

Factors associated with readmission to alcohol and opioid detoxification in the Alaska Interior

Ursula Running Bear PhD, MA¹ | Jessica D. Hanson PhD²  | Carolyn Noonan MS³ |
Clemma Muller PhD, MS⁴ | Jodi Trojan MCJ⁵ | Spero M. Manson PhD⁶

¹Department of Population Health, University of North Dakota, Grand Forks, North Dakota, USA

²Department of Applied Human Sciences, University of Minnesota Duluth, Duluth, Minnesota, USA

³Institute for Research and Education to Address Community Health, Washington State University, Seattle, Washington, USA

⁴Department of Medical Education and Clinical Science, Elson S. Floyd College of Medicine, Institute for Research and Education to Address Community Health, Washington State University, Seattle, Washington, USA

⁵SideTracks, LLC, Fairbanks, Alaska, USA

⁶Centers for American Indian and Alaska Native Health, Colorado School of Public Health, University of Colorado Anschutz Medical Campus, Aurora, Colorado, USA

Correspondence

Jessica D. Hanson, PhD, Department of Applied Human Sciences, 110 Sports and Health Center, 1216 Ordean Ct, University of Minnesota Duluth, Duluth, MN 55812, USA.
Email: jdhanson@d.umn.edu

Funding information

National Institute on Alcohol Abuse and Alcoholism, Grant/Award Number: P60AA026112

Abstract

Background and Objectives: A “revolving door” of repeated admissions to detoxification treatment facilities has long plagued alcohol and drug use patients, yet few studies examine factors associated with readmission. This study examined risk factors for readmission to alcohol and opioid detoxification in a sample from the Alaska Interior.

Methods: Data were extracted from electronic medical records for admissions between 2012 and 2016 at an inpatient detoxification facility in Fairbanks, Alaska. Data from 1014 patients admitted for alcohol detoxification and 267 patients admitted for opioid detoxification were analyzed. The analysis employed descriptive statistics for risk factors (substance use history, adverse life experiences, and psychosocial functioning) and prevalence of readmission to either alcohol or opioid detoxification. Inferential analyses used marginal standardization to calculate differences in readmission risk by patient characteristics.

Results: Male, Alaska Native/American Indian, single-never married patients, and those seeking work were at higher risk for readmission to alcohol detoxification, while those with stable housing were at reduced risk. Being single-never married and completing detoxification treatment reduced readmission to opioid detoxification. Family involvement in detoxification reduced readmission risk for both alcohol and opioid patients.

Discussion and Conclusions: Further research that investigates the mechanism(s) by which family may act as a protective factor may be efficacious in eliminating the “revolving door” of detoxification.

Scientific Significance: This study is the first to examine both alcohol and opioid use risk and protective factors in the Alaska Interior. The results can be used in the development of interventions for subpopulations with high detoxification readmission rates.

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2022 The Authors. *The American Journal on Addictions* published by Wiley Periodicals LLC on behalf of The American Academy of Addiction Psychiatry (AAAP).

INTRODUCTION

Detoxification is the process of clearing the body of toxins resulting from acute substance withdrawal and/or intoxication.¹ Detoxification treatment ideally is the first step toward long-term recovery, as substance abuse treatment programs require the process to be complete before admission.² The primary goal of detoxification is the safe management of the withdrawal process, with a secondary goal of effecting entry into longer-term substance use treatment.¹ After diagnosis, evaluation, and treatment of withdrawal symptoms, patients are discharged and typically referred to formal substance use treatment, usually with minimal follow-up.^{3,4} Failure to transition to substance use treatment after discharge from detoxification is a strong predictor of readmission, whereas a successful transition can delay or prevent subsequent readmissions.^{5,6}

The lack of transition from detoxification and ongoing support results in a “revolving door” of repeated discharges and readmissions.^{7,8} The revolving door phenomenon was reported more than four decades ago but still persists today.^{8,9} It impacts both patients and health care systems. A large proportion of detoxification patients who do not transition to treatment are at high risk for readmission and remain vulnerable to poor health, experience more physical and psychiatric comorbidities, and have more withdrawal symptoms.^{10–12} Data from the United States in 1989 indicates the average cost for an inpatient detoxification stay for patients with mild to moderate withdrawal exceeded \$3300.¹³ Though not specific to inpatient detoxification, the average cost per episode of adult residential treatment was \$9426 in 2003.¹⁴ Although these studies are dated, the statistics hint at the staggering costs of treating patients caught in the revolving door. In Alaska, this phenomenon may be even more burdensome because only two detoxification facilities exist within the state, resulting in a limited number of beds to treat withdrawal. Additionally, Alaska experiences a shortage of healthcare providers including substance use treatment providers.¹⁵ These combined conditions may contribute to an increased strain on the health care system in Alaska.

