile shows the steepest decline, which shows that this group tends to drop out of treatment at higher rates earlier in treatment than lower-risk participants.

Previous research investigating the relationship between stigma and treatment retention is mixed. For example, Kamaradova et al. found that stigma negatively impacts treatment retention (20), while Luoma et al. report positive associations between self-stigma and treatment duration (19). The current study expands upon earlier work by focusing on perceived stigma (rather than self-stigma) and premature discontinuation (rather than duration). Additionally, by measuring perceived stigma in particular, we are capturing a wider breadth of stigma (i.e., stigmatizing attitudes held by the general public rather than being limited to clinical settings).

The mechanism underlying the relationship between perceived stigma and treatment discontinuation remains partially unclear. One potential explanation is the psychological impact of perceived societal judgment, which may erode patients' confidence in receiving supportive care, thereby reducing engagement with treatment. The PSAS measure, which assesses perceptions of stigma toward PWUS generally, may also reflect broader societal attitudes rather than specific experiences. This could influence participant responses (47), as some participants may interpret the questions through their own experiences, while others might assess societal views more broadly. Additionally, post hoc tests (Supplemental Materials) indicate that stigma partially mediates the relationship between treatment type and completion, with residential and intensive outpatient programs reducing stigma, which in turn increases the likelihood of program completion. This suggests that addressing stigma in these treatment settings may help mitigate the risk of premature discontinuation by countering societal attitudes that could otherwise discourage participation. Further exploration of other forms of stigma, such as enacted stigma (social repercussions of stigmatizing attitudes (23)), is critical to refining our understanding of these dynamics. Such insights could guide adjustments to legislation, treatment protocols, and public communication initiatives.

The importance of perceived stigma on intake in predicting downstream treatment outcomes highlights the need to incorporate stigma assessments as part of routine clinical evaluation for SUD treatment, as every patient's individual perception of stigma will be uniquely influenced by their own previous experiences. Early identification of individuals with high levels of perceived stigma may enable targeted interventions aimed at improving recovery outcomes. Additionally, as individuals in SUD and mental health treatment facilities often report perceived stigma from healthcare providers (48–50), stigma-reduction interventions for clinicians are critical. Interventions may include psychoeducational programs to address patients' concerns about societal judgment, as well as staff training. Evidence-based strategies, such as motivational interviewing and peer support programs (51–54) have been successful in addressing stigmatizing beliefs in previous studies by integrating community perspectives and clinical interventions. Consequently, these interventions should be further investigated to mitigate

the impact of stigma on treatment outcomes. Moreover, at a broader level, the role of perceived stigma at intake specifically suggests that public health campaigns and policy initiatives are needed to combat stigma at the societal level. SUD is often portrayed in criminal contexts in media (55–57). As such, mass media campaigns that challenge these negative perceptions and promote narratives of recovery and resilience can help reshape public viewpoints (58). Additionally, harm reduction practices and community-based interventions, such as the development of strong recovery networks, should be encouraged to foster supportive environments for individuals in treatment (58).

These findings emphasize the importance of addressing stigma to improve treatment retention and outcomes. Implementing stigma-reduction measures across multiple contexts could significantly enhance recovery rates for individuals with SUDs, reducing the societal and economic burden of these disorders.

Limitations

Limitations of this study should be acknowledged. While the study design included a prospective element, with perceived stigma assessed at intake and treatment outcomes tracked over time, it is not fully longitudinal. This design allows for temporal relationships to be inferred between perceived stigma and treatment discontinuation, but causality cannot be established. Fully longitudinal designs with multiple time points for stigma measurement would help clarify whether changes in stigma during treatment mediate discontinuation risk.

Second, the reliance on self-reported measures introduces the potential for participants' responses to be influenced by their emotional state or social desirability concerns, potentially underestimating stigma or misrepresenting their experiences. Furthermore, the PSAS captures perceptions of stigma toward individuals with SUDs broadly, rather than one's unique personal experiences or internalized stigma. Additional measures of other stigma dimensions, such as stigma experienced throughout treatment, could enhance future analyses. Third, although the study utilized a large, multi-site sample, findings are limited to individuals receiving treatment within formal care settings. These results may not generalize to non-treatment-seeking individuals. Finally, our analyses do not account for polysubstance use or for which substance participants received treatment. As such, future work should evaluate these factors when studying stigma and SUD.

Conclusions

Our study examined how stigma predicts treatment completion, finding that higher levels of perceived stigma are related to premature termination of treatment. This work contributes to a larger body of research showing that stigma, whether toward PWUS or toward those with mental or physical health issues, is related to many societal and health outcomes. Future work should develop strategies to reduce high levels of perceived stigma with the hopes of decreasing rates of premature discharge. Overall, our study highlights the dangerous consequences of perceived stigma and the importance of stigma reduction.

Disclosure statement

Due to current federal policy under Executive Order 14,151, federal employees are restricted from including analyses or interpretations based on demographic characteristics such as race, ethnicity, or sex. As a result, this manuscript does not examine potential subgroup effects or discuss generalizability based on participant demographics.

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Author contributions

CRediT: **Isman**: Conceptualization, Methodology, Formal Analysis, Writing – Original Draft, Writing – Review & Editing. **Giorgi**: Conceptualization, Methodology, Validation, Formal Analysis, Data Curation, Writing – Original Draft, Writing – Review & Editing. **Ellis**: Conceptualization, Data Curation, Writing – Review & Editing. **Huhn**: Conceptualization, Data Curation, Writing: Review & Editing, Funding Acquisition. **Liu**: Conceptualization, Writing – Review & Editing. **Curtis**: Conceptualization, Methodology, Validation, Data Curation, Writing – Original Draft, Writing – Review & Editing, Supervision, Funding acquisition.

Data availability statement

Due to the proprietary nature of the data (i.e., collected through a third-party vendor), data are unable to be shared.

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