Our prior work from a detoxification facility located in Southcentral Alaska found 42% of Alaska Native/American Indian (ANAI) people admitted to an inpatient alcohol detoxification program were readmitted within 1 year of their index admission.¹⁶ This study also found lower levels of social, occupational, and psychological functioning and worse withdrawal severity, measured by the Global Assessment of Functioning (GAF), were associated with readmission to detoxification among ANAI people.¹⁶ Other associations with readmission to detoxification included unemployment and homelessness.¹⁶ The ANAI Southcentral readmission rate is higher than the readmission rate found in a sample of the general US population where 26% were readmitted within 1 year.⁵ Readmitted detoxification patients in the general population tend to be older, male, and have a longer length of time to readmission if follow-up treatment is received.⁵ First Nations people in Canada experience a 1-year readmission rate of 35% with risk factors of being male, unemployment, unstable residence, and alcohol as the primary drug of choice.¹⁷ Recurrent themes in these 1-year studies show readmission to alcohol detoxification is associated with being male, unemployed, and homeless.

The literature is absent information on readmission to opioid detoxification among ANAI people, therefore we focus on what is known generally. Regardless of urban or rural residence, ANAI people had the highest drug overdose death rate in 2015.¹⁸ The metropolitan and nonmetropolitan ANAI opioid age-adjusted death rates are similar to the White racial group but slightly higher.¹⁸ However, the ANAI nonmetropolitan opioid death rate (19.8 per 100,000) is much higher compared to rural resident Blacks (7.1 per 100,000) or Hispanics (7.5 per 100,000).¹⁸ Similar patterns emerge in metropolitan areas.¹⁸

ANAI opioid risk and protective factors are specific to certain samples. ANAI/Native Hawaiian college students experience the highest rate of opioid misuse among all racial groups with reported risk factors of loneliness, difficult social relationships, family problems, and intimate partner violence.¹⁹ Risk factors for life-time opioid misuse among American Indian youth aged 10 to 21 include family disapproval, poor academic performance, and peer substance use.²⁰ ANAI patients at risk of ceasing their medication-assisted treatment were younger and had co-occurring substance disorders.²¹ In the United States 1-year opioid detoxification readmission ranges from 20% to 30%.^{22,23} Factors associated with 1-year opioid readmission, include a history of physical abuse, police involvement or incarceration, a younger age, male, bipolar disorder, and a discharge against medical advice.^{23,24}

Rarely does the literature include the experiences of ANAI people or residents of Alaska. In a state with the largest landmass and a sparsely populated population, this study aims to identify risk and protective factors associated with readmission for both alcohol and opioid detoxification to better inform interventions aimed at transitioning patients to long-term recovery.

METHODS

Setting

The data derive from the Gateway to Recovery (GTR) detoxification program located within the Fairbanks Native Association (FNA). FNA provides comprehensive behavioral health treatment, including inpatient detoxification, short-term residential treatment, long-term residential treatment for women with children, and outpatient treatment. GTR is the only medical detoxification program in the Alaska Interior and only one of two in the state. Although GTR treats detoxification from opioids, approximately 95% of patients are admitted for alcohol withdrawal.

Data

This analysis was deemed “not human subjects” from institutional review boards at CU Anschutz and WSU who conducted the analysis. Data for these analyses were extracted from GTR’s Electronic Medical Record (EMR) for unique individual patients discharged from the detoxification facility during a 5-year period (2012–2016). Extracted data are detailed below. FNA supports an aggressive, continuous quality improvement effort related to data collection and

employs a data manager who works closely with staff to ensure the accuracy and completeness of EMR data.

Measures

The outcome variable(s) were readmission to detoxification within 1 year of the index admission for a primary substance of alcohol or opioids (yes/no). Death data were unavailable; therefore, those in the nonreadmitted group may include patients who died within 1 year who would have otherwise been at risk for readmission.

Demographic information

Age was recoded into five categories: 18–24, 25–34, 35–44, 45–54, and 55–82 years. Sex was a dichotomous (male/female). Race was assessed as ANAI or Other. Marital status included married or living as married; single-never married; and divorced-, separated-, or widowed-not remarried. Employment categories included employed full or part-time versus unemployed (seeking employment, not in the labor force, seasonal employment, other). Location of residence included Fairbanks, the Interior of Alaska, and outside the Interior of Alaska. Stable housing included living in a private residence with or without support. Presence of children within the home was defined as having children younger than 18 years of age residing in the household.

History of substance use

Number of days abstinent from primary substance before the index admission was recoded as 0, 1–10, and 11–30 days. Age at first use of primary substance was recoded into four categories: <14, 14–19, 20–29, and 30–57 years. Self-report of any substance use hospitalizations in the year preceding the index admission was a dichotomous yes/no variable.

Adverse life experiences

Self-reported lifetime history of physical abuse and current involvement in the legal system (legal charges, court appearances, arrest, probation or parole) were extracted as yes/no variables.

Mental health

Depression severity was assessed by the Alaska Screening Tool, required of all programs receiving State of Alaska funding.²⁵ The screening asked eight questions related to the number of days over the last 2 weeks the patient experienced depressive symptoms. The items were categorized and summed to create a scale.²⁵ Symptom categories included none, mild or moderate, and moderately severe or severe. Data on self-reported

mental health hospitalizations in the year preceding the index admission was also extracted.

Psychosocial functioning

GAF measured the severity of withdrawal symptoms and psychological, social, and occupational functioning.²⁶ Scores range from zero to 100, higher scores indicating better functioning.²⁶ Scores were categorized in quartiles, 10–25, 26–30, 31–35, and 36–99.

Index admission and discharge information

Length of stay (LOS) in detoxification, family involvement in treatment (yes/no), and patient completion of the index detoxification admission (completed/left against staff advice) were extracted. LOS was categorized as 1–2, 3–4, or 5–19 days.

Statistical analysis

The analysis was conducted separately by primary substance use for the index admission between 2012 and 2016: alcohol ($n = 1014$) or opioids ($n = 272$). We calculated descriptive statistics as means and standard deviations (SD) for continuous variables and frequencies for categorical variables. Continuous variables were categorized and included in the models as dummy variables to allow for nonlinear associations with the outcome. Logistic regression was used to estimate associations between risk factors and detoxification readmission within 1 year versus no readmission. Because odds ratios overestimate the risk ratio for common outcomes,²⁷ we used marginal standardization to report risk differences for each factor. As a simple extension of conventional standardization methods,^{28,29} marginal standardization uses coefficients from the logistic regression model to calculate the predicted probability of readmission for each level of a risk factor. We used the predicted probabilities to estimate risk differences, reported as percent. These results reflect the estimated population-level difference in percent readmission that would be expected if everyone in the population were exposed compared to if everyone were not exposed to the risk factor, assuming a population with the same distribution of confounders as in the study cohort.³⁰

We fit two models for each risk factor. First, we estimated the crude association with the outcome. Second, we estimated the association adjusted for age, sex, and race. Regression results are presented as risk difference accompanied by 95% confidence intervals (CI). As a sensitivity analysis, we evaluated age at index admission, age at first alcohol or opioid use, GAF score, and LOS as continuous variables by including linear and quadratic terms in the models. We considered multiple imputation but chose listwise deletion to account for missing data because of the exploratory nature of the analysis, minimal missing data for most variables, and the likelihood that available variables would not be sufficient to estimate missing values without bias. All analyses were conducted using Stata version 15.³¹

RESULTS

The average age for those admitted to alcohol detoxification was 44 years (SD: 12), 64% were male, and more than two-thirds were ANAI (Table 1). Fifty percent were single-never married, 65% resided within the Fairbanks area, and 66% had stable housing. The average number of days abstinent in the 30 days before admission was 7 (SD: 9). Thirty percent of patients experienced moderately severe to severe depressive symptoms and the average GAF score was 32 (SD: 10). The average LOS was 3 days (SD: 1), and 74% completed detoxification.

The average age for those admitted to opioid detoxification was 31 years (SD: 10), 52% were male, and 54% were single-never married (Table 1). Seventy percent resided in the Fairbanks area, and 80% had stable housing. Patients averaged 3 days of abstinence (SD: 6) in the 30 days before admission. Thirty-four percent experienced moderately severe to severe depressive symptoms and the average GAF score was 35 (SD: 10). The average LOS was 5 days (SD: 3), and 38% completed detoxification.

Overall, 44% of alcohol detoxification patients were readmitted within 1 year (Table 2). The prevalence of readmission for alcohol use was highest among patients aged 35–54 years (49%), compared with younger or older age groups (range 18%–42%). More men (48%) than women (38%) were readmitted for alcohol detoxification, and more ANAI patients were readmitted (48%), compared to all other races combined (37%). A total of 25% of the opioid detoxification sample were readmitted within 1 year. The prevalence of readmission for opioid use was highest among patients aged 45 years and older (31%), compared with younger age groups (range 19%–27%). Slightly more women (26%) than men (23%) were readmitted, and slightly fewer ANAI (20%) were readmitted compared to all other racial groups (26%).

Age exhibited an upside-down, U-shaped association with readmission, with the lowest readmission risk among the youngest and oldest categories and the highest risk in people 35–54 years old (Table 3). Being male sex, ANAI, unmarried, unemployed, with a longer LOS, and having completed detoxification were all associated with higher risks of readmission. Living outside of Fairbanks, stable housing, depressive symptoms, and family involved in treatment were all associated with lower risks of readmission. Family involvement was the single strongest protective factor, with 26% (95% CI: –37% to –16%) lower risk of readmission compared with no family involvement. Children in the home, number of days abstinent, age at first use, history of substance use or physical abuse, involvement in the legal system, GAF score, and mental health hospitalizations in the past year did not show strong associations with readmission for alcohol. Unadjusted risk differences are not presented because they were similar to the adjusted results.

Results for risk factors associated with opioid detoxification were considered exploratory due to the smaller sample size and lower statistical power (Table 3). Adjusted point estimates for single-never married compared to married patients and completion of detoxification were consistent with lower risk for readmission. Family involvement in treatment was the strongest protective factor for opioid detoxification

readmission, with 21% (95% CI: –31% to –10%) lower risk compared to no family involvement. Confidence intervals were too wide for conclusive interpretation regarding the association of opioid detoxification admission with other patient characteristics. Results from sensitivity analyses examining select risk factors as continuous variables showed similar curvilinear associations as demonstrated in the discrete variable analysis results (data not shown).

DISCUSSION

The 44% of alcohol detoxification patients readmitted from the Alaska Interior is similar to our previous work in Southcentral Alaska where 42% of the patients were readmitted within 1 year but is higher than the 26% in a general US sample.^{5,16} This analysis found associations with male sex, unemployment, housing and readmission which aligns with the existing literature as factors related to readmission to alcohol detoxification.^{5,16,17} Unlike our previous work with a sample of ANAI people in Southcentral Alaska focused on alcohol detoxification only,¹⁶ GAF was not an important or strong predictor of readmission in this current analysis. The GAF's validity has been criticized due to interrater reliability issues,³² consequently this may be a potential reason for the insignificant findings.

Family involvement has not been included in readmission to alcohol detoxification studies and in this study was an important protective factor. With ANAI communities, family support and family connectedness promote positive health outcomes.³³ Influences of family may be an important consideration for future interventions. Residence outside the Interior of Alaska, decreased risk for alcohol detoxification readmission. This may derive from access issues where long-distance travel to treatment and the associated cost of transportation³⁴ result in a decreased risk of readmission, even though treatment may be warranted.

Results are similar to another one of our studies on detoxification completion in Southcentral Alaska that found patients who completed alcohol detoxification (75%) were more likely to be readmitted, yet a small number of the total sample transitioned to treatment (20%).³⁵ Often, patients enter detoxification, complete the treatment protocol, and resume daily lives without seeking long-term substance use treatment. Completions results may be influenced by other patterns, some patients enter detoxification due to intoxication but do not require the full medical protocol because they are not experiencing severe withdrawal which increases completion rates.

The opioid readmission rate found in this study (25%) falls in the center of two previous 1-year opioid readmission studies, 20% and 30%, respectively.^{22,23} Although our study of readmission to opioid detoxification was exploratory, it provides insight into risk and protective factors for adult opioid misuse focusing on a population in Alaska. This information may be useful to target interventions. We included similar variables in our analysis as other studies such as a history of physical abuse, police involvement and functioning but the confidence intervals were too wide for conclusive interpretation in this sample.^{24,36} Abuse and police involvement are sensitive topics in which underreporting may

TABLE 1 Descriptive statistics for risk factors of readmission among clients admitted to gateways to recovery for alcohol or opioid detoxification, 2012–2016

Risk factor	Alcohol		Opioids	
	Missing n (%)	N = 1014	Missing n (%)	N = 272
<i>Demographic</i>				
Age at index admission, mean years (SD)	0 (0%)	44 (12)	0 (0%)	31 (10)
Male sex	0 (0%)	64%	0 (0%)	52%
Alaska Native/American Indian	0 (0%)	68%	0 (0%)	31%
Marital status	6 (1%)		1 (<1%)	
Married or living as married		23%		31%
Single, never married		50%		54%
Divorced, widowed, or separated		27%		15%
Employed	7 (1%)	22%	1 (<1%)	21%
Location of residence	8 (1%)		1 (<1%)	
Fairbanks		65%		70%
Interior		25%		14%
Outer		10%		16%
Stable housing	5 (<1%)	66%	1 (<1%)	80%
Children <18 years of age in home	3 (<1%)	17%	8 (3%)	32%
<i>History of substance use</i>				
Days abstinent in past 30 days, mean days (SD)	53 (5%)	7 (9)	9 (3%)	3 (6)
Age at first use, mean years (SD)	18 (2%)	15 (6)	6 (2%)	24 (9)
Any substance use hospitalizations in past year	8 (1%)	13%	4 (1%)	13%
<i>Adverse life experiences</i>				
History of physical abuse	104 (10%)	29%	36 (13%)	28%
Current involvement in legal system	18 (2%)	9%	1 (<1%)	20%
<i>Mental health and psychosocial functioning</i>				
Any mental health hospitalizations in past year	13 (1%)	10%	3 (1%)	7%
Depression symptoms	80 (8%)		15 (6%)	
None		26%		21%
Mild/moderate		43%		45%
Moderately severe/severe		30%		34%
Global assessment of functioning, ^a mean (SD)	126 (12%)	32 (10)	25 (9%)	35 (10)
<i>Detoxification admission and discharge</i>				
Length of stay, mean days (SD)	1 (<1%)	3 (1)	0 (0%)	5 (3)
Family involvement in treatment	81 (8%)	7%	3 (1%)	12%
Completed detox	0 (0%)	74%	0 (0%)	38%

Abbreviation: SD, standard deviation.

^aHigher score indicates better functioning, possible scores range 1–100.

TABLE 2 Readmission presented as row percentages by primary substance, age at index admission, sex, and race, 2012–2016

	Alcohol Readmitted, n (%)	Not readmitted ^a , n (%)	Opioids Readmitted, n (%)	Not readmitted ^a , n (%)
Overall	447 (44%)	567 (56%)	67 (25%)	205 (75%)
Age at index admission				
18–24	7 (18%)	32 (82%)	22 (27%)	59 (73%)
25–34	92 (39%)	145 (61%)	26 (23%)	88 (77%)
35–44	120 (49%)	126 (51%)	8 (19%)	34 (81%)
45–54	149 (49%)	154 (51%)	11 (31%) ^b	24 (69%) ^b
55–82	79 (42%)	110 (58%)		
Sex				
Female	138 (38%)	227 (62%)	34 (26%)	96 (74%)
Male	309 (48%)	340 (52%)	33 (23%)	109 (77%)
Race				
Alaska Native/ American Indian	326 (48%)	359 (52%)	17 (20%)	66 (80%)
Other	121 (37%)	208 (63%)	50 (26%)	139 (74%)

^aCombines people who died during the year without being readmitted and people who survived the full year without readmission.

^bOldest age categories combined due to sparse data.

occur. Given other studies found, loneliness, difficult social relationships, and intimate partner violence were related to opioid use, these may be important considerations in future studies which were not included due to lack of availability in the EMR.

Similar to readmission to alcohol detoxification, family involvement in treatment was the strongest protective factor against opioid detoxification readmission. Among those admitted for opioid detoxification, being single-never married decreased the risk of readmission compared to those married or living with a partner. This may appear contrary to the finding that family involvement in treatment is an important factor for success, however, there are considerations. Those admitted for opioid detoxification tended to be younger: 72% were between the ages of 18 and 34, and perhaps made a conscious choice to not marry. Importantly, among ANAI people family structure extends beyond marital status such as grandparents, parents, siblings, and may also include those residing in the same home sharing responsibilities.³⁷ Interventions designed to promote family involvement and social connectedness need further exploration, particularly since family is an integral part of ANAI life, as noted above.³³ For instance, research comparing interventions that promote family involvement in treatment versus family support in general may be worthwhile. In Alaska, historical trauma may contribute to the “revolving door” phenomena.³⁸ Although it cannot be easily addressed within the short LOS typical of detoxification, it may contribute to underlying factors of readmission. In fact, the FNA's substance use continuum of care incorporates trauma into their treatment programs.

While we did not directly compare differences in magnitude of associations for alcohol- and opioid-related readmissions, some patterns emerged that suggest two different patient populations exist with varying risk and protective factors. Being aged 18 to 24 was associated with reduced readmission to alcohol detoxification, whereas no association was found for readmission to opioid detoxification. Compared to being married or living with a partner, being single-never married increased the risk for alcohol detoxification readmission but was a protective factor against opioid detoxification readmission. Likewise, completing detoxification treatment was a risk for alcohol detoxification readmission but a protective factor for opioid readmission. We found no association between mental health hospitalization in the past year and alcohol or opioid detoxification readmission. We suspect patients who require mental health hospitalization may receive referrals and needed mental health care, resulting in lower readmission to detoxification.

The “revolving door” pattern that emerged more than four decades ago is still present in our society and points to a system in need of reform. Attempting to solve a complex problem like the detoxification “revolving door” by addressing only the individual or health care influences may be too simplistic. We have yet to address the societal factors that either encourage or inhibit the “revolving door” such as societal attitudes and beliefs, policy, and funding for this vulnerable population. Evident in previous work, detoxification readmission and homelessness are closely connected.^{5,16,17} Housing First programs demonstrate success for those homeless and in need of substance use treatment.³⁹ However, these programs may need

TABLE 3 Difference in risk and protective factors of readmission^a for alcohol or opioid detoxification within 1 year of index admission (adjusted for age, sex, and race), 2012–2016

Risk factor	Alcohol Risk difference % (95% CI)	Opioids Risk difference % (95% CI)
Age at index admission, in years		
18–24	-21 (-34, -8)	5 (-8, 17)
25–34	Ref	Ref
35–44	11 (2, 19)	-3 (-17, 11)
45–54	11 (2, 19)	8 (-12, 28)
55–82	3 (-6, 12)	11 (-17, 38)
Male sex	10 (4, 16)	-4 (-14, 7)
Alaska Native/American Indian	13 (7, 19)	-7 (-17, 4)
Marital status		
Married or living as married	Ref	Ref
Single, never married	15 (7, 23)	-15 (-27, -2)
Divorced, separated, widowed	11 (3, 20)	2 (-16, 20)
Employed	-9 (-17, -2)	8 (-6, 21)
Location of residence		
Fairbanks	Ref	Ref
Interior	-12 (-19, -5)	-8 (-22, 6)
Outer	-22 (-31, -13)	-7 (-21, 6)
Stable housing	-14 (-20, -7)	10 (-2, 21)
Children <18 years of age in home	-4 (-12, 5)	-2 (-13, 10)
Days abstinent in past 30 days		
0	Ref	Ref
1–10	2 (-6, 10)	-4 (-15, 7)
11–30	4 (-3, 11)	-9 (-26, 9)
Age at first use in years		
<14	Ref	Ref
14–19	-3 (-10, 3)	-1 (-26, 23)
20–29	4 (-7, 14)	-9 (-32, 14)
30–57	4 (-16, 24)	-15 (-39, 9)
Any substance use hospitalizations in past year	4 (-5, 13)	6 (-10, 23)
History of physical abuse	3 (-4, 10)	-6 (-18, 5)
Current involvement in legal system	2 (-9, 13)	-8 (-20, 4)
Depression symptoms		
None	Ref	Ref
Mild/moderate	-5 (-13, 3)	4 (-10, 17)

TABLE 3 (Continued)

Risk factor	Alcohol Risk difference % (95% CI)	Opioids Risk difference % (95% CI)
Moderately severe/severe	-8 (-16, 1)	7 (-8, 21)
Any mental health hospitalizations in past year	0 (-10, 10)	3 (-19, 24)
Global assessment of functioning ^b		
10–25	-5 (-14, 4)	8 (-6, 23)
26–30	7 (-2, 16)	4 (-11, 18)
31–35	6 (-5, 16)	4 (-11, 20)
36–99	Ref	Ref
Length of stay in days		
1–2	Ref	Ref
3–4	13 (6, 19)	9 (-5, 23)
5–19	11 (0, 21)	2 (-11, 15)
Family involvement in treatment	-26 (-37, -16)	-21 (-31, -10)
Completed detoxification	7 (0, 13)	-15 (-24, -5)

Abbreviation: CI, confidence interval.

^aPeople who may have died without a readmission before 1 year were included in the no readmission group because death information was not available.

^bHigher score indicates better functioning.

expansion to address functioning, overall health, and social relationships to be more effective.³⁹ As a society, work on dispelling negative connotations is needed. Some believe homelessness is a result of irresponsible behavior and this group of people are less likely to support federal funding to address housing problems.⁴⁰ Those with substance use disorder experience stigma from the general population and healthcare systems.^{41,42} These opinions may contribute to policies and practices that remain unsupportive of vulnerable populations with chronic conditions. Studies of the underlying mechanisms that influence the choices that high-risk groups make regarding their lack of transition to longer-term treatment and studies augmenting promising programs like Housing First are needed. Substantial research and health care resources are devoted to preventing inpatient readmissions for other chronic health conditions,^{43,44} yet funding to prevention detoxification readmission and focused interventions intended to connect patients with subsequent treatment are both understudied and underfunded.⁴⁵

Our study has limitations. Patients who died within the 1-year period could have been readmitted had they lived, introducing unmeasurable bias into our results. However, our FNA partners indicate that the annual mortality rate is typically <2%, therefore we expect the magnitude of this potential bias to be small. Similarly, we are unable to discern whether patients were readmitted to detoxification facilities other than GTR within 1 year.

This may not be a major concern given the limited number of detoxification facilities in Alaska. Additionally, our statistical power for evaluating readmission to opioid detoxification was limited; results should be interpreted with caution and confirmed in larger studies. Nevertheless, our findings show potential factors that can be targets for future intervention research. Moreover, we fit only unadjusted and demographic-adjusted models as appropriate for the many comparisons and the hypothesis-generating goals of this study. This study sample primarily includes residents of the Alaska Interior; generalizations to other populations should be made cautiously. However, GTR is state-funded and operates similar to other programs.

Detoxification is the first step toward long-term recovery from alcohol and drug dependence. It is therefore important to understand risk and protective factors for readmission to detoxification to provide better transitional care, ongoing treatment, and support. This is especially true for subpopulations with relatively high detoxification readmission rates, including people in the Alaska Interior who seek treatment for alcohol and opioid use.

ACKNOWLEDGMENTS

We would like to acknowledge and thank Perry Ahsogeak from Fairbanks Native Association for his support and review of this manuscript. We also thank Susan McLaughlin for her thorough edits of this paper. This study was supported by the National Institute on Alcohol Abuse and Alcoholism of the National Institutes of Health under grant number P60AA026112. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIH.

CONFLICTS OF INTEREST

The authors declare no conflicts of interest.

REFERENCES

- Center for Substance Abuse Treatment. Detoxification and Substance Abuse Treatment. Rockville, MD: Substance Abuse and Mental Health Services Administration; 2006.
- Hayashida M. An overview of outpatient and inpatient detoxification. *Alcohol Health Res World*. 1998;22(1):44-46.
- Larson SA, Burton MC, Kashiwagi DT, Hugo SP, Cha SS, Lapid MI. Multiple admission for alcohol withdrawal. *J Hosp Med*. 2012;7(8):617-621.
- Carrier E, McNeely J, Lobach I, Tay S, Gourevitch MN, Raven MC. Factors associated with frequent utilization of crisis substance use detoxification services. *J Addict Dis*. 2011;30(2):116-122.
- Mark TL, Vandivort-Warren R, Montejano LB. Factors affecting detoxification readmission: analysis of public sector data from three states. *J Subst Abuse Treat*. 2006;31(4):439-455.
- Li X, Sun H, Marsh DC, Anis AH. Factors associated with seeking readmission among clients admitted to medical withdrawal management. *Subst Abuse*. 2008;29(4):65-72.
- McCarty D, Caspi Y, Panas L, Krakow M, Mulligan DH. Detoxification centers: who's in the revolving door? *J Behav Health Serv Res*. 2000;27(3):245-256.
- Richman A, Neumann B. Breaking the 'detox-loop' for alcoholics with social detoxification. *Drug Alcohol Depend*. 1984;13(1):65-73.
- Richman A. After how many detoxifications is rehabilitation probable? *Drug Alcohol Depend*. 1981;7(3):233-238.
- Worner TM. Relative kindling effect of readmissions in alcoholics. *Alcohol Alcohol*. 1996;31(4):375-380.
- Brems C, Johnson ME, Neal D, Freemon M. Childhood abuse history and substance use among men and women receiving detoxification services. *Am J Drug Alcohol Abuse*. 2004;30(4):799-821.
- Araujo L, Goldberg P, Eyma J, et al. The effect of anxiety and depression on completion/withdrawal status in patients admitted to substance abuse detoxification program. *J Subst Abuse Treat*. 1996;13(1):61-66.
- Hayashida M, Alterman AI, McLellan AT, et al. Comparative effectiveness and costs of inpatient and outpatient detoxification of patients with mild to moderate alcohol withdrawal syndrome. *N Engl J Med*. 1989;320(6):358-365.
- Roebuck MC, French MT, McLellan AT. DATStats: results from 85 studies using the Drug Abuse Treatment Cost Analysis Program. *J Subst Abuse Treat*. 2003;25(1):51-57.
- Johnson ME, Brems C, Warner TD, Roberts LW. Rural-urban health care provider disparities in Alaska and New Mexico. *Adm Policy Ment Health*. 2006;33(4):504-507.
- Running Bear U, Anderson H, Manson SM, Shore JH, Prochazka AV, Novins DK. Impact of adaptive functioning on readmission to alcohol detoxification among Alaska Native People. *Drug Alcohol Depend*. 2014;140(7):168-174.
- Callaghan RC. Risk factors associated with dropout and readmission among first nation individuals admitted to an inpatient alcohol and drug detoxification program. *Can Med Assoc J*. 2003;169(1):23-27.
- Mack KA, Jones CM, Ballesteros MF. Illicit drug use, illicit drug use disorders, and drug overdose deaths in Metropolitan and Nonmetropolitan Areas—United States. *MMWR Surveill Summ*. 2017;66(19):1-12.
- Qeadan F, Madden EF, Bern R, et al. Associations between opioid misuse and social relationship factors among American Indian, Alaska Native, and Native Hawaiian college students in the U.S. *Drug Alcohol Depend*. 2021;222:108667.
- Nalven T, Spillane NS, Schick MR. Risk and protective factors for opioid misuse in American Indian adolescents. *Drug Alcohol Depend*. 2020;206:107736.
- Lillie KM, Shaw J, Jansen KJ, Garrison MM. Buprenorphine/naloxone for opioid use disorder among Alaska Native and American Indian people. *J Addict Med*. 2021;15(4):297-302.
- Davison JW, Sweeney ML, Bush KR, et al. Outpatient treatment engagement and abstinence rates following inpatient opioid detoxification. *J Addict Dis*. 2006;25(4):27-35.
- Grzebinski S, Stein L, Dhmoon MS. Characteristics and outcomes of hospitalizations and readmissions for opioid dependence and overdose: nationally representative data. *Subst Abuse*. 2024;42(4):654-661.
- Chalana H, Kundal T, Gupta V, Malhari AS. Predictors of relapse after inpatient opioid detoxification during 1-year follow-up. *J Addict*. 2016;2016:7620860.
- State of Alaska. Alaska Screening Tool FY2011 and Initial Client Status Review FY2011: Supporting Clinical Decision Making and Program Performance Measurement. Anchorage, AK: Department of Health and Human Services, Division of Behavioral Health; 2011.
- Aas IH. Guidelines for rating global assessment functioning (GAF). *Ann Gen Psychiatry*. 2011;10(2):1-11.
- Schmidt CO, Kohlmann T. When to use the odds ratio or the relative risk? *Int J Public Health*. 2008;53(3):165-167.
- Greenland S, Holland P. Estimating standardized risk differences from odds ratios. *Biometrics*. 1991;47(1):319-322.
- Sato T, Matsuyama Y. Marginal structural models as a tool for standardization. *Epidemiology*. 2003;14(6):680-686.

30. Muller CJ, MacLehose RF. Estimating predicted probabilities from logistic regression: different methods correspond to different target populations. *Int J Epidemiol.* 2014;43(3):962-970.
31. Stata/SE 14.1 for Windows (64-bit x86-64) [computer program]. Version 14.1; 2016.
32. Vatnaland T, Vatnaland J, Friis S, Opjordsmoen S. Are GAF scores reliable in routine clinical use? *Acta Psychiatr Scand.* 2007;115(4):326-330.
33. Henson M, Sabo S, Trujillo A, Teufel-Shone N. Identifying protective factors to promote health in American Indian and Alaska Native adolescents: a literature review. *J Prim Prev.* 2017;38(1-2):5-26.
34. State of Alaska. Transforming Health Care in Alaska: 2009 report/2010-2014 strategic plan. In. Anchorage, Alaska: Department of Health and Social Services; Alaska Health Care Commission; 2010.
35. Running Bear U, Croy CD, Kaufman CE, Thayer ZM, Manson SM. The relationship of five boarding school experiences and physical health status among Northern Plains Tribes. *Qual Life Res.* 2018;27(1):153-157.
36. Wu L-T, Ling W, Burchett B, Blazer DG, Shostak J, Woody GE. Gender and racial/ethnic differences in addiction severity, HIV risk, and quality of life among adults in opioid detoxification: results from the National Drug Abuse Treatment Clinical Trials Network. *Sust Abuse Rehabil.* 2010;1:13-22.
37. Sharma R. The family and family structure classification redefined for the current times. *J Family Med Prim Care.* 2013;2(4):306-310.
38. Gameon JA, Skewes MC. Historical trauma and substance use among American Indian people with current substance use problems. *Psychol Addict Behav.* 2021;35(3):295-309.
39. Cherner RA, Aubry T, Sylvestre J, Boyd R, Pettey D. Housing first for adults with problematic substance use. *J Dual Diagn.* 2017;13(3):219-229.
40. Tsai J, Lee CYS, Shen J, Southwick SM, Pietrzak RH. Public exposure and attitudes about homelessness. *J Community Psychol.* 2019;47(1):76-92.
41. Yang LH, Wong LY, Grivel MM, Hasin DS. Stigma and substance use disorders: an international phenomenon. *Curr Opin Psychiatry.* 2017;30(5):378-388.
42. Muncan B, Walters SM, Ezell J, Ompad DC. "They look at us like junkies": influences of drug use stigma on the healthcare engagement of people who inject drugs in New York City. *Harm Reduct J.* 2020;17(1):53.
43. Goldfield NI, McCullough EC, Hughes JS, et al. Identifying potentially preventable readmissions. *Health Care Financ Rev.* 2008;30(1):75-91.
44. Anderson GF, Steinberg EP. Hospital readmissions in the Medicare population. *N Engl J Med.* 1984;311(211):1349-1353.
45. Mark TL, Dilonardo JD, Clalk M, Coffey CM. *Substance Abuse Detoxification: Improvements Need in Linkage to Treatment.* Center for Substance Abuse Treatment, Substance Abuse and Mental Health Services Administration; 2002.

How to cite this article: Running Bear U, Hanson JD, Noonan C, Muller C, Trojan J, Manson SM. Factors associated with readmission to alcohol and opioid detoxification in the Alaska Interior. *Am J Addict.* 2022;31:406-414.
[doi:10.1111/ajad.13288](https://doi.org/10.1111/ajad.13288)